
A Guide for Monitoring and Evaluating Child Health Programs

Anastasia J. Gage
Disha Ali
Chiho Suzuki



World Health
Organization



THE WORLD BANK

This guide was made possible by support from the U.S. Agency for International Development (USAID) under terms of Cooperative Agreement GPO-A-00-03-000003-00. The author's views expressed in this publication do not necessarily reflect the views of USAID or the United States Government.

September 2005

MS-05-15



Printed on recycled paper

ACKNOWLEDGEMENTS

This Guide has grown out of the collective experience of many individuals and organizations over the past few decades in monitoring and evaluating child health programs at the national level in developing countries. The effort, coordinated by the United States Agency for International Development (USAID), World Health Organization Headquarters (WHO-HQ), and MEASURE Evaluation, was co-financed by the USAID Office of Health, Infectious Diseases and Nutrition (HIDN) and WHO. We are particularly grateful to Al Bartlett and Norma Wilson of USAID/HIDN, Thierry Lambrechts and colleagues of the WHO Department of Child and Adolescent Health and Development, and Maria Francisco, who sustained this activity with enthusiastic and unwavering support and sound technical advice.

The process has involved repeated consultation with monitoring and evaluation specialists at WHO/AFRO and the United States Centers for Disease Control and Prevention (CDC). We are particularly grateful to Dr. Wondi Alemu, who led the significant amount of work that went on with partners in CDC, WHO-HQ and Ministries of Health in the African region to develop the set of indicators for monitoring and evaluating integrated disease surveillance and response, which are described in Chapter Five of the guide. The United Nations Children's Fund (UNICEF) and the World Bank provided substantial input to the development of the guide.

Technical input has come from numerous colleagues and a number of institutions, including WHO-HQ, CDC, Academy for Educational Development/FANTA and Change, BASIC Support for Institutionalizing Child Survival II Project, the Environmental Health Project, John Snow International Research and Training Institute, ORC Macro International/Child Survival Technical Support and MEASURE DHS, Project Hope/The Core Group, Save the Children, and MEASURE Evaluation. A technical advisory group meeting was held in May 2003 at which a draft version of this Guide was extensively reviewed. This meeting was attended by technical specialists from a range of institutions. Following this meeting, the draft guide was revised and finalized.

The authors are especially grateful to the following colleagues (listed below in alphabetical order) who contributed to this volume in various ways through attending meetings, preparing text, reviewing drafts of specific chapters, and answering requests for information:

Mounkaila Abdou	Maria Francisco
Jacob Adetunji	Mary Freyder
Juan Carlos Alegre	Nancy Fronczak
Sharon Arscott-Mills	Amanda Gibbons
Stacey Ballou	Anja Giphart
Sandra Bertoli	Stephen Hadler
Ed Bos	Paige Harrigan
Matthew Carney	Eckhard Kleinau
Misun Choi	Ann LaFond
Eunyong Chung	Thierry Lambrechts
Stella Chungong	Margaret Lamunu
Bruce Cogill	Joy Lawn
Siân Curtis	Robert Magnani
Rebecca Fields	John Mason

Jay McAuliffe
Subhi Mehdi
Roy Miller
Eric Mintz
John Novak
Peter Nsubuga
Michel Pacqué
Helen N. Perry
Beth Plowman
Sandra Remancus
Amanda Rose
La Rue Seims

Kavita Singh
Adam Slote
Cynthia Stanton
Mary Ellen Stanton
Robert Steinglass
Patricia Stephenson
Murray Trostle
Steve Wall
Tessa Wardlaw
Norma Wilson
Professor D.L. Woods
Jelka Zupan

Recommended citation:

Gage, Anastasia J., Disha Ali, and Chiho Suzuki. (2005). A Guide for Monitoring and Evaluating Child Health Programs. MEASURE Evaluation. Carolina Population Center, University of North Carolina at Chapel Hill.

TABLE OF CONTENTS

Acknowledgements	iii
List of Figures and Tables	vii
Summary List of Indicators	ix
Acronyms	xv
Chapter 1. Overview	1
A. Rationale for the Guide	1
A.1 Objectives of the Guide	3
A.2 Intended Audience	4
A.3 Organization of the Guide	4
B. Indicators for Program Monitoring and Evaluation	5
B.1 Program Components - Inputs, Processes, Outputs, and Outcomes	5
B.2 Defining Monitoring and Evaluation	6
B.3 Program-based and Population-based Measures	8
B.4 Monitoring and Evaluation during Phases of the Program Cycle	9
B.5 Value of a Conceptual Framework	9
B.6 Indicators	13
B.7 How to Select Indicators	14
B.8 Data Sources	15
B.8.1 Household and community level data	15
B.8.2 Health systems data	17
B.8.3 Qualitative data	18
B.9 The Use of Indicators at Different Levels	19
Chapter 2. Prevention of Mother-to-Child Transmission of HIV	24
Chapter 3. Newborn Health	42
Chapter 4. Immunization	112
Chapter 5. Integrated Disease Surveillance and Response	160
Chapter 6. Integrated Management of Childhood Illness: Improved Health Worker Skills	206
Chapter 7. Diarrhea, Acute Respiratory Infection, and Fever	240
Chapter 8. Growth Monitoring and Nutrition	302
Chapter 9. Mortality	370

LIST OF FIGURES AND TABLES

Figure 1.1. Program phases and priority monitoring and evaluation activities	10
Figure 1.2. Conceptual framework for monitoring and evaluating child health programs	12
Table 3.1. WHO essential newborn care package	44
Figure 3.1. Maternal & newborn health linkages	45
Table 3.2. Essential newborn care intervention sub-package	55
Table 3.3. WHO recommended tetanus toxoid immunization schedule for women of childbearing age and pregnant women without previous exposure to TT, Td, or DTP ..	66
Table 3.4. Essential newborn care intervention sub-package	80
Table 3.5. Potential causes of death for specific age and birth weight categories	102
Table 4.1. Illustrative inputs, processes, outputs, and outcomes for monitoring immunization programs	114
Table 4.2. Tetanus toxoid immunization schedule for women of childbearing age and pregnant women without previous exposure to tetanus toxoid-containing vaccines (TT, Td, or DTP)	120
Figure 5.1. Information flow in an integrated disease surveillance system (IDS)	163
Figure 5.2. Steps for establishing health facility thresholds	176
Figure 5.3. The role of laboratories in a well-functioning surveillance system	182
Table 5.3. Recommended responses to confirmed outbreaks for selected diseases that are of relevance to child health programs	186
Figure 6.1. Outline of the integrated management of childhood illness (IMCI) impact model	207
Table 6.1. Illustrative processes, outputs, and outcomes associated with improving health worker skills	208
Table 7.1. List of indicators for the household and community component of IMCI	242
Table 7.2. RBM core indicators	244
Figure 8.1. Conceptual framework for the causes of malnutrition in society	304
Figure 8.2. Conceptual framework for monitoring and evaluating child nutrition programs	305
Table 8.1. PAHO/WHO guiding principles for complementary feeding of the breastfed child ...	312
Table 8.2. Components and scoring of a young child feeding practices score for children aged 6-23 months	333

SUMMARY LIST OF INDICATORS

The indicators in this guide are organized into eight chapters. Chapters two to eight describe indicators that are relevant to specific programmatic areas of child health. Chapter IX presents mortality indicators. Essential core indicators that are relevant for monitoring and evaluation in multiple programmatic areas have been cross-referenced. For example, some hygiene indicators are cross-referenced in the nutrition and diarrhea/ARI/fever sections. The indicators appearing within each chapter are detailed below.

<u>Chapter</u>	<u>Indicators</u>
2	Prevention of Mother-to-Child Transmission of HIV
	<ul style="list-style-type: none"> ● Existence of guidelines for the prevention of HIV infection in infants and young children ● Number and percentage of health care workers newly trained or retrained in the minimum package during the preceding 12 months ● Prevention and care service points ● Women completing the testing and counseling process ● Percentage of HIV-positive pregnant women receiving a complete course of antiretroviral (ARV) prophylaxis to reduce the risk of MTCT in accordance with a nationally approved treatment protocol (or WHO/UNAIDS standards) in the preceding 12 months ● Percentage of HIV-infected infants born to HIV-infected mothers
3	Newborn Health
	<ul style="list-style-type: none"> ● Number of health facilities providing basic and comprehensive emergency obstetric care functions per 500,000 population ● Proportion of hospitals and maternity facilities designated as baby friendly ● Proportion of health workers competent in neonatal resuscitation upon completion of training ● Proportion of pregnant women attending antenatal clinics who are screened for syphilis ● Proportion of babies who receive eye prophylaxis care within one hour of birth ● Percentage of HIV-positive pregnant women receiving a complete course of antiretroviral (ARV) prophylaxis to reduce the risk of MTCT according to nationally approved (or WHO/UNAIDS) guidelines in the past 12 months (<i>cross-referenced in Chapter II</i>) ● Proportion of pregnant women who received at least two antenatal care visits ● Proportion of pregnant women receiving at least two doses of tetanus-toxoid vaccine ● Proportion of pregnant women receiving intermittent preventive treatment or malaria prophylaxis, according to national policy ● Proportion of pregnant women who know two or more newborn danger signs

<u>Chapter</u>	<u>Indicators</u>
3	Newborn Health (continued)
	<ul style="list-style-type: none"> ● Proportion of deliveries occurring in a health facility ● Proportion of deliveries with a skilled attendant at birth ● Maternal mortality ratio ● Proportion of newborns who receive thermal protection immediately after birth ● Timely initiation of breastfeeding (<i>cross-referenced in Chapter eight</i>) ● Exclusive breastfeeding rate (<i>cross-referenced in Chapter eight</i>) ● Proportion of women who receive two high-dose supplements of vitamin A within six weeks of giving birth ● Preterm birth rate ● Proportion of live births with low birth weight ● Late fetal death rate (<i>cross-referenced in Chapter nine</i>) ● Perinatal mortality rate (<i>cross-referenced in Chapter nine</i>) ● Cause-specific perinatal mortality rate ● Birth weight specific mortality rate (<i>cross-referenced in Chapter nine</i>) ● Number of neonatal tetanus cases ● Neonatal mortality rate (<i>cross-referenced in Chapter nine</i>)
4	Immunization
	<ul style="list-style-type: none"> ● Proportion of infants born protected against neonatal tetanus ● BCG coverage ● DTP1 coverage ● DTP3 coverage ● OPV3 coverage ● Measles coverage ● HEPB3 coverage ● Hib3 coverage ● Dropout from DTP1 to DTP3 ● Fully immunized child (FIC) ● Vaccine wastage rate
5	Integrated Disease Surveillance and Response
	<ul style="list-style-type: none"> ● Proportion of health facilities submitting weekly/monthly surveillance reports on time to the district level ● Proportion of districts submitting weekly/monthly surveillance reports on time to the next level ● Proportion of cases of diseases selected for case-based surveillance which were reported to the district using case-based or line listing forms ● Proportion of suspected outbreaks of epidemic-prone diseases notified to the next level within two days of surpassing the epidemic threshold ● Proportion of districts with current trend analysis (line graphs) for selected priority diseases ● Proportion of reports of investigated outbreaks that include case-based data recorded and analyzed ● Proportion of outbreaks of epidemic-prone diseases with laboratory results

<u>Chapter</u>	<u>Indicators</u>
5	Integrated Disease Surveillance and Response (continued)
	<ul style="list-style-type: none"> • Proportion of confirmed outbreaks with recommended response • Attack rate • Case fatality rate for outbreaks of epidemic-prone diseases
6	Integrated Management of Childhood Illness: Health Facility Level
	<ul style="list-style-type: none"> • Child checked for three danger signs • Child checked for the presence of cough, diarrhea, and fever • Child's weight checked against a growth chart • Child's vaccination status checked • Index of integrated assessment of sick child • Child under two years of age assessed for feeding practices • Child needing an oral antibiotic and/or antimalarial is prescribed the drug(s) correctly • Sick child not needing antibiotic leaves the facility without antibiotic • Caretaker of sick child is advised to give extra fluids and continue feeding • Child needing vaccinations leaves facility with all needed vaccinations • Caretaker of child who is prescribed ORS and/or oral antibiotic and/or antimalarial knows how to give the treatment • Sick child needing referral is referred
7	Diarrhea, ARI, and fever
	<ul style="list-style-type: none"> • Proportion of households with access to an improved source for drinking water • Proportion of households using an improved toilet facility • Proportion of households with access to essential handwashing supplies • Proportion of households storing drinking water safely • Proportion of households treating drinking water effectively • Proportion of households where drinking water has sufficient levels of residual chlorine • Proportion of households where the caretaker of the youngest child under five reported appropriate handwashing behavior • Proportion of households that disposed of the youngest child's feces safely the last time s/he passed stool • Period prevalence of diarrhea • Child with non-bloody diarrhea treated with antibiotics

<u>Chapter</u>	<u>Indicators</u>
7	Diarrhea, ARI, and fever (continued)
	<ul style="list-style-type: none"> ● Oral rehydration therapy (ORT) use rate ● Proportion of children aged 2-59 months with diarrhea in the last two weeks who were treated with zinc supplements ● Period prevalence of acute respiratory infection needing assessment ● Care seeking for ARI in children 0-59 months of age ● Period prevalence of history of fever ● Child sleeps under an insecticide-treated net ● Child with fever receives appropriate antimalarial treatment ● Caretaker knows at least two signs for seeking care immediately ● Number of malaria cases among under-fives ● Malaria death rate among under-fives
8	Growth Monitoring and Nutrition
	<ul style="list-style-type: none"> ● Sick child checked for three danger signs (<i>cross-referenced in Chapter six</i>) ● Sick child's weight checked against a growth chart (<i>cross-referenced in Chapter six</i>) ● Sick child under two years of age assessed for feeding practices (<i>cross-referenced in Chapter six</i>) ● Caretaker of sick child is advised to give extra fluids and continue feeding (<i>cross-referenced in Chapter six</i>) ● Proportion of hospitals and maternity facilities designated as baby friendly (<i>cross-referenced in Chapter three</i>) ● Exclusive breastfeeding rate ● Timely initiation of breastfeeding ● Complementary feeding rate ● Mean dietary diversity of foods consumed by children aged 6-23 months ● Proportion of children aged 6-23 months with good young child feeding practices ● Proportion of households with access to essential handwashing supplies (<i>cross-referenced in Chapter seven</i>) ● Proportion of households where the caretaker of the youngest child under five reported appropriate handwashing behavior (<i>cross-referenced in Chapter seven</i>) ● Sick child aged 6-23 months is offered increased fluids and continued feeding ● Proportion of children living in households using adequately iodized salt ● Proportion of children aged 12-59 months who were dewormed in the past six months ● Prevalence of night blindness in children ● Vitamin A supplementation

<u>Chapter</u>	<u>Indicators</u>
8	Growth Monitoring and Nutrition (continued)
	<ul style="list-style-type: none"> ● Vitamin A deficiency (serum retinol concentration) ● Proportion of children aged 6-59 months with anemia ● Low weight-for-height/length (wasting) ● Low height/length-for-age (stunting) ● Low weight-for-age (under weight) ● Under-five mortality rate (<i>cross-referenced in Chapter nine</i>)
9	Mortality
	<ul style="list-style-type: none"> ● Late fetal death rate (<i>cross-referenced in Chapter three</i>) ● Perinatal mortality rate (<i>cross-referenced Chapter three</i>) ● Cause-specific perinatal mortality rate (<i>cross-referenced in Chapter three</i>) ● Birth weight specific mortality rate (<i>cross-referenced in Chapter three</i>) ● Neonatal mortality rate (<i>cross-referenced in Chapter three</i>) ● Infant mortality rate ● Child mortality rate ● Under-five mortality rate (<i>cross-referenced in Chapter eight</i>) ● Cause-specific mortality rate

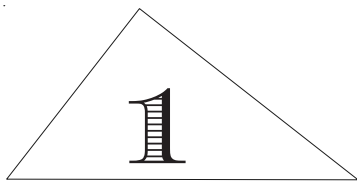
ACRONYMS

ACC/SCN	Administrative Committee on Coordination/Standing Committee on Nutrition
AEFI	Adverse Events Following Immunization
AFP	Acute Flaccid Paralysis
AFR	Bureau of Africa
AMRO	WHO Latin American Regional Office
ANC	Antenatal Clinic
APH	Ante-Partum Hemorrhage
API	Annual Parasite Index
ARI	Acute Respiratory Infection
ART	Antiretroviral Therapy
ARV	Antiretroviral (drugs)
AZT	Azidodeoxythymidine (Retrovir)
BASICS	Basic Support for Institutionalizing Child Survival II
BCC	Behavior Change Communication
BCI	Behavior Change Interventions
BCG	Bacille Calmette-Guerin (vaccine)
BFHI	Baby Friendly Hospitals Initiative
BHR	Bureau of Humanitarian Response
C-IMCI	Community Integrated Management of Childhood Illness
CATCH	Core Assessment Tool on Child Health
CFR	Case Fatality Rate
CBD	Community-Based Distribution
CDC	Centers for Disease Control and Prevention
CDD	Control of Diarrheal Disease
CHW	Community Health Worker
CORE	Child Survival Collaborations and Resources Group
DD	Diarrheal Disease
DHS	Demographic and Health Survey
DTP	Diphtheria, Tetanus, Pertussis (vaccine)
EBR	Exclusive Breastfeeding Rate
EH	Environmental Health
EHP	Environmental Health Project
END	Early Neonatal Death
ENMR	Early Neonatal Mortality Rate
EOC	Emergency Obstetric Care
EPI	Expanded Program on Immunization (WHO)
FANTA	Food and Nutrition Technical Assistance
FIC	Fully Immunized Child
FP	Family Planning
GAVI	Global Alliance for Vaccines and Immunization
GDP	Gross Domestic Product
HAART	Highly Active Antiretroviral Therapy
HIF	Hygiene Improvement Framework

HFA	Health Facility Assessment
HFS	Health Facility Survey
HHIQAT	Household Hygiene Improvement Quantitative Assessment Tool
HIB	Haemophilus Influenza Type B (vaccine)
HIF	Health Improvement Framework
HIS	Health Information Survey
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information Systems
HMN	Health Metrics Network
HPLC	High-Performance Liquid Chromatography
IAWG	Inter-Agency Working Group
ICCIDD	International Council for Control of IDD
ICDS	Integrated Child Development Services
ICHS	Integrated Child Health Survey
IDD	Iodine Deficiency Disorders
IEC	Information, Education and Communication
IMCI	Integrated Management of Childhood Illness
IPT	Intermittent Preventative Treatment
ITM	Insecticide-Treated Materials
ITN	Insecticide-Treated Net
IU	International Units
IUGR	Intrauterine Growth Retardation
IVACG	International Vitamin A Consultative Group
JMP	Joint Monitoring Programme
KAP	Knowledge, Attitude, and Practice
KPC	Knowledge, Practice, Coverage
LBW	Low Birth Weight
lcd	Liters Per Capita Use Per Day (lcd)
LFDR	Late Fetal Death Rate
LMIS	Logistics Management Information System
LNMR	Late Neonatal Mortality Rate
LQAS	Lot Quality Assurance
MEASURE	Monitoring and Evaluation to Assess and Use Results
MEWG	Monitoring and Evaluation Working Group
MCH	Maternal and Child Health
MDG	Millennium Development Goal
M&E	Monitoring and Evaluation
mg/l	Milligrams Per Liter
MICS	Multiple Indicator Cluster Survey
MIS	Management Information System
MMR	Maternal Mortality Rate
MOH	Ministry of Health
MTCT	Maternal to Child Transmission
mU/l	Milliunits Per Liter
NCHS	National Center for Health Statistics
NIDS	National Immunization Days
NGO	Nongovernmental Organization

NMR	Neonatal Mortality Rate
NRL	National Reference Library
NT	Neonatal Tetanus
NTMR	Neonatal Tetanus Mortality Rate
OSD	Office of Sustainable Development
OPV	Oral Polio Vaccine
ORS	Oral Rehydration Salt
ORT	Oral Rehydration Therapy
PAHO	Pan American Health Organization
pH	Potential of Hydrogen
PHC	Primary Health Care
PMR	Perinatal Mortality Rate
PMTCT	Prevention of Mother to Child Transmission (of HIV)
PNDA	Perinatal Death Audits
Ppm	Parts Per Million
PVC	Office of Private and Voluntary Cooperation
PVO	Private Voluntary Organization
PVP	Predictive Value Positive
QA	Quality Assurance
QIQ	Quick Investigation of Quality
RAMOS	Reproductive Age Mortality Survey
RBM	Roll Back Malaria
RBP	Retinol Binding Protein
RHS	Recommended Home Fluid
RTH	Road to Health
SD	Standard Deviation
SES	Socioeconomic Status
SDP	Service Delivery Point
SNID	Sub-National Immunization Day
SP	Sulfadoxine-Pyrimethamine
SPA	Service Provision Assessment
STH	Soil-Transmitted Helminths
STI	Sexually Transmitted Infection
TD	Tetanus-Diphtheria
TSH	Thyroid Stimulating Hormone
TT	Tetanus Toxoid (vaccine)
U5MR	Under-Five Mortality Rate
µg	Micrograms (millionth of a gram)
UN	United Nations
UNAIDS	Joint United Nations Program on HIV/AIDS
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNGASS	United Nations General Assembly Special Session
UNICEF	United Nations Children's Fund
UNICEF/ESAR	United Nations Children's Fund/Eastern & Southern Africa Regional Office
USAID	United States Agency for International Development

UTI	Uterine Tract Infection
VAD	Vitamin A Deficiency
VADD	Vitamin A Deficiency Disorder
VCT	Voluntary Counseling and Testing
VE	Vaccine Efficiency
VIP	Ventilated Improved Latrine
VVM	Vaccine Vial Monitors
WHO	World Health Organization
WHO/AFRO	World Health Organization/Regional Office for Africa
WFS	World Fertility Survey
WHS	World Health Survey
WSSCC	Water Supply and Sanitation Collaborative Council



CHAPTER 1. OVERVIEW

A. Rationale for the Guide

A number of recent global initiatives have triggered renewed interest in supporting and strengthening the monitoring and evaluation of child health programs. The Millennium Development Goals (MDGs) are among the most prominent and provide a commonly accepted framework, benchmarks, and indicators for measuring development progress. Six of the MDGs (see Annex Table 1.1) are directly relevant to children and match the goals set out in “A World Fit for Children” (United Nations, 2002). Goals 4, 5, and 6 set out to reduce child mortality, improve maternal health, and combat HIV/AIDS, malaria and other diseases, respectively. The MDGs have not only accelerated demand for data, but they have also highlighted limitations in data availability and quality, as significant numbers of countries do not have enough data to track changes in poverty, child malnutrition and HIV/AIDS prevalence. Some countries also face serious data quality issues in measuring maternal mortality and access to water and sanitation. Achieving the MDGs by 2015 will require greater focus on outcomes rather than inputs to effectively measure progress at the national and global levels.

Internationally-led efforts to monitor and evaluate progress in reducing child mortality and morbidity also encompass the Integrated Management of Childhood Illness (IMCI) strategy. The strategy includes interventions to prevent illness and reduce deaths from the most common child health problems and to promote child health and development. The interventions comprise three components: improving health worker case management skills, improving the health system to deliver IMCI, and improving family and community practices. The World Health Organization (WHO) Department of Child and Adolescent Health and Development has

developed recommendations for monitoring IMCI at national and district levels, conducted worldwide monitoring of IMCI implementation, developed tools for national and district level evaluation, and established milestones for worldwide monitoring of IMCI implementation (WHO, 1999). A list of priority and supplemental indicators for IMCI implementation at first level health facilities and in the community was developed and agreed upon by an Inter-Agency Working Group on IMCI Monitoring and Evaluation for use in all monitoring and evaluation activities to facilitate the collection of comparable information in different settings.

The Global Alliance for Vaccines and Immunization (GAVI) was launched by its partners in 2000 to fight declining immunization rates and growing disparities in access to vaccines among the world’s poorest countries. GAVI is a public-private partnership between governments in developing and industrialized countries, established and emerging vaccines manufacturers, nongovernmental organizations (NGOs), research institutes, United Nations Children’s Fund (UNICEF), World Health Organization (WHO), the Bill & Melinda Gates Foundation, and the World Bank. GAVI’s objectives are to: improve access to sustainable immunization services; expand the use of all existing safe and cost-effective vaccines, and promote delivery of other appropriate interventions at immunization contacts; support the national and international accelerated disease control targets for vaccine-preventable diseases; accelerate the development and introduction of new vaccines and technologies; accelerate research and development (R&D) efforts for vaccines needed primarily in developing countries; and make immunization coverage a centerpiece in international development efforts. To help measure progress towards its overall goal

of protecting children of all nations and socioeconomic levels against vaccine-preventable diseases, GAVI has established the following milestones:

- (1) By 2010 or sooner all countries will have routine immunization coverage at 90% nationally with at least 80% coverage in every district.
- (2) By 2007, all countries with adequate delivery systems will have introduced hepatitis B vaccine.
- (3) By 2005, 50% of the poorest countries with high disease burdens and adequate delivery systems will have introduced Hib vaccine.
- (4) By 2008, the world will be certified polio-free.
- (5) By 2005, the vaccine efficacy and burden of disease will be known for all regions for rotavirus and pneumococcal vaccine, and mechanisms will be identified to make the vaccines available to the poorest countries.

International efforts in monitoring and evaluating programs for the prevention of HIV in infants and young children were spurred in large measure by the adoption of the Declaration of Commitment on HIV/AIDS at the United Nations General Assembly Special Session on HIV/AIDS in June 2001, at which governments from 185 countries committed themselves to a comprehensive international and national effort to fight the HIV/AIDS pandemic. The Declaration established a number of goals for the achievement of specific targets including reductions in HIV infection among infants and young adults; improvements in HIV/AIDS education, health care and treatment; and improvements in orphan support. The Declaration of Commitment has generated an international effort, led by the Joint United Nations Programme on HIV/AIDS (UNAIDS), to develop a core set of indicators for monitoring various aspects of national and international actions, national program outcomes and national impact objectives (UNAIDS, 2002). Some of the global and national indicators for implementation of the Declaration of Commitment have a direct

bearing on child health programs. Ongoing efforts include the development of guidelines for *Local Monitoring and Evaluation of the Integrated Prevention of Mother to Child HIV/Transmission in Low-Income Countries* (UNAIDS, 2000) and the development of a national guide to monitoring and evaluating programmes for the prevention of HIV in infants and young children.

Another important initiative that has shaped international monitoring and evaluating efforts is Roll Back Malaria (RBM). Roll Back Malaria is a global partnership founded in 1998 by WHO, the United Nations Development Programme (UNDP), UNICEF, and the World Bank with the goal of halving the world's malaria burden by 2010. The RBM partnership includes national governments, civil society and nongovernmental organizations, research institutions, professional associations, UN and development agencies, development banks, the private sector and the media. Drawing on past work accomplished by the WHO Regional Offices and on the more recent efforts of the WHO Regional Offices for Africa and for Eastern Mediterranean during the Accelerated Implementation of Malaria Control in 1997-1998, WHO has developed a framework along with indicators for monitoring the progress and evaluating the outcomes and impacts of RBM. A multi-disciplinary group on RBM monitoring and evaluation was created to propose a framework for monitoring and evaluation to be endorsed by all RBM partners, to specify, as far as possible, standard methods, indicators and criteria to be used, to select a set of tools to be used to collect the data needed for measuring global indicators and to propose a guide for use of these tools (WHO, 2000).

Faced with the necessity to improve country capacity to provide and use health information and the increasing data needs among the global donor community, a new global initiative, the Health Metrics Network (HMN), was launched in May 2005. The overarching goal of the HMN is to improve the availability and quality of population

and health information in resource poor countries. It proposes to do this through three primary functions: global coordination of health information efforts, strengthening country health information systems, and development and promotion of priority innovations in health information methods. The HMN is a network of partners, spearheaded initially through the efforts of the Bill and Melinda Gates Foundation and WHO, that will work with ministries of health, departments of statistics and information, international organizations, multi-lateral and bilateral agencies, foundations, academic institutions and civil society organizations. The primary focus of the HMN will be at country level and activities will be country led. The HMN will work to mobilize resources and technical expertise to assist countries in their health information system improvements and reform. At the same time the HMN will work with global partners in collaborating and coordinating global monitoring and evaluation efforts in order to lessen the burden placed on country partners as they respond to information requests.

This is by no means an exhaustive list of initiatives that have renewed interest in the monitoring and evaluation of health programs. The importance of health information as a public good has gathered momentum since the adoption of the MDGs. International meetings on selected health topics have provided a forum for generating recommendations for outcome indicators, a case in point being the International Vitamin A Consultative Group (IVACG) Meeting held from October 30 to November 2, 2000 in Annecy, France where outcome indicators were proposed for monitoring and evaluating vitamin A programs (Wasantwisut, 2002). The process of developing international consensus on monitoring and evaluation frameworks, indicators, and tools has typically involved consultations among global partners and has taken considerable time and effort. As a result, many of the indicators proposed by these initiatives have achieved broad international consensus and have been tested and

used extensively in the field. The current volume reaps the benefits of these recent initiatives, as well as of earlier international efforts to develop indicators on various aspects of child health.

A.1 Objectives of the Guide

The overarching objective of this guide is to encourage program monitoring and evaluation and to improve the quality of work in the child health area. To this end, the guide provides a comprehensive listing of the most widely used indicators for monitoring and evaluating child health programs in developing countries. The indicators are organized using a generic conceptual framework. This framework maps the pathways through which programs achieve results (see Figure 1.2 on page 12), and as such constitutes a logical framework for developing a monitoring and evaluation plan with appropriate indicators. Many of the program areas covered in the guide contain more detailed frameworks that explain the pathways for program effects specific to different technical intervention areas.

Past monitoring and evaluation efforts have sometimes focused exclusively on child health outcomes or ultimate program results, with little clarification of how programs operate to achieve their desired results. However, this framework specifies how those who design the program expect it to work to achieve results at both the program and population level. Moreover, the framework draws attention to the different aspects of child health programs that must be working satisfactorily to achieve the desired end result.

The specific objectives of this guide are to:

- Compile indicators judged to be most useful for monitoring and evaluating child health programs.
- Encourage the consistent use of standardized definitions of indicators and terminology across the child health community.

- Serve as a central source for obtaining measures of process and output that can be reasonably linked to program activities.
- Promote the monitoring and evaluation of child health programs by making indicators better known and easier to use.

A.2. Intended Audience

Several different audiences should find this guide pertinent to their own work, including:

- Directors, managers and staff of child health programs worldwide
- Staff of international agencies dealing with child health
- Monitoring and evaluation specialists
- Applied researchers

A.3. Organization of the Guide

Chapter 1 provides an overview of the Guide and presents generic monitoring and evaluation terminology that has been used to organize the indicators. This section describes hypothetical phases during the life of a program when evaluation can make a contribution; types of evaluation; and the major sources of data on which indicators are based. It also provides guidance on how to select indicators for program monitoring and evaluation.

The rest of the volume is organized by major area of program intervention. These encompass the prevention of mother-to-child transmission of HIV/AIDS, newborn health, immunization, integrated disease surveillance and response, integrated management of childhood illness at the health facility level, diarrhea/acute respiratory infection (ARI)/fever (malaria), growth monitoring and nutrition, and mortality. Each chapter briefly discusses measurement challenges and presents indicators for monitoring and evaluating the service delivery environment, specifically access to services and quality, and key population-based outcomes for the programmatic area under consideration.

Each indicator is described in the context of program goals. The data requirements are summarized, and reference is made to the questionnaires or measurement tools that would provide the required information for constructing the indicator. Details on methods of calculation are given for each indicator. Where calculation of the indicator requires the initial computation of a numerator and a denominator, precise definitions of these components are provided. The guidelines for each indicator end by highlighting the indicator's strengths and limitations and points to be considered when interpreting estimates of the indicator. Particular attention is paid to highlighting factors that could distort trends in the indicator as these may lead to incorrect conclusions being drawn on program effectiveness.

We also include targets and benchmarks, where these have been established at the global level by international consensus. In some poor countries, many of these targets and benchmarks may seem far out of reach. Even in better-off countries there may be regions or groups that lag behind. Individual countries may set and monitor progress against their own internal targets and benchmarks, if they wish to do so.

To the extent possible, we selected indicators that had been field-tested, including those measured in the Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS). However, some of the indicators presented in this guide represent work in progress. In some cases, data for measuring these indicators are not yet available or not adequately collected through international survey efforts.

This manual does not address output indicators for the multiple functional areas that are essential to support program activities. These functional areas include management, capacity building, commodities and logistics, behavior change communication (BCC), policy, and advocacy. Despite the importance of these topics to child health programs, the authors were not able to locate a standard set of indicators that had been

tested and were in use at the field level to monitor and evaluate the functional areas of child health programs. The Child Health Technical Advisory Group felt that such indicators would need to be context-specific and proposed that a separate effort be initiated to develop a set of guidelines that will assist organizations in identifying appropriate means of monitoring and evaluating these functional areas within their organizations. The current volume focuses, therefore, on indicators measuring the adequacy of the service delivery environment as well as population-based outcomes.

Two topics that have not been covered by the manual are cost analysis or cost effectiveness and sustainability. These topics were excluded due to the difficulty of locating a set of standardized indicators on which international consensus had been reached. Some emerging areas are also not covered. These include gender, the urban poor, social mobilization, scaling-up, equity/poverty reduction, orphans and vulnerable children, and complex emergencies. It was felt that new indicators are not needed for some of these areas and that some issues like gender, urban poverty and equity can be addressed at the tabulation phase by disaggregating many of the indicators as appropriate. In this regard, the STATcompiler software program on the MEASURE *DHS* Web site can be utilized as one way of obtaining indicators pertaining to equity, the urban poor, or orphans.

While the guide includes many of the indicators recommended for monitoring and evaluating Integrated Management of Childhood Illness (IMCI), some of the key family practices proposed by UNICEF for improving care of children at the household and community levels are notably absent. These include:

- (1) Promote children's mental and social development by being responsive to the child's needs for care, and by stimulating the child through talking, playing, and other appropriate physical and affective interactions.

- (2) Take steps to prevent child abuse, recognize it has occurred, and take appropriate action.
- (3) Adopt and sustain appropriate behavior regarding HIV/AIDS prevention and care for the sick and orphans.
- (4) Ensure that men actively participate in providing childcare, and that they are involved in reproductive health initiatives.
- (5) Prevent and provide appropriate treatment for child injuries.

Interest in monitoring and evaluating the success of programs designed to influence these areas has grown. However, more work needs to be done for measuring progress in these areas. Therefore, relevant indicators for these key family practices have been excluded from the document. Readers are referred to the following Web site for further information: <http://www.unicef.org/programme/health/focus/community/cimci/overview.htm>

B. Indicators for Program Monitoring and Evaluation

B.1. Program Components – Inputs, Processes, Outputs, and Outcomes

As with other public health programs, child health programs may be thought of as consisting of a set of components (defined below). Throughout the guide, the discussion of monitoring and evaluation and indicators is organized around these components:

- **Inputs** refer to the human and financial resources, physical facilities, equipment, clinical guidelines, and operational policies that are the core ingredients of child health programs and enable health services to be delivered.
- **Processes** refer to the multiple activities that are carried out to achieve the objectives of child health programs. Although a high level of input is generally reflected in satisfactory program implementation, it is theoretically possible to have a high level of inputs but a poorly delivered program (for example,

available resources that are poorly managed or quality that is not monitored).

Conversely, there are countless real-life examples around the world, where program staff with inadequate resources strive to do the best work they can under the circumstances.

- **Outputs** refer to the results of these efforts at the **program level**. Although child health program managers at the field level are interested in national/sub-national trends in child morbidity, nutrition, and mortality, they tend to limit the monitoring and evaluation of their own activities to program-based measures, especially measures of output. Two types of outputs may be distinguished:
 - **Functional outputs**, which measure the number/quantity of activities conducted in each functional area of service delivery, such as behavior change communication, commodities and logistics, management and supervision, training, etc.
 - **Service outputs**, which measure the quantity of services provided to the program's target population, as well as the adequacy of the service delivery system in terms of access, quality of care, and program image/client satisfaction.
- **Outcomes** refer to changes measured at the **population level** in the program's target population, some or all of which may be the result of a given program or intervention. Outcomes refer to specific knowledge, behaviors, or practices on the part of the intended audience – such as timely initiation of breastfeeding, increased fluids and continued feeding during illness, and increased use of oral rehydration therapy – that are clearly related to the program, can reasonably be expected to change over the short-to-intermediate term, and that contribute to a program's desired long-term goals. Outcomes also include coverage and disease prevalence.
- **Impact** refers to the anticipated end results of a program – for example, reducing disease

incidence, improving children's nutritional status, and reducing child morbidity and mortality.

B.2. Defining Monitoring and Evaluation

Monitoring

Monitoring is the routine tracking of a program's activities by measuring on a regular, ongoing basis whether planned activities are being carried out. Monitoring systems inform managers whether program activities are being implemented according to plan and at what cost, how well the program is functioning at different levels, the extent to which a program's services are being used, whether interim targets are being met, and whether key performance measures are changing.

The terms “monitoring” and “process evaluation” are often used interchangeably. Process evaluation measures how well program activities are being performed. This information is sometimes collected on a routine basis, such as through staff reports, but may also be collected periodically in a larger-scale process evaluation effort (i.e., special studies) that may include use of observational studies, surveys of clients, focus groups or other qualitative methods. Process evaluation is often used to measure the quality of program implementation and to assess coverage; it may also measure the extent to which services are used (Adamchak et al., 2000). Program managers, staff, and participants in a program tend to be the primary users of process evaluations but this does not preclude any other type of stakeholder from using the findings.

In this guide, we distinguish between the two by whether the data in question are gathered routinely – “monitoring” entails the assessment of program operational performance based upon routinely collected information, while “process evaluation” also entails non-routine data collection and often less structured/more open-ended approaches to collect information on the strengths and weaknesses of the program. As the purpose of both monitoring and process evaluation is to assess program operational performance, readers who prefer alternative distinctions between the two terms or use them

interchangeably should not encounter major difficulties in using the indicators presented in the guide.

Evaluation

In the early days of program evaluation, and to some extent in contemporary child health programs, evaluation tended to focus on outcomes – the extent to which intended population-level changes, as defined by the objectives of the program, are achieved. However, that is changing rapidly. In order to improve a program, it is necessary to understand how well it is moving toward its objectives so that changes can be made in the program components (Herman et al., 1987). Ignoring implementation issues limits the usefulness of findings about effective programs and is a major impediment to improving complex operating programs or conducting policy analysis.

The multiple informational needs for managing and assessing the results of child health programs require the use of complementary evaluation approaches and methodologies. Two main types of program evaluation may be distinguished: formative evaluation and summative evaluation.

Formative Evaluation

Formative evaluation is conducted during the planning or re-planning stage of a program to identify priority unmet health needs, barriers and constraints to the use of health services, and factors underlying existing health problems and disparities. A formative evaluation may include a needs assessment to determine what are the specific needs with regard to child health services and the best ways to meet those needs. A needs assessment may also be conducted to establish baseline measurements for documenting changes in service delivery as a result of this project. For the purpose of the guide, we will assume that the program design or initiation phase has been completed.

Summative Evaluation

Summative evaluations address established interventions and are used to make decisions about the program being evaluated. Evaluations of program *efficacy* are conducted when interventions are delivered through health services in relatively restricted areas and assess whether, given ideal circumstances, the intervention had an effect (Bryce et al., 2004). Evaluations of program *effectiveness* assess whether the interventions have an effect under “real-life” circumstances faced by health services. Few public health programs are implemented in ways that allow evaluations to be entirely “efficacy” or entirely “effectiveness” (Habicht et al., 1999).

An important component of summative evaluations is establishing the level of certainty that decision-makers need to have that any observed effects are in fact due to the project or program. *Adequacy evaluations* assess how well the program activities have met the expected objectives – whether or not the expected changes have taken place. These may include assessments of how many health centers have been opened, how many ORS packets or other drugs are available, how well workers have been trained, how many children used the service, what coverage has been achieved in the target population or whether health and behavioral indicators have improved among the target population. Adequacy evaluations do not require a control group and may be cross-sectional or longitudinal (Habicht et al., 1999).

Plausibility evaluations refer to whether changes in indicators – be they service provision, utilization, coverage, or impact – are likely to be due to the intervention. Plausibility evaluations try to rule out the influence of external or confounding factors and require a control group (Bryce et al., 2004). Finally, *probability evaluations* require randomization of treatment and control activities and aim at ensuring that there is only a small known probability that the differences between

program and control areas were due to chance. Probability evaluations are often not feasible for addressing program effectiveness for several reasons. Evaluators must be present at a very early stage of the program planning cycle to design the randomization of services, communities or individuals to intervention or control groups but are often not recruited until after the program has been implemented. There may also be political factors influencing the placement of the new interventions. Additionally, the methodology often results in situations that are different from reality and not useful for the decisions that are to be made (Habicht et al., 1999).

B.3. Program-based and Population-based Measures

For the purpose of monitoring and evaluation, it is important to distinguish between program-based and population-based measures/data. Program-based data consist of information available from program sources (e.g., administrative records, client records, service statistics) or information that can be obtained from on-site collection (e.g., observation, client-provider interaction, client exit interviews, simulated purchase/mystery client surveys), although routine health information systems are also the primary source of program-based data. Also, a follow-up study of clients who attended a clinic constitutes program-based data, in that the information on the clients comes from program records. Although some program-based data correspond to a limited network of clinics providing a specialized service, “program-based” can also refer to programs that are national in scope.

Program-based information is very important for understanding the performance of programs and the type of output they achieve (e.g., number of measles doses administered, number of vitamin A capsules distributed, etc.). However, program-based data do not reflect the extent of coverage of these programs (unless one estimates a denominator for the catchment area that converts these program statistics into a rate). Moreover, data from program participants are potentially

biased (do not reflect the situation of the general population), because of selectivity; that is, persons who opt to participate in the programs are often different from the population at large.

In the conceptual framework described later in this chapter, output measures have been classified as program-based and outcome measures as population-based. This classification is useful for evaluating national programs such as a national vitamin A program. However, it is less useful (especially the term “outcome”) for the evaluation of specific functional areas such as behavior change communication, training, and commodities and logistics management. For example, one objective of training programs is usually improved quality of service delivery. Although the collective efforts of training will contribute to outcomes at the national level (e.g., improved family and community child health practices), the most direct and measurable effect of training is improved service quality. In this sense, the desired outcome for a series of training events is quality of care in a specific network of facilities. These results are not population-based, but they represent the appropriate endpoint for monitoring and evaluating training programs. Thus, the “desired outcomes” for functional areas such as management, training, logistics, and BCC are appropriately measured at the program level. This report cannot resolve the debate about how to classify the results of program efforts. It can only provide guidance for indicator classification and a recommendation that programs specify their definitions of the terms “input,” “process,” “output,” “outcome,” and “impact” in their monitoring and evaluation plans and frameworks.

In contrast, governmental programs designed to have national coverage are evaluated in terms of their effect on the general public. The term “population-based” can refer to a smaller geographic region (e.g., the catchment area for a demonstration project, such as a district), provided the data are drawn from a representative sample of the population.

B.4. Monitoring and Evaluation during Phases of the Program Cycle

Child health programs need to be evaluated at different phases of the program cycle. These phases quite often overlap, and some programs may skip certain phases altogether. However, thinking about the phases helps to provide an overall picture of the program. It also helps evaluators and program managers to conceptualize the functions and decisions an evaluation is to serve, the kinds of questions it is to address, and the data collection approaches that would be needed to address different evaluation needs. Thinking about phases of the program cycle would also help to structure the evaluation to facilitate the use and impact of the findings. Figure 1.1 (on page 10) provides a summary of the key monitoring and evaluation issues for programs at different stages (Herman et al., 1987).

B.5. Value of a Conceptual Framework

The complexity and multiplicity of child health interventions make it difficult to capture all individual program components in one monitoring and evaluation framework. In some cases, different programs use different processes to arrive at the same outcome; in others, various programs use similar means to achieve different outcomes. A conceptual framework is useful for sorting out causal linkages—capturing the ways in which the processes/activities of the program affect the knowledge, attitudes, skills, behaviors of the target population. In this sense, a conceptual framework can help identify what evaluation information might be most useful to the primary intended users.

The conceptual framework illustrated in Figure 1.2 (on page 12) was designed to provide guidance on how to define and select indicators for monitoring and evaluating child health programs. The framework is adapted from a similar model developed under the EVALUATION project (Bertrand and Tsui, 1995). The framework is organized around the standard input-process-output-outcome-impact schema and suggests a typical chain of program events: inputs must be assembled to get the program

underway; activities are then undertaken with available resources; program participants engage in program activities; and as a result of what they experience, changes occur in knowledge, attitudes, and skills. Behavior and practice changes follow knowledge and attitudinal changes, leading to the program outcomes, both intended and unintended. The conceptual framework was developed with a nationally scaled program in mind. The framework can be applied at a lower scale, such the regional or district level, but the scale of the expected outcomes should be adjusted accordingly. The shaded boxes represent the areas most commonly covered by routine monitoring systems.

Individual, household and community child health outcomes are influenced by many factors, an important one being the broader context in which programs operate. This context includes the social, cultural and individual factors, including education, maternal health and nutrition, and genetic risk, many of which are often outside the control of programs.

Inputs include the financial and staff resources, equipment and supplies, treatment protocols, and essential drugs, and vaccines. Another critical element is the political and administrative system in which programs operate. The system influences how child health is organized in a given country, the infrastructure available for service delivery, the type of service delivery strategies that are used (clinic based or community-based, or and social marketing), and the relative contribution of the public and private sectors to that effort (Bertrand et al., 1995). The framework also recognizes the contributions of donors to health service provision in many developing country settings.

The inputs into child health programs are invested into processes. Processes refer to the series of activities that are carried out at the planning and implementation phases of a program in order to achieve specific program objectives. Many activities are designed to achieve results outside the health services area. These activities seek to improve capacity for the planning and management of child health services, improve health system support, and

Figure 1.1. Program phases and priority monitoring and evaluation activities.

Phase 1 - Program initiation

Early in the development of a new program or policy, sponsors and program managers consider the goals they hope to accomplish through program activities and identify the needs or problems to be addressed by the program. A needs assessment may be conducted at this stage to try and help structure a program. The questions addressed at this stage are the following: What needs attention? What should the program try to accomplish? Data gathering at this stage can be used to make decisions about how to allocate money and effort in order to meet identified program needs and in order to provide baseline data. The activities that follow from this stage are program planning or revision of existing programs.

Phase 2 - Program planning

The program may be designed from scratch to meet the goals identified by a needs assessment or an already existing program may be revised or adapted to meet desired goals. During this phase, monitoring and evaluation activities may include the development of a monitoring and evaluation plan, controlled pilot testing and market testing to assess the effectiveness and feasibility of alternative methods of service delivery. The monitoring and evaluation plan should typically include the following components: assumptions regarding context, activities, and goals; anticipated relationships between activities, targets, and outcomes; well-specified measures and their operational definitions (indicators and metrics) and baseline values; monitoring schedule, data sources, and M&E resource estimates; partnerships and collaborations required to achieve results; and a plan for data dissemination and use.

Phase 3 - Program implementation

In order to assess whether a program attains intended outcomes and meets participants' needs, it is essential to know what occurred in the program and that these activities can be reasonably connected to outcomes. At this program stage, staff is trying to operationalize the program, adapt it as necessary to a particular setting, solve problems that arise and get the program to a point where it is running smoothly. Monitoring and evaluation activities provide information that describes how the program is operating and contributes to ways to improve it. Activities include continuous data collection such as with service statistics, special studies to gather information not covered in a routine health information system, qualitative studies to get in-depth insights into why the program may or may not be accomplishing what it wants to accomplish.

At the implementation stage, the questions addressed by monitoring and evaluation activities include: To what extent has the program been implemented as designed? How much does implementation vary from site to site? How can the program be improved? How can it become more efficient or effective? As a result of these activities, revisions may be made to staffing, materials, activities, and the organizational or administrative aspects of the program. Sometimes, the information may be used to make decisions about the program based on whether or not the program's stakeholders think the activities occurring will probably be effective in achieving other goals.

Phase 4 - Program accountability

At this stage, the program has become established with a permanent budget and an organizational niche and the purpose of evaluation is to assess the extent to which a program's highest priority goals are and are not being achieved: To what extent has the program met its goals? Some of these goals might be satisfaction with the program, knowledge or skill gain, or behavioral. Activities at this stage include data reporting and dissemination and use of data for planning and management decisions. Decisions and actions likely to follow monitoring and evaluation activities at this stage are those concerning whether to continue a program and in an expanded or reduced form.

strengthen the policy environment. Strengthened health system elements that are required to maintain both facility and community-level activities include improvement in clinical supervision and logistics, the strengthening or development of routine surveillance and reporting systems, and improved capacity for planning and management of child health services. At the policy level, program activities strive to create a supportive policy environment. This may include the formulation of clear policies and guidelines, the legal regulatory environment that affects product development, pricing and distribution, and the provision of financial, material and human resources needed by child health programs.

At the program planning stage, processes may include coalition building (for example, initiatives to bridge the community and health-facility based services, dialogue between professional health service providers and community-based health workers, and between public and private-sector providers), information-based needs assessment, formulation of a strategy for implementation, the assessment of resource needs and availability, and the establishment of monitoring and evaluation procedures. At the program implementation stage, activities may include behavior change interventions, outreach, community mobilization, advocacy, training, logistics, supervision, and cross-sectoral collaboration.

Many interventions are also designed to strengthen political support and/or develop effective national policies in support of child health programs. Consequently, program implementation activities at the process level may include the update and revision of existing clinical protocols and training guidelines, policy development, and advocacy. For example, where community IMCI has not yet been adopted, programs may advocate for the adoption of community IMCI as a national strategy.

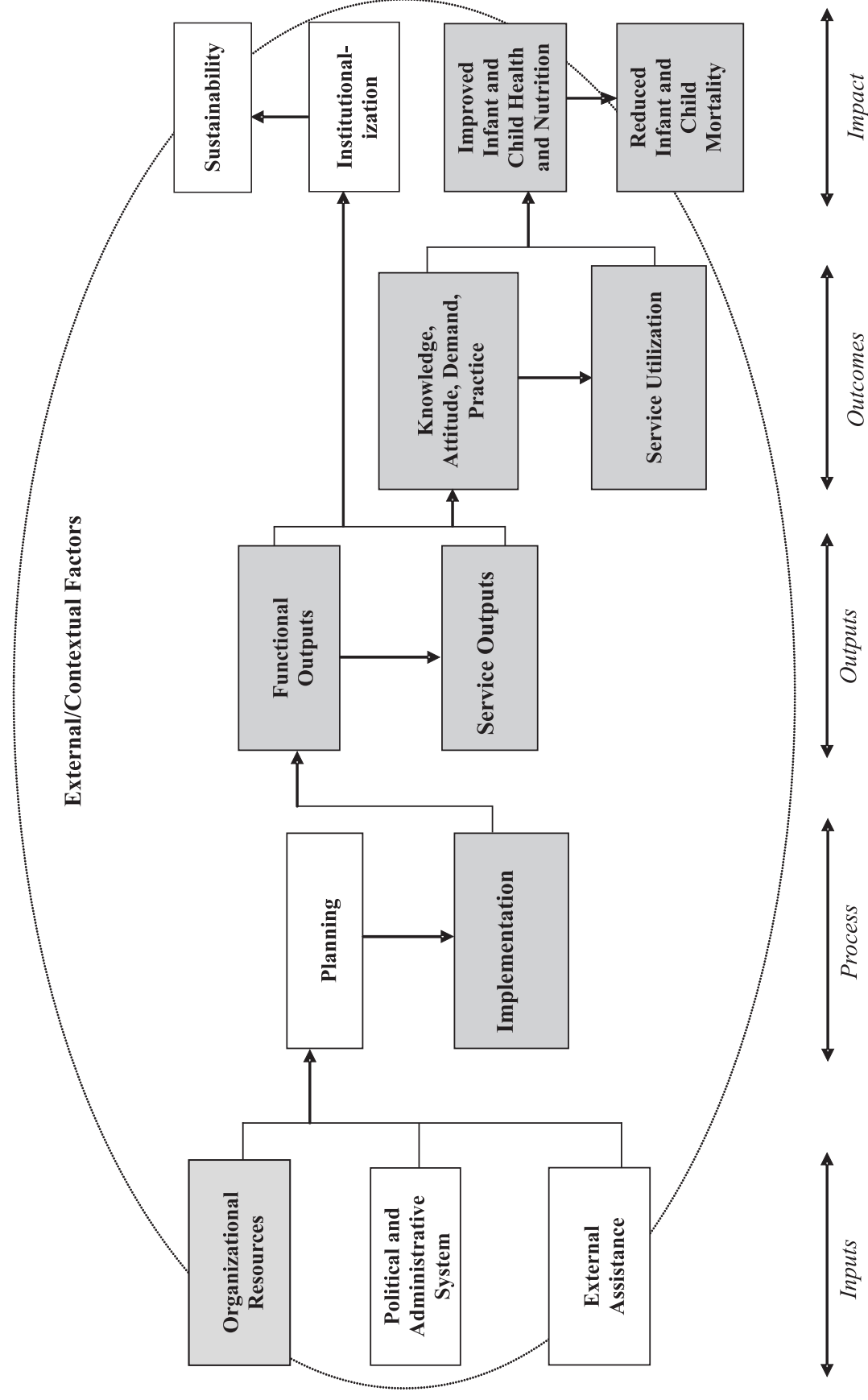
The results achieved from the set of activities in which child health programs invest their human and financial resources are called outputs. Outputs may be defined for each of the functional areas of

a program. Functional outputs measure the number of activities conducted in each functional area such as capacity building, BCC, strategic planning, and management. Functional area outputs may include, for example, the number of health workers trained, the number of community meetings held, the number of IEC messages developed and disseminated, the number of districts with micro plans, the existence of a strategic plan, and so forth.

The outputs from the different functional areas contribute collectively to defining the service outputs. Typically, programs strive to improve the adequacy of the service delivery system. Service outputs can be classified and evaluated on three dimensions: access, quality (including referral and counseling), and program image. In this framework, quality is conceptualized both in terms of the technical performance of health workers, as well as the efficiency of service delivery, interpersonal relations, the continuity of services, physical infrastructure, and client satisfaction. Implicit in this conceptual framework are feedback loops. The results obtained on output indicators may require a reexamination of the activities undertaken by the program in different functional areas and may require changes in program input.

The boxes on the right side of the conceptual framework reflect the intended outcomes of child health programs. Child health programs strive often to promote improvements in key behaviors proven to be essential for child survival in the intermediate term and over the long term. The key outcome of child health programs is an improvement in the knowledge, attitudes, and child health practices of caretakers, households and communities and coverage, which are critical for reducing overall child mortality. These outcomes are most relevant for the prevention component of child health programs. At the household and community levels many programs strive to increase knowledge of preventive health behaviors, early recognition of danger signs, and knowledge of sick child management. Key child health practices include the emphasis behaviors recommended by

Figure 1.2. Conceptual framework for monitoring and evaluating child health programs.



WHO/UNICEF for the prevention of illness at home, improved home management of childhood illness and improved care-seeking for preventive services, such as vitamin A and immunization, and for curative services in communities or health facilities. Improved child health practices and timely care seeking behavior are measured at the population level, and include compliance with treatment recommendations (dosage and duration) and referral after receiving care from a health worker; increased fluids and continued feeding during illness; the provision of appropriate nutrition management (exclusive breastfeeding and complementary feeding); adequate consumption of micronutrients; and ensuring that a child receives a full course of childhood vaccination in the first year of life.

The precise individual, household, and community practices that a program strives to change depend on its technical interventions. With respect to the prevention and control of childhood diarrhea, for example, desired intermediate outcomes may include proper hand washing at critical times; protection of drinking water from fecal contamination; protection of food from fecal contamination; use of ORS; and care seeking from a trained health provider when the child suffers from certain symptoms.

By improving individual, household, and community practices, and by making services more accessible and satisfactory to potential clients, programs may also strive to achieve increased and sustained demand for child health services and appropriate service use. The “appropriateness” of service use is emphasized for a number of reasons, an important one being the renewed emphasis on the prevention and management of illness at home and in the community. A case in point is the WHO Roll Back Malaria Strategy of “home as the first hospital” which places increased emphasis on caretaker recognition of malaria and treatment seeking in both formal and non-formal health care systems. Consequently, depending on the nature of the technical intervention, a general increase in

the utilization of facility-based services may or may not be a measure of program success.

Both improved individual, family, and community health practices and the appropriate use of services are closely and directly linked with the long-term goal of child health programs, which is to improve infant and child health and nutrition and to reduce infant and child mortality. While many programs are designed to reduce overall child mortality, it often takes years to produce this result and it is not always possible to make a causal link between the child health program in question and mortality decline as it is also influenced by many non-program factors (such as socio-economic conditions and the status of women). Consequently, program evaluations often concentrate on outcomes that are more directly linked to program effort and which are expected to reflect change over a shorter period of time.

As indicated in the upper right corner of the conceptual framework, institutionalization and program sustainability are also explicit goals of many donors and national/regional/district-level child health programs. Although successes in this area may not translate into gains in child health in the short run, the extent to which program efforts have enhanced institutional capacity and program sustainability are legitimate foci of evaluation efforts.

B.6. Indicators

Central to program monitoring and evaluation efforts is the development of a set of indicators that assess if and how well program activities have been carried out and whether program objectives have been achieved. An indicator may be defined simply as a condition that can be empirically measured. For example, the measles coverage rate provides a measure of the extent to which measles immunization efforts have been successful in reaching the program’s target population.

Many indicators have been developed for child health programs. However, to date most of these

have not been compiled in a single document. The general objective of the guide is to bring together indicators that have already been tested and used extensively in the child health field and compile them in a single volume. By consolidating existing indicators and creating a framework for monitoring and evaluating child health programs, this guide aims to promote monitoring and evaluation by making indicators more readily available to program managers and facilitating the use of consistent terminology across programs, countries, and donor agencies.

The indicators presented in the guide recapitulate and expand on indicators developed by CDC, UNICEF, USAID, and WHO for assessing health provider, household and community practices that affect child health. Because of the efforts undertaken by these organizations to standardize child health indicators, a broad consensus has been reached on the best measures and data collection tools for many of the indicators presented in the guide. For example, Chapter II draws heavily on the core indicators established by WHO for monitoring and evaluating programs for the prevention of HIV in infants and young children. Chapter III presents indicators established by WHO and CDC for monitoring and evaluating newborn health at the global and national levels. The indicators presented in Chapter V were developed over a long period of time by the Integrated Disease Surveillance and Response Task Force, with considerable consensus-building by WHO-AFRO in collaboration with CDC, WHO-HQ and Ministries of Health in the Africa region. Chapter VI of the guide presents a set of priority indicators for IMCI at the health facility level developed by the Interagency Working Group on IMCI, coordinated by WHO. These indicators reflect extensive field-based experience and were selected to be valid, reliable, programmatically important, sensitive enough to demonstrate change, and measurable.

The indicators presented in this guide are by no means exhaustive. Because of the complexity of the child health field and because substantial

resources can go into collecting data at the national level, the number of indicators in any programmatic area must remain limited. The set of indicators presented in this volume will not comprehensively address all the specific monitoring and evaluation needs of a national program in a given country or of individual projects.

B.7. How to Select Indicators

In general, the program's objectives and phase of implementation, the evaluators' role, and the information needs of the program's managers and stakeholders will guide decisions about what to measure, observe or analyze. The four main steps in selecting indicators are as follows:

- (1) State (or formulate) the objectives of the program;
- (2) Review the activities to be carried out in pursuit of the objectives;
- (3) Develop a simple framework to show how the program will work; that is, how the activities will lead to the desired objectives; and
- (4) Select indicators that measure progress in each of those boxes.

Selecting indicators and setting targets is usually done during the process of program planning and replanning, preferably in a participatory way with the implementing agency and key stakeholders. While the level of attainment to be measured by an indicator is not usually part of the indicator itself, it is a critical factor. The magnitude of the level to be measured affects the size of the sample of the population needed to estimate that level accurately. It may also help select indicators that might assist in later interpretations of the result. The following questions can be helpful in selecting indicators:

- (1) Are program objectives measurable?
- (2) Are the data needed to measure the indicators available? If not, are they feasible to collect?
- (3) Are there alternative measures that need to be considered?

- (4) How often will the program report on the different results? Will the data be available by internal or external deadlines?
- (5) What financial support is available for monitoring and evaluation? Does the organization have funds to conduct a survey? Or does the budget dictate the use of existing data such as service statistics?
- (6) What are the requirements of the donor agency (if applicable)?

Ideally, indicators should be:

- **Valid** – They should measure the condition or event they are intended to measure.
- **Reliable** – They should produce the same results when used more than once to measure the same condition or event, all things being equal (for example, using the same methods/tools/instruments).
- **Specific** – They should measure only the condition or event they are intended to measure.
- **Sensitive** – They should reflect changes in the state of the condition or event under observation.
- **Operational** – It should be possible to measure or quantify them with developed and tested definitions and reference standards.
- **Affordable** – The costs of measuring the indicators should also be reasonable.
- **Feasible** – It should be possible to carry out the proposed data collection.

Validity is inherent in the actual content of the indicator and also depends on its potential for being measured. Reliability is inherent in the methodology used to measure the indicator and in the person using the methodology.

In many areas of health, there is a tendency to develop indices or composite/summary measures that encompass several areas of service provision. These summary indicators are useful in that they

limit the number of statistics that need to be presented at the highest policy level or to people who are not specialists in the field and just need a general idea of whether things are getting better or worse. The limitation of summary indicators is that changes are harder to interpret. A higher score may mean an improvement across all components measured by the index, or may be the result of massive improvement in one area but an actual deterioration in another. Program managers, who need to know about the performance of all components, will be interested in disaggregated data that allow them to see progress in each area of service provision separately (UNAIDS, 2000). It is important to bear in mind that aggregation too early in the process of data collection or analysis may not meet the needs of program or project managers.

B.8. Data Sources

There are a number of options for collecting essential data for monitoring and evaluating child health programs in developing countries. These are summarized briefly below.*

B.8.1. Household and community level data

Population-Based Surveys: The most frequently conducted surveys are:

USAID Demographic and Health Survey (DHS): Comprehensive large sample surveys that include information on maternal and child health, reproductive health, and mortality. A national sampling frame is usually used, although data can sometimes be disaggregated to the level of smaller administrative units such as districts. These surveys provide useful background data for identifying health priorities at the household and community levels. These data can be also used for policy development and program planning.

* This section is adapted from the 2000 Technical Reference Materials from the USAID/BHR/PVC Child Survival Grants Program, updated by Child Survival Technical Services Group, Macro International, Inc.

UNICEF-Multiple Indicator Survey (MICS): Comprehensive large sample surveys that include information on maternal and child health, reproductive health and mortality. These data can also be used for policy development and program planning.

30-Cluster Survey (WHO Control of Diarrheal Disease (CDD)/ARI/Breastfeeding Survey; WHO Immunization Coverage Survey/PVO KPC Survey): The 30-cluster methodology is often used with reasonable precision by PVOs to obtain information in a project area. Survey instruments collect data on household knowledge and practices for key maternal and child health behaviors. Health behaviors are used as program outcome measures – this method is often used to collect baseline and follow-up data.

Rapid Catch: The Child Survival Collaborations and Resources Group (CORE) Monitoring and Evaluation Working Group (MEWG) strongly suggests that organizations include all the Rapid Core Assessment Tool on Child Health (CATCH) questions in their population-level baseline survey. The Rapid CATCH contains 26 questions from the KPC2000+ modules that are considered important measures of child health. The Rapid CATCH has an accompanying Tabulation Plan, which lists priority child health indicators and provides instructions on calculating these indicators. The CORE MEWG suggests that USAID-supported child survival projects report on these priority indicators of household behaviors and care-seeking patterns that affect the health and survival of children.

Data from the Rapid CATCH can be used by implementing PVOs and their local partners to: (1) inform planning, monitoring, and evaluation activities; (2) provide a basis for comparability between projects within a given country, as well as across countries; and (3) advocate at both the national and international levels for child health resources.

Other methods for obtaining data include:

Lot Quality Assurance Sampling (LQAS): LQAS uses small samples to determine whether health behaviors are reaching pre-determined levels. This approach is used in some settings to monitor the performance of health services in small health areas. The method consists of the establishment of an acceptable and unacceptable performance threshold, preferably with local input, and identifying areas with poor performance in which remedial action needs to be taken. The survey instruments are often the same as those used for larger sample surveys.

Census-based Household Information Systems: In some settings it may be possible to track all households in a community using regular visits by trained workers. This system allows data on vital events (births, deaths, pregnancies, episodes of illness) to be gathered, and also allows tracking of household knowledge and practices – and the collection of health indicator data. If regular visits are complete and sustained, then an accurate picture of the health status of a population can be obtained (since sampling is not required). When establishing census-based systems, strategies for local use of data for planning purposes need to be developed, and strategies for sustaining household visits over time need to be elaborated upon.

Sample Vital Registration with Verbal Autopsy (SAVVY): This method is based on sentinel demographic surveillance and sample vital registration systems and uses a validated verbal autopsy tool to ascertain major causes of death. All births, deaths, and migrations at sentinel sites are enumerated through annual or semi-annual “census-update” rounds. A SAVVY system can yield reliable national estimates of all leading causes of death including HIV/AIDS, malaria, respiratory infection, diarrheal disease, and maternal mortality. Data can be aggregated over multiple years to produce robust estimates for sub-national areas, age groups, or poverty groupings.

B.8.2. Health systems data

Routine Health Information System Data: These data are collected by facility-based staff and recorded on standard reporting forms that are sent to higher levels in the system where they are aggregated. Data are most often service statistics such as the number of cases seen by category; number of deaths at the facility; number of pregnancies and births; number of vaccinations given, and the estimates of coverage using local population data; and the number of outreach visits conducted. These data may all be useful for monitoring or evaluating elements of program performance. The advantage of this method is that it uses routine systems and does not require additional resources. These data do not present any information on health worker performance – a critical element of quality of care.

Health Facility Surveys (HFS): These survey methods include WHO integrated HFS, BASICS integrated HFA, CORE adapted and integrated HFS, and USAID-SPA, and usually focus on outpatient services at first-level and referral facilities. Hospital-based care is not included. Facilities in the project area are sampled. Instruments need to be adapted, translated and pre-tested. Measures of health worker clinical performance for the management of key child health problems (ARI, diarrhea, malaria, measles, and nutrition) are collected (in the areas of assessment, classification, treatment, and counseling). Direct observations of practice are required, as well as exit interviews with caretakers of young children when they leave facilities. Health worker performance outcome measures are important measures of quality of care, and can be used to monitor improvements in clinical practice.

Health facility system performance indicators are also collected by health facility assessments, and include the availability of essential drugs, vaccines, supplies, equipment, and services; the availability of vehicles; the availability of health education materials; and the infrastructure of the facility. All are important measures of quality of care.

Supervisory-based Data Collection: This method is most often used to collect monitoring data, to provide feedback to staff, and to engage these staff in solving problems locally. Structured checklists that include an observation of clinical practice are usually used. Instruments, methods, and indicators are similar to those used for health facility assessments. Supervisory methods may allow a complete census of facilities in project areas, and therefore are an accurate measure of performance. This approach can also be used to observe the practices of community-based health workers.

Self-Assessment Methods and Peer-Assessment Methods: Tools have been developed for self and peer assessments of quality of care at the health facility level (COPE methods). The advantage of these approaches is that the cost and logistical difficulties of getting surveyors or supervisors to facilities is eliminated. While these methods are very useful in engaging local staff in the process of identifying and solving their own problems, they are not considered valid or reliable enough for the purpose of program evaluation. However, they can play an important role in program monitoring.

Program reviews: Program reviews are a systematic review of key program elements using a structured approach. Evaluations are conducted using several methods, including reviewing routine documentation and reports; interviews with key informants; and structured checklists. Trained staff are needed to conduct reviews, and visits need to be made to each level. Program reviews can focus at all levels of a system (national, provincial, district, sub-district, facility, community) or at single components (district-level). Program reviews might include reviews of routine surveillance data; program plans and financial records; training records and lists of staff trained; the number of staff in facilities or communities; the availability of essential drugs and supplies; or the regularity of supervision activities. Program reviews can also include activities at the community level such as the availability of trained

community health workers; the regularity of outreach visits; the regularity of health education activities; and the frequency with which health planning committees meet. Several elements of support systems can be quantified and tracked over time (such as the proportion of facilities with trained staff; the proportion of districts with child health plans; and the proportion of the population in a community with access to a trained community health worker).

B.8.3. Qualitative data

Although qualitative indicators are not covered in this guide, it is important to point out their role in monitoring and evaluation efforts. Qualitative data play an important role in impact evaluation by providing information useful to understand the processes behind observed results and assess changes in people's perceptions of their health status. At the population level, these data are most useful for identifying health priorities and barriers to health practices; identifying local perceptions and beliefs about illness and the prevention and treatment of illness; and identifying local terms for illness. These data are also important for developing program strategies, adapting or improving the quality of M&E instruments, and strengthening the design of survey questionnaires.

At the health systems level, qualitative data are critical for identifying failures in various health system components; the possible reasons for health system failures; and possible strategies for improving strategies in the local setting. At the health facility level, qualitative data are important for identifying perceptions of clients and health staff that may influence the delivery of care; identifying problems with care delivery, and identifying solutions to these problems; defining quality care for the local population based on cultural and ethnic norms; investigating barriers to compliance with medications; identifying barriers to referral of sick children; and reviewing and improving counseling behaviors by health workers. Sometimes, information can often be

transformed into a quantitative rating scale against which targets can be set.

Qualitative methods most commonly used in monitoring and evaluation can be categorized as follows:

In-depth Interviews: These tend to be open-ended and to range from a total lack of structure and minimum control over an informant's responses to semi-structured interviews based on a written list of questions and topics that need to be covered in a particular order, and fully-structured interview techniques that may include pile sorting, frame elicitation, triad sorting, and tasks that require informants to rate or rank order a list of things (for more information about these methodologies, see Patton, 2002; Russell-Bernard, 1995). Open-ended questions and probes are used to elicit information about respondents' experiences, perceptions, opinions, feelings, and knowledge.

Focus groups are a particular type of in-depth interview in which a group of people, usually 6 to 12, and a moderator are recruited to discuss a particular topic. Focus groups are less expensive to conduct than surveys and provide insights on how people feel about a particular product, issue, or behavior, and why they feel that way.

Observation: The methodology entails fieldwork descriptions of activities, behaviors, actions, conversations, interpersonal reactions, organizational or community processes. Data consists of rich detailed descriptions that include the context in which the observations were made. A variety of data collection methods can be used. These include observations, conversations, interviews, checklists, and unobtrusive methods. Direct, reactive observations entail the investigator engaging personally in all or part of the program under study or participating as a regular program member or client as a

participant observer in order to gain greater insights than could be obtained from a survey questionnaire. Continuous monitoring and spot sampling can also be used. Nonreactive and unobtrusive observation includes all methodologies in which case informants do not know they are being studied (e.g., behavior trace studies, archival research, content analysis, and two methods that pose serious ethical problems: disguised observations and naturalistic field experiments). For further details on these methodologies, see Russell-Bernard (1995).

Document Review: This methodology entails studying written materials and other documents from organizational, clinical or program records, memoranda and correspondence; official publications and reports; personal diaries, letters, artistic works, photographs, and memorabilia; and written responses to open-ended surveys. Data consist of excerpts, quotations, or entire passages from these documents that record and preserve the context.

Rapid appraisals are becoming an increasingly common way of obtaining information on the needs of the most vulnerable populations and involving these groups in decisions about their own health improvements. This methodology is fairly quick and cost-effective and addresses problems of communities, rather than individuals. Methods of data collection include ranking, mapping, diagramming, scoring, open interviews, and participant observation. There are different types of rapid appraisals. Rapid rural appraisal involves the use of multidisciplinary teams to collect data from people in rural communities. Participatory rural appraisals are a technique by which program managers, planners, and the community are partners in information collection and analysis and in proposing solutions to the problems identified. Rapid epidemiological assessments involve surveys, sampling, and risk assessments to evaluate health service functions. Rapid assessment procedures involve the use of anthropological

methods to assess community views of health, diseases, and health interventions. Rapid ethnographic assessments involve the use of anthropological methods to assess community beliefs and practices in relation to specific disease interventions (Annett and Rifkin, 1995).

B.9. Use of Indicators at Different Levels

Many commonly used indicators presented in the guide have grown out of international survey programs such as the Demographic and Health Surveys and the Multiple Indicator Cluster Surveys, or out of protocols promoted by international donor organizations such as WHO and other United Nations agencies. Such indicators permit comparisons between different countries and are useful at the international level for identifying regional trends or patterns in child morbidity and mortality; highlighting persistent global and regional problems in child health; tracking trends in epidemics and response on a global scale; and allocating financial and technical resources so as to have the greatest impact on child health. It is important, therefore, that indicators are defined and measured in the same way so that they can be compared directly from one country to the next.

The indicators can be used for similar purposes at the national level. The use of comparable measures can provide national programs with valuable measures of the same indicator in different populations, enabling triangulation of findings and allowing regional or local differences to be noted and addressed. This can help to direct resources to regions or subpopulations with greater health needs and identify areas for intensification or reduction of effort (UNAIDS, 2000a). In deciding on a national set of indicators, it is important that countries realize that they are not limited to the set of indicators described in this volume, nor should they necessarily collect all of them. The choice of indicators should be driven by the objectives, goals, and activities of the national program, taking into consideration the time and money it costs to collect and analyze data for each

indicator. Many of the indicators presented in this guide are core indicators that have been recommended for collection in all countries by international health organizations such as CDC, UNICEF, and WHO. Supplemental indicators for certain programmatic areas, such as IMCI and newborn health, are only presented in a few instances. Where they fit the needs of a country, national programs are encouraged to use the indicator definitions presented here to ensure standardization of information over time. Many of the indicators listed in the guide are also suitable for district monitoring and evaluation purposes.

At the project level, the choice of indicators depends on what the project wants to do. While many of the indicators in this volume are relevant for use in the population at large or in health service settings, they do not cover the full range of monitoring and evaluation needs for specific projects. Some projects may find some of the indicators contained in the guide at odds with their own operational definitions. In such cases, collecting and reporting on data in the way specified in the guide may or may not meet the project's information needs. If a measurement method comparable to one proposed in this guide is being used or if the project's monitoring and evaluation activities can be modified slightly without compromising the evaluation of the project, then those indicators which are relevant to the project should be collected and reported. The use of uniform definitions can provide the national program with comparable measures for different populations and facilitate district and regional-level comparisons within and across countries.

Ideally, indicators should be measured with data that are already available. It should be possible to use data from routine health reporting systems to obtain data for calculating some output and coverage indicators. Frequently, data for many outcome and impact indicators will need to be collected through health facility or population-based surveys. The cost and benefits of various data collection options must be borne in mind when indicators are chosen to measure change in areas of program effort.

References

- Annett HB, & Rifkin SB. (1995). *Guidelines for Rapid Participatory Appraisal to Assess Community Health Needs: A Focus on Health Improvements for Low-Income Urban and Rural Areas*. WHO/SHS/DHS/95.8. Geneva, Switzerland: World Health Organization.
- Bertrand JT, & Escudero G. (2002). *Compendium of Indicators for Evaluating Reproductive Health Programs*. Chapel Hill, NC: MEASURE Evaluation Project.
- Bertrand JT, Magnani RJ, & Ruttenberg N. (1994). *Handbook of Indicators for Family Planning Program Evaluation*. Chapel Hill, NC: The University of North Carolina at Chapel Hill, Carolina Population Center, Evaluation Project.
- Bertrand JT, & Tsui A. (1995). *Indicators for Reproductive Health Program Evaluation*. Chapel Hill, NC: The University of North Carolina at Chapel Hill, Carolina Population Center, Evaluation Project.
- Bryce J, Victora CG, Habicht JP, Vaughn JP, & Black RE. (2004). The Multi-Country Evaluation of the Integrated Management of Childhood Illness Strategy: Lessons for the Evaluation of Public Health Interventions. *American Journal of Public Health*, 94(3):406-415.
- Habicht JP, Victora CG, & Vaughan JP. (1999). Evaluation Designs for Adequacy, Plausibility and Probability of Public Health Programme Performance and Impact. *International Journal of Epidemiology*, 28(1):10-8.
- Herman JL, Fitz-Gibbon LL, & Morris CT. (1987). *Evaluator's Handbook*. Thousand Oaks, CA: Sage Publications, Inc.
- Patton MQ. (2002). *Qualitative Research and Evaluation Methods - Third Edition*. Thousand Oaks, CA: Sage Publications, Inc.
- Russell BH. (1995). *Research Methods in Anthropology: Qualitative and Quantitative Approaches - Second Edition*. New York: Altamira Press.
- Schalock RL. (1996). *Outcome-based Evaluation*. New York and London: Plenum Press.
- UNAIDS. (2000). *Local Monitoring and Evaluation of the Integrated Prevention of Mother to Child HIV Transmission in Low-income Countries*. Geneva, Switzerland: UNAIDS.
- UNAIDS. (2002). *Monitoring the Declaration of Commitment on HIV/AIDS: Guideline on Construction of Core Indicators*. Geneva, Switzerland: UNAIDS.
- UNGASS. (2001). *Declaration of Commitment on HIV/AIDS: Global Crisis - Global Action*. UNGASS; United Nations General Assembly Twenty-Sixth Special Session.
- United States Agency for International Development, Bureau for Humanitarian Response, and Office of Private and Voluntary Cooperation. (2000). *PVO Child Survival Grants Program: Technical Reference Materials*. Washington, DC: USAID

Wasantwisut E. (2002). Recommendations for Monitoring and Evaluating Vitamin A Programs: Outcome Indicators. *Journal of Nutrition*, 2940S-2S.

WHO. (1999). *IMCI Indicators, Monitoring and Evaluation*. Geneva, Switzerland: World Health Organization.

WHO. (2000). *Roll Back Malaria: Framework for Monitoring Progress and Evaluating Outcomes and Impact*. Geneva, Switzerland: World Health Organization.

Annex 1.1. A complete listing of goals and targets for the Millennium Development Goals

Goal 1	Eradicate extreme poverty and hunger	Target 1: Halve, between 1990 and 2015, the proportion of people whose income is less than \$1 a day
		Target 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger
Goal 2	Achieve universal primary education	Target 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full able to complete a full course of primary schooling
Goal 3	Promote gender equality and empower women	Target 4: Eliminate gender disparity in primary and secondary education preferably by 2005 and in in all levels of education no later than 2015
Goal 4	Reduce child mortality	Target 5: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate
Goal 5	Improve maternal health	Target 6: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio
Goal 6	Combat HIV/AIDS, malaria, and other diseases	Target 7: Have halted by 2015 and begun to reverse the spread of HIV/AIDS
		Target 8: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases
Goal 7	Ensure environmental sustainability	Target 9: Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources
		Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation
		Target 11: Have achieved, by 2020, a significant improvement in the lives of at least 100 million slum dwellers
Goal 8	Develop a global partnership for development	Target 12: Develop further an open, rule-based, predictable, nondiscriminatory trading and financial system (includes a commitment to good governance, development, and poverty reduction—both nationally and internationally)
		Target 13: Address the special needs of the least developed countries (includes tariff- and quota-free access for exports enhanced program of debt relief for HIPC and cancellation of official bilateral debt, and more generous ODA for countries committed to poverty reduction)
		Target 14: Address the special needs of landlocked countries and small island developing states (through the Program of Action for the Sustainable Development of Small Island Developing States and 22nd General Assembly provisions)
		Target 15: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term
		Target 16: In cooperation with developing countries, develop and implement strategies for decent and productive work for youth
		Target 17: In cooperation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries
		Target 18: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications

**PREVENTION OF
MOTHER-TO-CHILD
TRANSMISSION
(PMTCT) OF HIV**

Indicators:

- Existence of guidelines for the prevention of HIV infection in infants and young children
- Number and percentage of health care workers newly trained or retrained in the minimum package during the preceding 12 months
- Prevention and care service points
- Women completing the testing and counseling process
- Percentage of HIV-positive pregnant women receiving a complete course of ARV prophylaxis to reduce MTCT in accordance with a nationally approved treatment protocol (or WHO/UNAIDS standards) in the preceding 12 months
- Percentage of HIV-infected infants born to HIV-infected mothers

CHAPTER 2. PREVENTION OF MOTHER-TO-CHILD TRANSMISSION (PMTCT) OF HIV

By the end of 2004, UNAIDS estimated that 2.2 million children under 15 years of age were living with HIV. In the year 2004 alone, it was also estimated that 640,000 children were newly infected with HIV and 510,000 died of HIV/AIDS (UNAIDS, 2004). Almost all HIV-infected children acquired HIV via mother-to-child transmission (MTCT). Such transmission can occur during pregnancy, labor or delivery, and after birth through breastfeeding. In the absence of anti-retroviral intervention, it is estimated that MTCT rates range from 5-10% during pregnancy, 10-20% during labor and delivery, and 15-30% in the absence of breastfeeding, to 25-35% with breastfeeding through 6 months and to 30-45% if there is breastfeeding through 18 to 24 months (De Cock et al., 2000).

At the United Nations General Assembly Special Session (UNGASS) on HIV/AIDS in June 2001, governments from 189 countries adopted the Declaration of Commitment on HIV/AIDS. The Declaration established specific goals on a number of quantified and time-bound targets, including reductions in HIV infection among infants. The UNGASS goal for prevention of HIV infections in infants and young children is presented below:

“By 2005, reduce the proportion of infants infected with HIV by 20 percent, and by 50 percent by 2001, by ensuring that 80% of pregnant women accessing antenatal care have information, counseling and other HIV prevention services available to them, increasing the availability of and by providing access for HIV-infected women and babies to effective treatment to reduce mother-to-child transmission of HIV, as well as through effective interventions for HIV-infected women, including voluntary and confidential counseling and testing, access to treatment, especially antiretroviral therapy (ART) and,

where appropriate, breast-milk substitutes and provision of a continuum of care” (*UNGASS Declaration of Commitment on HIV/AIDS*, 2001, paragraph 54).

The WHO framework for action to prevent HIV infection in infants and young children includes the following four strategies:

- Primary prevention of HIV infection in all women (including the promotion of abstinence, monogamy, and condom use).
- Prevention of unintended pregnancy among HIV-infected women (including the provision of testing and counseling in family planning (FP) and other reproductive health services).
- Prevention of HIV transmission from HIV-infected women to their infants and young children (including the use of antiretroviral (ARV) drugs, safer delivery practices, and counseling and support for infant feeding).
- Provision of care and support to HIV-infected women and their infants and families (including the prevention and treatment of opportunistic infections, the use of antiretroviral drug therapy (ART), psychosocial and nutritional support, and reproductive health care, including safer delivery, FP, and counseling and support for infant feeding).

Many countries are expanding their programs for prevention of HIV infection in infants and young children to respond to the growing HIV/AIDS pandemic and increased commitment and support. However, many programs remain costly relative to per capita spending on health in many countries, so careful monitoring and evaluation of the success of interventions to reduce transmission of HIV from mothers to children is important. UNAIDS

and its partners have developed a set of core indicators that permit monitoring of key international and national actions, national program outcomes, and impact. These are presented in *National AIDS Programmes: A Guide to Monitoring and Evaluation*, which represents the joint efforts of UNAIDS and multiple partner organizations (UNAIDS, 2000a). However, though this document was produced in recent years, some important areas are not included, reflecting the rapid developments in HIV/AIDS prevention and care in the last few years. One of these key gaps is the insufficient attention paid to the monitoring and evaluation of programs for reducing MTCT of HIV/AIDS.

Ongoing monitoring and evaluation efforts include the development of guidelines for Local Monitoring and Evaluation of the Integrated Prevention of Mother to Child HIV Transmission in Low-Income Countries, a joint collaborative effort by UNICEF, UNAIDS and WHO (UNAIDS, 2000b). These guidelines include: (1) locally monitoring the progress in implication, identifying problems, troubleshooting and adapting implementation strategies; (2) evaluating the effectiveness, impact, cost-effectiveness and financial sustainability of the intervention in pilot projects; and (3) conducting applied research to address unresolved issues, test strategies for optimizing the effectiveness, impact, cost-effectiveness and financial sustainability, and minimizing the risks of the intervention programs. The guidelines also give advice on how to choose indicators for monitoring, evaluation, and operations research; establish methodologies to analyze and use the information; and establish standards for information systems. Local managers and planners are the primary audience for these guidelines.

In 2004, WHO published the *National Guide to Monitoring and Evaluating Programmes for the Prevention of HIV in Infants and Young Children* (WHO, 2004). This national guide complements existing M&E guides, including *Monitoring the Declaration of Commitment on HIV/AIDS:*

Guidelines on Construction of Core Indicators (UNAIDS, 2002), which included two indicators on programs for the prevention of HIV infection in infants and young children. The national guide also supplements *National AIDS Programmes: A Guide to Monitoring and Evaluation*, and like that manual, is intended for use by national MTCT, reproductive health, and HIV/AIDS program managers. The purpose of the national guide is to determine the level of success of programs for the prevention of HIV infection in infants and young children, to identify areas where further support is required, and to inform adaptation and scaling up strategies.

Methodological Challenges of Monitoring and Evaluating PMTCT Programs

Prevention of HIV in infants cuts across a number of other programs, sometimes well integrated, sometimes not.

In spite of recent efforts on M&E for HIV/AIDS, many challenges remain. Prevention of mother-to-child transmission can be considered as a cascade of program components as follows: primary HIV prevention activities and VCT services during antenatal care; improvement in basic obstetrical care including offer of ARVs to HIV-positive pregnant women and adequate delivery practices; counseling for infant feeding during antenatal care (ANC); postpartum care including support to infant feeding, growth monitoring, family planning services, and screening of HIV infection in children; and long-term support to HIV infected mothers and their families. The wide range of interventions is a challenge to monitor and evaluate. Some of these services are well integrated into MCH services but others are not. While some services are done at the level of MCH services, others are done at the community level (i.e. communication programs) or at the level of other health, social services, or NGOs (i.e. long-term care). Effective monitoring and evaluation of PMTCT services would need to incorporate standard indicators that have been used in the context of other programs. Some of these standard indicators include antenatal care coverage, births attended by skilled

health personnel, availability of basic essential obstetric care, family planning method mix, condom availability, and iron/folic acid supplementation during pregnancy. Clearly, indicators that are selected for monitoring and evaluation of PMTCT interventions would depend on program goals.

PMTCT lacks a set of standard, easily measurable indicators at the program output level.

Standard monitoring and evaluation approaches use indicators at three levels: the program level, outcome level, and impact level. Few standard indicators have been established for the M&E of PMTCT programs at the program output and outcome levels. Recent efforts to establish core indicators for monitoring the United States President's Emergency Plan for AIDS Relief have included functional output indicators for PMTCT. However, this is a work in progress and many of the proposed output indicators have only recently been field-tested.

Monitoring and evaluating replacement feeding is a complex programmatic issue.

Promotion of breastfeeding as the best possible nutrition for infants has been the cornerstone of child health and survival strategies for the past two decades, and has played a major part in lowering infant mortality in many parts of the world. Breastmilk substitutes if used incorrectly or over-diluted can cause infection, malnutrition, and death. Therefore, assessment of the effectiveness of the infant feeding component of PMTCT programs needs to be made in the light of other indicators such as the availability of infant formula; access to clean water and fuel to boil it; and the ability of mothers/caregivers to make up replacement feeds correctly. A promotion of replacement feeding among HIV-infected women may also lead to a reduction in the fertility-inhibiting effects of breastfeeding, making the availability of FP services a necessary part of postpartum care.

Impact indicators are especially difficult to obtain.

Regarding impact indicators, it is difficult in practical terms to obtain information from a truly representative sample in a given country. Consequently, the current approach is to examine women attending antenatal clinics with the assumption that they represent a wide cross-section of the population. However, in many countries, large numbers of pregnant women with HIV may not have access to ANC services or may choose not to utilize them.

One measure of impact, infant infection status, is especially difficult to obtain. HIV-testing at birth is of limited use for establishing the infection status of infants because nearly half of all vertical transmission in developing countries takes place in the postnatal period, during breastfeeding. Follow-up would be nearly impossible for routine surveillance systems. In many countries, particularly those with high pre-AIDS mortality in the under-fives and poor vital registration systems, infant and child mortality indicators are not specific enough to register changes in rates of HIV-associated mortality in infants.

Selection of Indicators

This chapter draws on the core indicators established by WHO (2004) for monitoring and evaluating programs for the prevention of HIV in infants and young children. These indicators are recommended for M&E in all countries, regardless of the type of epidemic. Some are newly developed, whereas others have been used for several years. We have modified the format used in the original document to be consistent with that used in this guide. Otherwise, the content of these core indicators remains true to the original.

The indicators included in this chapter are the following:

Output indicators

- Existence of guidelines for the prevention of HIV infection in infants and young children

- Number and percentage of health care workers newly trained or retrained in the minimum package during the preceding 12 months

Outcome indicators

- Prevention and care service points
- Women completing the testing and counseling process

Impact indicators

- Percentage of HIV-positive pregnant women receiving a complete course of ARV prophylaxis to reduce MTCT in accordance with a nationally approved treatment protocol (or WHO/UNAIDS standards) in the preceding 12 months
- Percentage of HIV-infected infants born to HIV-infected mothers

As was pointed out by WHO (2004), the two impact indicators were established by UNGASS for monitoring progress towards the achievement of specific targets established in the Declaration of Commitment on HIV/AIDS (UNGASS, 2002b).

The set of PMTCT indicators presented here does not comprehensively address all the specific monitoring and evaluation needs of PMTCT programs. Indicators of service provision for PMTCT should ideally include provision of VCT services for pregnant women, the availability and affordability of ARVs, provision of counseling and support for infant feeding, and the availability and affordability of alternatives to breastmilk. In addition, indicators should measure crosscutting themes essential for program development and scaling up such as policy development and development of health system capacity (WHO, 2004).

At the project level, good monitoring and evaluation requires indicators that are directly tied to project activities, goals, and objectives. Additional indicators are proposed in other M&E guides for countries in which they are relevant to the national epidemic or national response. The UNAIDS guidelines for *Local Monitoring and Evaluation of the Integrated Prevention of Mother-to-Child HIV Transmission in Low-Income Countries* (UNAIDS, 2000b), for example, may be of greater relevance for monitoring and evaluating specific projects aimed at demonstrating the feasibility and effectiveness of integrating PMTCT activities in routine MCH services within developing countries. The *National Guide to Monitoring and Evaluating Programmes for the Prevention of HIV in Infants and Young Children* (WHO, 2004) also presents additional indicators that can be used at the national level depending on programmatic needs and available resources.

Terminology

The term *mother-to-child transmission of HIV* (MTCT) is often used to refer to the transmission of HIV to infants. As in the *National Guide to Monitoring and Evaluating Programmes for the Prevention of HIV in Infants and Young Children* (WHO, 2004), we use MTCT to refer to the biological process of vertical transmission. The term *prevention of mother-to-child transmission* (PMTCT) is used to refer to the broad range of recommended strategies for the prevention of HIV infection in women, infants, and young children, including, but not limited to, the provision of ARVs to HIV-infected women to prevent MTCT.

WHO PMTCT Core Indicator
Definition

Existence of national guidelines (either approved or in draft form) for the prevention of HIV infection in infants and young children and the care of infants and young children in accordance with international or commonly agreed standards.

Guidelines should be available for all four components of the comprehensive strategy for preventing HIV infection in infants and young children; these components are as follows:

- (1) Intensified prevention efforts aimed at young women (this may or may not be specifically included in these guidelines and may be addressed elsewhere);
- (2) Prevention of unintended pregnancies among HIV infected women;
- (3) Specific interventions to prevent HIV transmission from infected mothers to their children, including ARVs; safe delivery practices; and counseling and support for infant-feeding; and
- (4) Referral or care for HIV-infected mothers and their children.

In some countries, each of these issues may be addressed as part of comprehensive national HIV/AIDS guidelines. In others, individual guidelines may be available. Information on HIV and infant feeding may be incorporated in national guidelines on the feeding of infants and young children.

Measurement Tools

A survey among key informants at the national level or in health care facilities is used to determine whether there are guidelines for each intervention

prong. The key informants at the national level are persons responsible for HIV/AIDS, maternal and child health (MCH) or infant feeding and nutrition; at the health facility level the key informants include practitioners and clinic directors. The actual guidelines, with evidence of approval or submission for approval, may also be reviewed.

What It Measures

National guidelines are commonly based on existing international standards, or on standards about which there is general agreement but which have not yet been formally presented as international guidance. Without guidelines, services of unknown quality and impact can be implemented on an ad hoc basis, making it difficult to monitor and evaluate efforts.

How to Measure It

Measurement of this indicator requires evidence of guidelines. These include guidelines to prevent initial infection among HIV-negative women; prevent unintended pregnancies among HIV-positive women; provide ARV prophylaxis, use safe delivery practices, and provide infant feeding counseling and support among HIV-infected pregnant and lactating women; and refer to or provide care and support to HIV-infected women and their children. When asking if such guidelines exist, the following additional questions may be asked if time and resources allow:

- How were these guidelines formulated? (Explore the process: ask by whom and on what basis they were formulated)
- Are these guidelines nationally accepted (even if only draft versions are available)?
- To what extent are they implemented? (Explore the extent of implementation and the

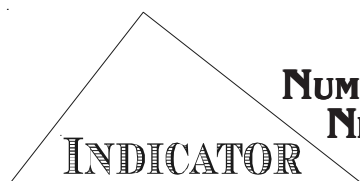
barriers and opportunities that were or are being encountered in implementation)

- How often and by whom are they updated?

The indicator should be measured and the above questions answered for **each** intervention as outlined in the indicator's definition. This indicator should be measured every year until guidelines are found to exist.

Strengths and Limitations

This indicator is not concerned with the quality of guidelines or that of their implementation. Furthermore, because it does not capture new developments in the field, the guidelines have to be reassessed periodically in order to guarantee that they remain consistent with changing standards.



NUMBER AND PERCENTAGE OF HEALTH CARE WORKERS NEWLY TRAINED OR RETRAINED IN THE MINIMUM PACKAGE DURING THE PRECEDING 12 MONTHS

WHO PMTCT Core Indicator

Definition

The number and percentage of health care workers newly trained or re-trained in the minimum package during the preceding 12 months.

Numerator: Number of health care workers newly trained or re-trained in the minimum package during the preceding 12 months.

Denominator: Total number of health care workers working in facilities that have implemented the minimum package, with women that could benefit from it, for preventing HIV infection in women and infants.

“*Re-trained health care workers*” are those that have undergone in-service training, i.e., they are already in the work force and have been practicing for several years. Training includes both in-service and pre-service training.

The “*minimum package*” varies between different types of health care facilities. Several kinds of facilities that may provide services for prevention of HIV infection in infants and young children are outlined below, together with services that should be available. Providers working in these settings should be trained in each of the components mentioned.

ANC/MCH clinics: counseling on risk reduction, counseling on infant feeding, and referral or provision of the following: HIV counseling and testing, ARV prophylaxis, FP (including counseling on dual protection), attended delivery in birth facilities where safe obstetric practices are observed, and long-term care.

FP clinics: counseling on dual protection; referral or provision of HIV counseling and testing, and long-term care; and referral to ANC/MCH services if appropriate.

Maternity hospitals: observance of safe obstetric practices, and referral to or provision of the following: HIV counseling and testing, ARV prophylaxis, counseling on infant feeding, MCH services, FP, and long-term care.

Primary health care (PHC) facilities: referral to HIV counseling and testing, ANC/MCH, and FP services.

Measurement Tools

Training records; health facility survey

What It Measures

This indicator quantifies the human resources that are trained in preventing HIV infection in women and children and are available to provide the required services. For the purpose of planning, it is important to assess the resources available to address health needs. Before the implementation or expansion of services, it is vital to know not only what facilities and equipment are available, but also what training and human resources exist. Only with this information can health systems provide services that meet the needs of and are acceptable to the populations concerned.

How to Measure It

The numerator can be calculated on the basis of a review of training records in each facility that has implemented services or serves women who could benefit from the minimum package for preventing HIV in infants and young children. If however, such records do not exist, a survey of facilities can be carried out. A random sample of health care

providers in these facilities should be asked what training they may have received in the prevention of HIV infections among infants and young children. (In some countries, a national, provincial or district training coordinator keeps records of the training given to individual health workers. Such data can be used instead of a facility survey.) Interviewers should investigate the composition of the training, which varies with the type of site. The minimum package for each type of facility is outlined in the definition of the indicator.

The denominator, i.e., the number of staff able to provide preventive services for HIV infection among infants and young children, is calculated on the basis of the number of health care providers working at sites where women could potentially receive the services included in the minimum package. These data can be obtained from ministry and health facility records.

The numerator should be collected every year. The denominator, if based on facility surveys, is more expensive, but is necessary for the calculation of the percentage and should be obtained every two years. After the initial collection of data, it may be of interest to disaggregate data for those health care workers who have been newly trained or retrained during the preceding 12 months, as well as to maintain a record of how many health care workers have been trained since the first time this indicator was measured.

Strengths and Limitations

This indicator is useful in that it tracks the number of health workers trained to provide services for the prevention of HIV infection in infants and young children over time. It attempts to document increasing capacity to deliver prevention interventions. However, no conclusion should be drawn regarding quality, because this is affected by the practices employed rather than by the existence of trained personnel. It should not be expected that all health workers in countries will have been trained, nor even that a high percentage of those who could be trained will have been

trained. The indicator should be interpreted in relation to the size and nature of the epidemic in particular countries.

Difficulties may occur in determining the denominator, as some countries may have limited information on the pool of human resources available in various facilities. Frequent transfers of personnel between facilities, or high rates of attrition, may complicate the interpretation of this indicator. It should be noted that the assumption is made that only formal health workers are counted, i.e. those remunerated either financially or in kind. In many settings, however, informal health workers make a significant contribution.

WHO PMTCT Core Indicator
Definition

The percentage of public, missionary, and workplace venues (FP and PHC clinics, ANC/MCH, and maternity hospitals) offering the minimum package of services for the prevention of HIV infection in infants and young children in the preceding 12 months.

Numerator: Number of public, missionary, and workplace venues (FP and PHC clinics, ANC/MCH, and maternity hospitals) offering the minimum package of services for the prevention of HIV infection in infants and young children in the preceding 12 months.

Denominator: Total number of public, missionary, and workplace venues (FP and PHC clinics, ANC/MCH, and maternity hospitals).

The “*minimum package*” is defined, as with the previous indicator, by the type of clinical setting. An outline is given below of facilities that may provide services for the prevention of HIV infection in infants and young children, together with indications of the services that should be available.

ANC/MCH clinics: counseling on risk reduction, counseling on infant feeding, and referral or provision of the following: HIV counseling and testing, ARV prophylaxis, FP (including counseling on dual protection), attended delivery in birth facilities where safe obstetric practices are observed, and long term care.

FP clinics: counseling on dual protection; referral or provision of HIV counseling and testing, and

long-term care; and referral to ANC/MCH services if appropriate.

Maternity hospitals: observance of safe obstetric practices, and referral to or provision of the following: HIV counseling and testing, ARV prophylaxis, counseling on infant feeding, MCH services, FP, and long-term care.

Primary health care (PHC) facilities: referral to HIV counseling and testing, ANC/MCH, and FP services.

Measurement Tools

Survey of all public, missionary, and workplace health facilities offering FP and PH, ANC/MCH, and maternity services

For overall coverage, the following instruments can be adapted:

- WHO draft protocol for the evaluation of HIV/AIDS care and support (WHO, 2000)
- UNAIDS protocol for evaluation of care and support (UNAIDS, 1996)

These instruments involve the performance of surveys of health facilities.

For HIV testing and counseling, the following tool can be adapted:

- UNAIDS tool for evaluating HIV voluntary counseling and testing (UNAIDS, 2000c)

What It Measures

In order to be effective, the prevention of HIV in infants must be applied as broadly as possible at all relevant treatment sites. It is generally acknowledged that a large proportion of preventive services occur in ANC settings. As services become integrated, however, it will be important

to consider other outlets as well. This indicator measures the coverage of the services at each of the outlets where prevention or care opportunities arise. These opportunities comprise either referrals to other services or the provision of on-site services.

How to Measure It

The information required for this indicator can be obtained by various methods and depends on resource availability and the amount of detail sought. The first option requires that a questionnaire be sent to all public and private FP and PHC clinics, ANC/MCH, and maternity services. It should be facility-specific, outlining the specific services on offer. A column should be included to show whether services are provided on-site or if referrals are made. If the number of possible sites to be surveyed is too great for all to be covered, a stratified random sample, each stratum being a different type of service delivery, and the questionnaire can be sent to the selected sites.

In measuring this indicator, special attention must be taken that the type of service providing the information is noted (i.e., ANC, family planning center, etc.). Only this way will one be able to determine the more common outlets for prevention and care among women and infants. The availability of PMTCT services may also be analyzed by geographic area, or by sector (public or private).

Scoring should not be done in an “all or nothing” fashion. The numerator should reflect those elements of the package that are present (or for which there are in-house referral mechanisms). The denominator is all public, missionary and workplace venues (FP and PHC clinics, ANC/MCH, and maternity hospitals).

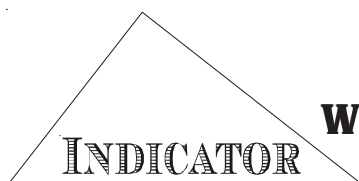
Irrespective of the method adopted for measuring the indicator, it is essential to note the type of service providing the information (e.g., ANC, FP center). This makes it possible to determine the

more common outlets for prevention and care among women and infants.

The indicator should be measured every two to three years.

Strengths and Limitations

This indicator provides critical information on the national availability of prevention and care efforts among women and infants. While it is useful to program planners seeking to determine where services are needed, or where facilities are providing the full spectrum of services to prevent HIV infection in women and infants, it cannot measure the quality of the services being provided in each facility. Moreover, not all countries should be expected to have all, or a high percentage of all possible, health care service points offering services to prevent HIV in infants and young children. Rather, this indicator needs to be interpreted in light of the size and nature of the epidemic a country is facing.



WOMEN COMPLETING THE TESTING AND COUNSELING PROCESS

WHO PMTCT Core Indicator

Definition

The percentage of pregnant women making at least one ANC visit who have received an HIV test result and post-test counseling.*

Numerator: Number of pregnant women who have received an HIV test result and post-test counseling in the preceding 12 months.

Denominator: The estimated number of pregnant women giving birth in the preceding 12 months who have made at least one ANC visit.

Measurement Tools

Review of program records

*An additional important program-level counseling and testing indicator must be considered when a PMTCT program is being managed. The indicator measures the points in the provision of counseling and testing for pregnant women at which women drop out. This information can be used to investigate further why women drop out at specific points and, ultimately, to reduce the percentage of drop-outs. Such information is therefore important for program planning. The indicator includes the following three components:

- The number of pregnant women who have made at least one ANC visit and have been counseled at a PMTCT site, divided by the total number of pregnant women.
- The number of pregnant women who have accepted testing for HIV, divided by the total number of pregnant women who have made at least one ANC visit and have been counseled at a PMTCT site.
- The number of women receiving post-test counseling and HIV results, divided by the total number of pregnant women who have made at least one ANC visit and have been counseled at a PMTCT site.

What It Measures

For PMTCT to be effective, it is necessary to know a woman's sero-status in order to tailor prevention and care to her needs. A successful PMTCT program will reach as many pregnant women as possible to ensure knowledge of sero-status. This indicator provides a broad measure of program coverage in the country concerned. However, issues of poor access to services and poor uptake result in only a small percentage of women knowing their status. It is therefore important to refer to the program-level indicator described in the footnote at the bottom of this page.

How to Measure It

This indicator requires that program records be reviewed in order to count how many women complete each stage of the testing and counseling process, i.e. have received their test results and post-test counseling. The number of women who have made at least one ANC visit is estimated by multiplying the number of births in the preceding 12 months, as given in a census or the best available sources, by the rate of ANC attendance (DHS-type sample survey). In some cases, the numerator may be obtained by examining national records. If this is not possible, the required data are likely to be available at the district level, where they can be collected directly from facilities providing the services in question.

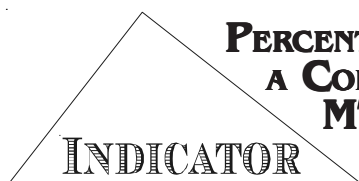
In some cases, the denominator may be obtainable by examining national ANC registries. This is the preferable denominator and should be used if possible. If this number is not available or reliable, the estimate of the number of pregnant women described above can be substituted but this approach involves an increased possibility of misinterpretation.

This indicator should be measured annually.

Strengths and Limitations

As stated in *National AIDS Programmes: A Guide to Monitoring and Evaluation* (UNAIDS, 2000), this indicator provides a broad measure of service provision and gives an idea of coverage in ANC settings where PMTCT interventions are available. It does not attempt to inform service providers about the points in the counseling and testing cycle at which women drop out

It is important that program managers employ a series of lower-level indicators for determining losses to follow up. Because the quality of services is not being measured, information on drop-outs and the points at which they occur is of limited use if not followed up with operations research aimed at discovering why women are failing to complete the cycle.



PERCENTAGE OF HIV-POSITIVE PREGNANT WOMEN RECEIVING A COMPLETE COURSE OF ARV PROPHYLAXIS TO REDUCE MTCT IN ACCORDANCE WITH A NATIONALLY APPROVED TREATMENT PROTOCOL (OR WHO/UNAIDS STANDARDS) IN THE PRECEDING 12 MONTHS

UNGASS Core Outcome Indicator

Definition

The percentage of HIV-positive pregnant women receiving a complete course of ARV prophylaxis to reduce MTCT in accordance with a nationally approved treatment protocol (or WHO/UNAIDS standards) in the preceding 12 months.

Numerator: Number of HIV-positive pregnant women receiving a complete course of ARV prophylaxis to reduce MTCT in accordance with a nationally approved treatment protocol (or WHO/UNAIDS standards) in the preceding 12 months.

Denominator: The estimated number of HIV-infected pregnant women giving birth in the preceding 12 months.

The definition of a “complete course of ARV prophylaxis” will depend on the country’s policy on ARV prophylaxis to reduce the risk of MTCT and may or may not include a dose for newborns. Details of the definition used should be provided.

Measurement Tools

Facility-based national MIS; program monitoring; HIV sentinel surveillance-based records; National Statistical Office estimates

A tool for the measurement of this indicator is provided in *Monitoring the Declaration of Commitment on HIV/AIDS: Guidelines on Construction of Core Indicators*.

What It Measures

This is an UNGASS national program and behavior indicator. It assesses progress in

preventing mother-to-child HIV transmission through the provision of ARV prophylaxis.

How to Measure It

The number of HIV-infected pregnant women who have been provided with ARV prophylaxis during the preceding 12 months in order to reduce the risk of MTCT is obtained from program monitoring records. Only those women who completed the full course should be included in the numerator. The denominator represents the estimated number of women in need of ARV, that is, the number of HIV-infected women to whom ARV prophylaxis to reduce the risk of MTCT could potentially have been given. The denominator is estimated by multiplying the total number of women who gave birth in the preceding 12 months (central statistics office estimates of births) by the most recent national estimate of HIV prevalence in pregnant women (HIV sentinel surveillance antenatal clinic estimates).

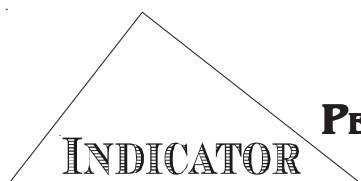
Whether women who receive ARV prophylaxis from the private sector and NGO clinics should be included in the calculation of the indicator is left to the discretion of the country concerned. This decision should be based on a frank appraisal of how often ARV for pregnant HIV-infected women is provided outside the government sector, and should be noted and applied consistently in calculating both the numerator and denominator. Private sector and NGO clinics that provide prescriptions for ARVs but assume that the drugs will be acquired elsewhere by the individuals are not included in this indicator, even though such clinics may be the major providers of services for the reduction of MTCT. The key feature is the actual provision of the drugs.

This indicator should be measured every two to three years.

Strengths and Limitations

This indicator has the following weaknesses:

- (1) ANC data are often incomplete and may not reflect the true situation.
- (2) There may be selection bias because only those women are included who self-select to access services.
- (3) Every country has its own definition of a full course of ARV treatment.
- (4) The indicator does not assess treatment compliance, and, as currently defined, measures need. It does not assess what percentage of women accessing ANC services where PMTCT services are available actually avail themselves of the intervention.
- (5) As the number of women provided with HAART increases over time, the need for specific ARV distribution to prevent vertical transmission may lessen. It will be necessary to develop specific indicators in order to capture information on this matter.



PERCENTAGE OF HIV-INFECTED INFANTS BORN TO HIV-INFECTED MOTHERS

UNGASS Core Impact Indicator

Definition

The percentage of HIV-infected infants born to HIV-infected women.

Measurement Tools

Facility-based MIS (national counts of pregnant women receiving ARV to prevent MTCT, as per national guidelines); background rate of MTCT without PMTCT intervention; current estimates of efficacy of national PMTCT drug regimen (average)

The complete tool for measuring this indicator can be found in *Monitoring the Declaration of Commitment on HIV/AIDS: Guidelines on Construction of Core Indicators* (UNAIDS, 2002).

What It Measures

This UNGASS indicator measures the impact on MTCT reduction of the provision of ARVs to pregnant women in order to prevent vertical transmission. The UNGASS targets are a 20% reduction in the percentage of HIV-infected infants born to HIV-infected mothers by 2005 and a 50% reduction by 2010.

How to Measure It

This indicator is measured by taking the weighted average of the probabilities of MTCT for pregnant women receiving and not receiving ART, the weights being the proportions of women receiving and not receiving ARV, respectively.

The indicator is calculated using the following formula:

$$\text{Indicator score} = \{T*(1 - e) + (1 - T)\} * v$$

where:

T = proportion of HIV-infected pregnant women given ART (this is the proportion obtained in the UNGASS indicator on ARV prophylaxis)

v = MTCT rate in the absence of treatment

e = efficacy of treatment provided

Default values of 0.25 and 0.50, respectively, can be used for v and e . However, if scientific estimates of the efficacy of the specific forms of treatment (i.e. combination therapies) employed in the country are available, these should be used, and this should be noted in the calculations.

This indicator should be measured every two to three years.

Strengths and Limitations

If an infant becomes positive, the indicator cannot distinguish between different causes of infection, i.e. treatment failure or infection during breastfeeding. The indicator may therefore underestimate the rates of MTCT in countries where long periods of breastfeeding are common. Conversely, rates may be overestimated in countries where other MTCT prevention interventions are common, e.g. cesarean section. The proportion of HIV-infected pregnant women given treatment, T , may be a poor estimate in places where the usage of ANC clinic services is low.

References

De Cock KM, Fowler MG, Mercier E, Vincenzi I, Saba J, Hoff E, Alnwick DJ, Rogers M, & Shaffer N. (2000). Prevention of Mother-to-Child HIV Transmission in Resource-Poor Countries: Translating Research into Policy and Practice. *Journal of the American Medical Association*, 283,9:1175-1182.

UNAIDS. (1996). *Care and Support Indicators: Protocol for the Evaluation of Case Management of HIV/AIDS Patients*. UNAIDS/96.3. Geneva, Switzerland: UNAIDS. Retrieved from <http://www.cpc.unc.edu/measure/guide/tools/whocare/unaidscare.pdf>

UNAIDS. (2000a). *National AIDS Programmes: A Guide to Monitoring and Evaluation*. Geneva, Switzerland: UNAIDS. Retrieved from <http://www.unaids.org/publications/documents/epidemiology/surveillance/JC427-Mon&Ev-Full-E.pdf>

UNAIDS. (2000b). *Local Monitoring and Evaluation of the Integrated Prevention of Mother to Child HIV Transmission in Low-income Countries*. Geneva, Switzerland: UNAIDS. Retrieved from <http://www.unaids.org/publications/documents/mtct/ME2000.doc>

UNAIDS. (2000c). *Tools for Evaluating HIV Voluntary Counseling and Testing*. UNAIDS/00.09E. Geneva, Switzerland: UNAIDS. Retrieved from <http://www.un.org/Depts/dpko/medical/pdfs/602unaidscounsel.pdf>

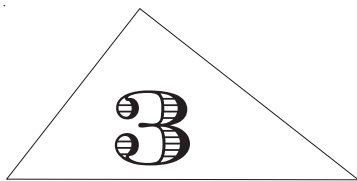
UNAIDS. (2002). *Monitoring the Declaration of Commitment on HIV/AIDS: Guideline on Construction of Core Indicators*. Geneva, Switzerland: UNAIDS. Retrieved from http://www.unaids.org/UNGASS/docs/JC718-CoreIndic_en.pdf

UNAIDS. (2004). *Global Summary of the AIDS Epidemic: December 2004*. Geneva, Switzerland: UNAIDS. Retrieved from http://www.unaids.org/wad2004/report_pdf.html

UNGASS. (2001). *Declaration of Commitment on HIV/AIDS: Global Crisis – Global Action*. United Nations General Assembly Twenty-Sixth Special Session. Retrieved from <http://www.un.org/ga/aids/coverage/FinalDeclarationHIVAIDS.html>

WHO. (2000). *Protocol for the Evaluation of HIV/AIDS Care and Support*. [Draft]. Geneva, Switzerland: World Health Organization. Retrieved from <http://www.emro.who.int/gfatm/guide/tools/whocare/whocare.pdf>

WHO. (2004). *National Guide to Monitoring and Evaluating Programmes for the Prevention of HIV in Infants and Young Children*. Geneva, Switzerland: World Health Organization.



NEWBORN HEALTH

Indicators:

- Number of health facilities providing basic and comprehensive emergency obstetric care functions per 500,000 population
- Proportion of hospitals and maternity facilities designated as baby friendly
- Proportion of health workers who are competent in neonatal resuscitation upon completion of training
- Proportion of pregnant women attending antenatal clinics who are screened for syphilis
- Proportion of babies who receive eye prophylaxis care within one hour of birth
- Percentage of HIV-positive pregnant women receiving a complete course of ARV prophylaxis to reduce MTCT in accordance with a nationally approved treatment protocol (or WHO/UNAIDS standards) in the preceding 12 months (*cross-referenced in Chapter two*)
- Percent of pregnant women who received at least two antenatal care visits
- Proportion of pregnant women receiving at least two doses of tetanus-toxoid vaccine
- Proportion of pregnant women receiving intermittent preventive treatment or malaria prophylaxis, according to national policy
- Proportion of pregnant women who know two or more newborn danger signs
- Proportion of deliveries occurring in a health facility
- Proportion of deliveries with a skilled attendant at birth
- Maternal mortality ratio
- Proportion of newborns who receive thermal protection immediately after birth
- Timely initiation of breastfeeding (*cross-referenced in Chapter eight*)
- Exclusive breastfeeding rate (*cross-referenced in Chapter eight*)
- Proportion of women who receive two high-dose supplements of vitamin A within six weeks of giving birth
- Preterm birth rate
- Proportion of live births with low birth weight
- Late fetal death rate (*cross-referenced in Chapter nine*)
- Perinatal mortality rate (*cross-referenced in Chapter nine*)
- Cause-specific perinatal mortality rate
- Birth weight specific mortality rate (*cross-referenced in Chapter nine*)
- Number of neonatal tetanus cases
- Neonatal mortality rate (*cross-referenced in Chapter nine*)

CHAPTER 3. NEWBORN HEALTH

The goal of many programs in developing countries is to improve maternal and newborn health and survival. Until recently, however, newborn health was relatively neglected in both the international child health and safe motherhood movements, and few programs focused specifically on improving newborn survival. A prime reason that newborn health has received such low priority is the general lack of awareness of the sheer numbers of early infant deaths. WHO estimates that each year more than 8 million infants die in the first year; of these, almost two thirds (5.1 million) die in the first month, and of these, two thirds die within the first day (Lawn, McCarthy & Ross, 2001). Virtually all of these deaths occur in developing countries. Although post-neonatal mortality has declined substantially, neonatal deaths have declined only slightly, thereby representing a growing proportion of overall infant deaths (Espeut, 1998).

A second factor has been the perception that sophisticated technologies are required to significantly reduce perinatal and neonatal mortality. On the contrary, most newborn deaths in developing countries can be prevented by interventions already widely used. The most common causes of neonatal mortality – infections, asphyxia and birth injuries – can be prevented by simple cost-effective interventions that also benefit the mother. These interventions include antenatal malaria prevention and treatment, tetanus toxoid immunization, the detection and management of sexually transmitted infections, and access to a clean and safe delivery (WHO, 1996a). Furthermore, providing all infants with an “essential package of newborn care” (see Table 3.1) including appropriate resuscitation, warmth, cleanliness and hygiene, clean cord care, and early exclusive breastfeeding also increases survival and reduces the proportions of surviving infants with disability (WHO, 1996c; WHO, 2001a).

Compared to other programmatic (technical intervention) areas discussed in this guide, newborn health is one of the least developed. Systematic review of operations research studies have identified which interventions are likely to effectively reduce newborn mortality, but how these services should be scaled up, by whom, and at what cost must still be determined. The monitoring and evaluation of these programs is also in its infancy, and many new data-gathering tools, analytical approaches, and indicators need to be developed and tested. Because of the close link between maternal and newborn health, however, many output indicators appropriate for newborn health are used extensively in safe motherhood programs. Indeed, separating newborn health indicators from those pertaining to maternal health may create a false dichotomy when the antecedents of a poor pregnancy outcome overlap with the program interventions required to address them.

However, our purpose in having a specific section on newborn health is to acknowledge growing awareness of the importance of newborn health and to highlight the fact that despite the many parallels between maternal and newborn health programs, important differences influence the way that programs are monitored and evaluated. These differences arise, not only because program interventions may vary, but because interventions that benefit both mothers and babies may differentially affect mortality. For example, some indicators strongly associated with maternal survival such as antenatal care and skilled attendance at birth may not have an equally strong association with perinatal survival. Other interventions such as immunizing pregnant mothers against tetanus are more likely to be monitored in newborn health programs than in safe motherhood programs.

Table 3.1. WHO essential newborn care package

- 1) Cleanliness: clean delivery and clean cord care for the prevention of newborn infections (tetanus and sepsis)
- 2) Thermal protection: prevention and/or management of neonatal hypothermia and hyperthermia
- 3) Early and exclusive breastfeeding
- 4) Initiation of breathing, resuscitation
- 5) Eye care: prevention and management of ophthalmia neonatorum
- 6) Immunization (BCG, Oral polio, Hepatitis B)
- 7) Management of newborn illness
- 8) Care of the preterm and/or low birth weight newborn

Source: WHO (1996a).

Methodological Challenges to Evaluating Newborn Health Programs

Some of the challenges of evaluating newborn health programs include the following:

Countries define births, deaths, and “newborn period” in different ways, making valid international comparisons difficult.

Meaningful use of any indicator is only feasible when standard definitions are used and applied. The lack of a generally agreed-upon definition of the “newborn period” may limit comparisons across countries and programs. In some settings, “newborn” may refer to infants up to a few days of age and in other settings to infants up to several weeks of age. In this guide, the term “newborn” refers to the neonatal period (i.e., the first 27 completed days of life).

Outcomes need to be measured for two individuals, the mother and the baby.

Newborn health programs (like safe motherhood programs) need to consider the outcomes for two individuals: the mother and the baby. Just because the newborn receives a postnatal checkup, it doesn’t mean the mother receives one also.

Interpreting whether outcomes are attributable to program interventions is difficult because most interventions consist of “bundled” services.

Demonstrating change due to a newborn health program is difficult because programs usually provide a package of care to communities rather than a single intervention. Therefore, such programs do not lend themselves easily to two common experimental designs: randomized control trials and cluster randomized community trials. Many programs adopt “before-after” designs for evaluation purposes that can demonstrate “plausible association” but that fall short of causality (UNFPA et al., 1997).

Measuring perinatal and neonatal morbidity is very difficult.

Estimates of newborn morbidity are important for designing effective program interventions. As with safe motherhood, however, existing estimates of newborn morbidity are usually derived from facility data and are unlikely to reflect the true burden of morbidity in the community where use of health facilities is low. Although community members can learn to diagnose illness in a sick newborn (Bang et al., 1999), illness is often difficult to recognize because babies usually

present with relatively non-specific symptoms, such as poor feeding and lethargy. Few facilities have adequate diagnostic facilities when ill babies do eventually present for care. Assigning a cause of death may be difficult because many different diseases may present with the same symptoms, and many babies die at home before ever reaching medical attention.

New program indicators are required at the individual, community, and facility level.

Much of the discussion on the challenges of monitoring and evaluating newborn health has so far focused on newborn mortality because of the relative lack of experience with output indicators for newborn health. Although mortality indicators clearly have their place and provide the only direct measure of the long-term objective of most programs, output indicators need to be developed to measure the wide range of interventions required to improve newborn health and survival.

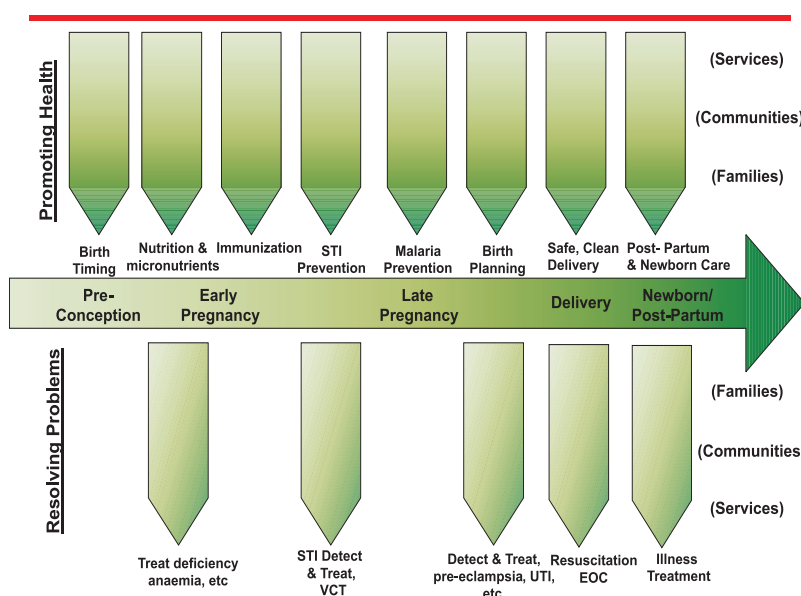
Output indicators are required for measuring the availability, accessibility, quality, utilization and demand for services at the facility level and for outreach services where the provision of newborn

health services has historically been overlooked. In addition, intermediate outcome indicators are required for monitoring and evaluating interventions at the individual and community levels. Many infants become ill and die before ever reaching medical care. It is particularly important to develop indicators that help programs understand community knowledge, attitudes, and behaviors in response to newborn illness and to determine which interventions are the most effective.

Relationship Between Maternal and Newborn Health

Figure 3.1 illustrates the links between maternal and newborn health from before pregnancy to after delivery. The figure does not address some of the system-level determinants – the social, cultural, economic, political, and legal factors that influence maternal and newborn health. The primary purpose of the figure is to show where maternal health interventions can promote and improve the health status of the newborn, as well as the levels (family, community, and services) at which the impact of these interventions should be measured.

Figure 3.1. Maternal & newborn health linkages.



As depicted in Figure 3.1, several interventions need to be implemented during pregnancy to increase newborn survival. These include high quality antenatal care, timely recognition and management of obstetric complications, good nutrition, and micronutrient supplementation (including iron and folate supplementation where anemia is common; vitamin A supplementation where vitamin A deficiency is prevalent; and iodization of salt and treatment of iodine deficiency with iodized oil).

As infections during pregnancy can have a serious effect on the survival of the newborn, newborn health requires the prevention and treatment of infections in pregnancy. Relevant interventions include the presumptive treatment of malaria and hookworm in endemic areas, identification and treatment of syphilis, and tetanus toxoid immunization. Another important intervention is the promotion of voluntary counseling and testing for HIV/AIDS for mothers to reduce the risk of mother-to-child transmission of HIV/AIDS. Promoting newborn health also includes mobilizing facilities, providers, communities, and families around birth preparedness and complication readiness for both the mother and the newborn.

The Selection of Indicators

Most indicators in this section of the guide are intended for use at the national level or in the context of large-scale programs, but many can be used in a much wider monitoring and evaluation context. Indicators were selected on the basis that they:

- Are widely used by international organizations or ministries of health;
- Have a relatively strong link to health or mortality outcomes; and
- Will likely provide valid comparisons at the national and international level.

The indicators included in this section of the guide relate directly to safe motherhood, newborn health,

and newborn health care and include the following, which are based on WHO and CDC recommendations for monitoring and evaluating newborn health at the global and national levels.

Output Indicators

- Number of health facilities providing basic and comprehensive emergency obstetric care functions per 500,000 population
- Proportion of hospitals and maternity facilities designated as baby friendly
- Proportion of health workers who are competent in neonatal resuscitation upon completion of training
- Proportion of pregnant women attending antenatal clinics who are screened for syphilis
- Proportion of babies who receive eye prophylaxis care within one hour of birth
- Percentage of HIV-positive pregnant women receiving a complete course of ARV prophylaxis to reduce MTCT in accordance with a nationally approved treatment protocol (or WHO/UNAIDS standards) in the preceding 12 months

Outcome Indicators

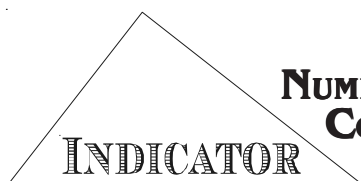
- Percent of pregnant women who received at least two antenatal care visits
- Proportion of pregnant women receiving at least two doses of tetanus-toxoid vaccine
- Proportion of pregnant women receiving intermittent preventive treatment or malaria prophylaxis, according to national policy
- Proportion of pregnant women who know two or more newborn danger signs
- Proportion of deliveries occurring in a health facility
- Proportion of deliveries with a skilled attendant at birth
- Maternal mortality ratio

- Proportion of newborns who receive thermal protection immediately after birth
- Timely initiation of breastfeeding
- Exclusive breastfeeding rate
- Proportion of women who receive two high-dose supplements of vitamin A within six weeks of giving birth

Impact Indicators

- Preterm birth rate
- Proportion of live births with low birth weight
- Late fetal death rate
- Perinatal mortality rate
- Cause-specific perinatal mortality rate
- Birth weight specific mortality rate
- Number of neonatal tetanus cases
- Neonatal mortality rate

We are aware that some programs cannot measure the neonatal health outcomes in the guide, and for these programs, our selection will be less useful. Certain indicators (for example, **Proportion of Pregnant Women Who Know Two or More Newborn Danger Signs**) have been field tested by some groups, but not widely adopted. This indicator is included because of the need to stimulate debate and discussion on appropriate newborn health process indicators, even though we recognize that this indicator may not meet all the criteria for a good indicator (WHO, 1997). Some indicators (for example, **Proportion of Babies Who Receive Eye Prophylaxis Care Within One Hour of Birth**) are difficult to measure but have been included nonetheless because they are a critical component of the WHO Essential Newborn Care Package. In the next few years, as awareness of the problem of newborn mortality grows, no doubt those working in newborn health will move toward a consensus on the indicators appropriate for monitoring national-level programs.



NUMBER OF HEALTH FACILITIES PROVIDING BASIC AND COMPREHENSIVE EMERGENCY OBSTETRIC CARE PER 500,000 POPULATION

Definition

Number of health facilities providing basic and comprehensive emergency obstetric care functions per 500,000 population.

Numerator: Number of facilities providing all standardized basic and comprehensive emergency obstetric care functions.

Denominator: Total population of catchment area.

“Emergency obstetric care” functions are defined as:

- Administration of parenteral antibiotics*;
- Administration of parenteral oxytocic drugs;
- Administration of parenteral anticonvulsants for pre-eclampsia and eclampsia;
- Performance of manual removal of placenta;
- Performance of removal of retained products (e.g., manual vacuum aspiration);
- Performance of assisted vaginal delivery (e.g., vacuum extraction, forceps);
- Performance of surgery (e.g. cesarean section); and
- Performance of blood transfusion.

Health facilities are divided into those that provide “basic” emergency obstetric care (EmOC) and “comprehensive” EmOC. If a facility has performed each of the first six functions *in the past three months*, it qualifies as providing basic EmOC. If it has provided all eight of the functions *in the past three months*, it qualifies as a “comprehensive” EmOC facility (UNICEF/WHO/UNFPA, 1997). Note

* Parenteral administration of drugs means by injection or intravenous infusion (“drip”).

that there has been confusion with changing terminology from “essential” to “emergency” obstetric care. For the purpose of this manual, we will refer to emergency obstetric care.

Measurement Tools

Health facility assessments that examine medical records or service statistics; personal interviews with knowledgeable staff who attend obstetric patients (These are a second, albeit, potentially more biased source of information than written records.)

What It Measures

This indicator measures the availability of life-saving obstetric care services. Due to the difficulties of measuring maternal mortality and morbidity, a series of process indicators are being suggested as an alternative (Goodburn, 2002). This indicator is one of those suggested indicators. It distinguishes between “basic” and “comprehensive” emergency obstetric care services to emphasize that maternal lives can be saved not only in hospitals providing all the services listed above, but also at health centers or smaller hospitals with basic services.

How to Measure It

This indicator is calculated by counting the number of facilities meeting the requirements for “Basic” (or “Comprehensive”) EmOC, dividing by the total population of the catchment area, and multiplying the result by 500,000. Civil registration and population censuses provide information for the denominator.

The indicator should be calculated separately to show the availability of Basic EmOC services and the availability of Comprehensive EmOC services. Only facilities currently providing all the signal functions in either the Basic or Comprehensive Emergency Obstetric Care lists should be included in the

numerator. Ideally, the facility should have all the signal functions available 24 hours a day and seven days a week.

UNICEF/WHO/UNFPA (1997) recommends a minimum acceptable level of at least four basic and one comprehensive EmOC facilities per 500,000 population. This indicator can be calculated for smaller geographic areas to show the distribution of EOC facilities at a sub-national level.

Strengths and Limitations

This indicator is relatively easy to produce and should respond to changes within a fairly short period of time (e.g., 6-12 months). Note that the list of signal functions is intentionally brief to facilitate assessment and monitoring; it does not constitute the complete list of services that either a Basic or Comprehensive EmOC facility should provide. Valuable services are omitted in the definition of EmOC facility. For example, use of anesthesia is not included, although it is assumed necessary for obstetric surgery.

Generally, this indicator applies to a large region or country and tells us whether there are problems in the availability of EmOC services in the general population. However, it does not tell us where facilities are needed or why existing EmOC facilities are not being used. The indicator is not necessarily a reflection of accessibility of facilities because it contains no information on their geographical distribution, referral systems, transport, cultural, and economic accessibility, or the uptake of care. Furthermore, this indicator may not reflect true differences in the availability to the population in need of EmOC (i.e. pregnant women) where there are differences in the proportion of women of reproductive age in the population and their fertility rates.

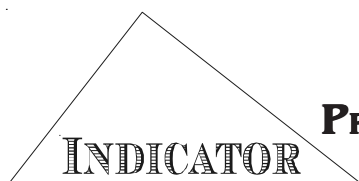
Generally, facility-based assessments should cover all the facilities in a specific area. However, private facilities may be under-represented compared to public facilities. Although geographically representative samples of facilities are possible in health facility surveys, such as in the Service

Provision Assessment (SPA), these surveys may not always include all the signal functions listed previously (MEASURE DHS+, 2000).

If areas fall short of the minimum level mentioned previously, they may upgrade existing facilities and/or build new ones. If the minimum level is met, evaluators should study the geographical distribution by looking at smaller divisions of the population. National summary measures may hide important sub-national disparities; hence, disaggregation by geographic (urban/rural) and by administrative (public/private) divisions is recommended (Bertrand and Tsui, 1995).

The use of this indicator in a wide variety of countries has brought to attention at least three difficulties in its application. First, where geographical terrain is particularly challenging and transportation is precarious (such as in the mountains of Nepal and Bhutan), the ratio of facilities to the population may require adjustment for local use. Second, the reference period for assessing whether a signal function or procedure has been performed is generally three months, but when patient volume is low, one or more of the signal functions may not be performed because an occasion did not present itself, not for lack of infrastructure or provider skills. Finally, a third situation concerns normative medical practice that fails to include one of the procedures, for example, assisted vaginal delivery. In some countries, vacuum extraction or a forceps delivery is no longer taught to medical students or midwives, and only a few older providers are experienced at performing these procedures.

In attempting to solve these problems, one may consider modifying the indicator in several ways. However, researchers must document modifications made to the definition and the calculation of the indicator in order to inform comparisons of facilities across time and space. If country-specific criteria were established in the definition of Basic or Comprehensive EmOC, or if a particular signal function was omitted from the definition, these changes should be documented as well.



PROPORTION OF HOSPITALS AND MATERNITY FACILITIES DESIGNATED AS BABY FRIENDLY

Definition

The proportion of hospitals and maternity facilities that have been accredited as “Baby Friendly” according to the ten UNICEF/WHO criteria related to breastfeeding and newborn care.

Numerator: Number of hospitals and maternity facilities accredited as “Baby Friendly.”

Denominator: Total number of hospitals and maternity facilities that handle deliveries.

To be designated as “Baby Friendly,” the hospital must:

- Have a written breastfeeding policy that is routinely communicated to all health care staff;
- Train all health-care staff in the skills necessary to implement this policy;
- Inform all pregnant women about the benefits and management of breastfeeding;
- Help mothers initiate breastfeeding within an hour of birth;
- Show mothers how to breastfeed and how to maintain lactation, even if they should be separated from their infants;
- Give newborn infants no food or drink other than breast milk, unless medically indicated;
- Practice “rooming in” by allowing mothers and infants to remain together 24 hours a day;
- Encourage breastfeeding on demand;
- Give no artificial teats, pacifiers, dummies, or soothers to breastfeeding infants; and
- Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or birthing center.

Measurement Tools

UNICEF/WHO/Wellstart Baby Friendly Hospitals Initiative (BFHI) internal self-assessment and external evaluation instruments

What It Measures

This indicator provides useful information on the availability of baby-friendly services in a given country. The BFHI is a joint UNICEF/WHO/Wellstart initiative aimed at increasing breastfeeding rates and encouraging global standards for maternity services in hospitals and maternities.

How to Measure It

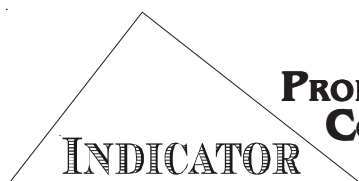
Data requirements are the number of maternities meeting BFHI criteria and the total number of maternities and hospitals. Facilities first conduct a self-assessment, then independent assessors appointed by the national BFHI committee or UNICEF country offices evaluate them according to the criteria mentioned in the previous column. These same bodies aggregate information on the numbers and proportions of facilities acquiring “Baby Friendly” status for national and global reporting (WHO, UNICEF, and Wellstart International, 1999).

Strengths and Limitations

The number of facilities achieving “Baby Friendly” status may be presented more often than the proportion because of difficulties in ascertaining the total number of maternities required for the denominator. Ascertaining the number of maternities in the private sector is particularly difficult, and in many cases, private facilities may not be represented in national estimates. The number of facilities achieving “Baby Friendly” status is of limited use for regional and cross-country comparisons because it is clearly affected

by geographic size. For example, by December 2000, 6312 hospitals in China (or 47% of all eligible facilities) had achieved “Baby Friendly” status compared to 232 (or 66% of all eligible facilities) in Kenya.

Second, the listing of facilities that are recorded as “Baby Friendly” may be out of date because periodic reaccreditation to maintain standards is voluntary and depends on the interest and motivation of each individual facility. The date of acquiring “Baby Friendly” status and whether reaccreditation has occurred are not routinely recorded.



PROPORTION OF HEALTH WORKERS WHO ARE COMPETENT IN NEONATAL RESUSCITATION UPON COMPLETION OF TRAINING

Definition

Proportion of health workers who are competent in neonatal resuscitation upon completion of training.

Numerator: Number of health workers who are competent in neonatal resuscitation upon completion of training.

Denominator: Total number of health workers trained.

The definition of “*competency*” depends on national training objectives. Usually, “*competent*” refers to the fact that the trainee can deliver the service according to a set standard.

Measurement Tools

Competency test (often in the form of a checklist administered by the trainers and/or external expert observer)

What It Measures

This indicator measures competency in neonatal resuscitation among health workers who have completed relevant training. It reflects both the adequacy of the training with respect to these skills and the ability of trainees to absorb the information. Resuscitation is needed when a newborn suffers from birth asphyxia. Birth asphyxia is defined as the failure to initiate and sustain breathing at birth. WHO estimates that approximately one to five percent of all newborns will require resuscitation at birth which accounts for up to 6 million babies per year. Of these about one million will die, and an unaccounted number will suffer from long-term disabilities (WHO, 1998d).

The incidence of birth asphyxia is higher in developing countries because of higher prevalence of risk factors such as poor health of women when they become pregnant; higher incidence of pregnancy and delivery; inadequate or non-existent care during delivery and labor; and high incidence of pre-term delivery. An international study found that 80% of babies requiring resuscitation needed only a bag and mask and room air (Saugstad, Rootwelt, and Aalen, 1998). More advance complex technologies are not always necessary.

How to Measure It

Measurement of this indicator requires that health workers undergo competency-based training for neonatal resuscitation. Four main pieces of information are needed to calculate this indicator:

- Training records
- Written tests (e.g., pre- and post-tests of knowledge)
- Results of observer checklists, pre and post-tests of skills
- National or institutional standards for training and service delivery

Competency should be assessed after training has been completed using a model. The instrument used in the evaluation is a standardized checklist including the relevant skills and steps in newborn resuscitation. Each step of the skill is scored by the evaluator to indicate if the skill was done correctly (2 points), done partly correctly (1 point), or done incorrectly or not at all (0 points). Table 3.2 summarizes different components of neonatal resuscitation.

The competency assessment may require the health worker to do the following:

- (a) Explain while demonstrating the first five steps of newborn resuscitation;
- (b) Explain while demonstrating the two things that are evaluated in a baby to decide if more resuscitation is needed;
- (c) Explain while demonstrating how to do resuscitation including infection prevention steps;
- (d) Explain what to do if the chest does not rise after the baby is given the first breath;
- (e) Explain while demonstrating how to keep the baby warm and stimulated when the baby is breathing but the color is blue.

This indicator can also be measured through direct observation of health worker practices at health facilities with high client volume. The same skills checklists used during the training can be used to assess on-the-job performance. A score of at least 80 percent can be used to represent “competency” for skills and a score of at least 70% to represent “competency” for knowledge. Low scores, with no critical steps missing, may reflect inadequacies in the course and/or in the ability of the participants to absorb the information.

Strengths and Limitations

The limitation of this indicator is that it would be difficult to compare the results from this indicator across countries or even across programs within a given country. Learning objectives, courses, and evaluation tools are not typically standardized. At the field level, there are inconsistencies in terms of the criteria used to define competency. Some programs would expect a 100% grade before the trainee would be judged competent on a battery of skills, whereas another program might consider a person competent if only 70% of the tasks are correctly completed. In some cases, local standards for neonatal resuscitation may not exist, in which case international standards can be used.

The strength of this indicator is that competency in neonatal resuscitation can be assessed every six months (as resources permit) against WHO or national standards. When measuring provider competency at a later date (using direct observation), the indicator is useful in determining the retention of skills acquired during training, and for identifying possible candidates for retraining.

Table 3.2. Essential newborn care intervention sub-package

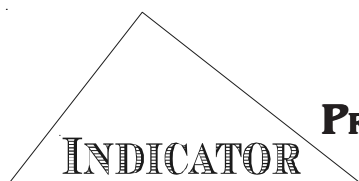
PACKAGE COMPONENT-NEONATAL RESUSCITATION	
Identification of babies to resuscitate:	
◆	Not breathing
◆	Blue color of mouth and body, or floppy and white
Standard and staff:	
◆	Develop resuscitation standards for different levels at your setting
◆	Use existing national or WHO guidelines as a basis
◆	Provide competency-based training for all staff who will be at the deliveries
◆	Provide supervision and ongoing training, as these skills can be lost
Supplies and equipment:	
◆	Dry clean cloth
◆	Bag and mask (ambu bag)
◆	Suction apparatus (a range of options are available in WHO guidelines)
◆	Gloves
Additional equipment:	
◆	Shelf to put the baby on
◆	Method to keep the baby warm, such as overhead light bulbs
◆	Oxygen supply
Immediate Actions:	
◆	Dry the baby and cover with a clean cloth
◆	Suction the mouth and nose if required (over-suctioning at the back of the throat can make the baby's condition worse)
◆	Place the baby correctly, with a small roll of cloth under the neck to extend it slightly
◆	Place the mask (attached to the bag) firmly over the baby's mouth and nose and form a seal
◆	Squeeze the bag to inflate the lungs at a rate of 40 respirations per minute
◆	Watch the baby's chest carefully to see that the chest is rising and falling as you squeeze the bag
◆	If the baby starts breathing regularly, stop using the ambu bag
◆	If there is no gasping or breathing at all, stop resuscitating after 20 minutes
◆	If there was gasping but no spontaneous breathing, stop resuscitation after 30 minutes
◆	Universal precautions should be observed, including hand washing, disinfecting all equipment, and use of gloves, if available

Table 3.2. Essential newborn care intervention sub-package (continued)

Mouth to mouth resuscitation:

If a bag and mask are not available, mouth to mouth resuscitation is effective. The risk for infection to the resuscitator can be reduced by cleaning blood and mucus from the baby's face and mouth with a cloth and placing the cloth over the baby's mouth and nose before starting to ventilate. Seal the mouth and nose with your mouth and blow at a rate of 40 respirations per minute.

Source: WHO/RHT/SMS/98.1.



PROPORTION OF PREGNANT WOMEN ATTENDING ANTENATAL CLINICS WHO ARE SCREENED FOR SYPHILIS

Definition

Proportion of pregnant women attending antenatal clinics who are screened for syphilis.

Numerator: Number of pregnant women attending antenatal clinics who are screened for syphilis.

Denominator: Total number of pregnant women attending antenatal clinics.

Measurement Tools

Clinic registries (data on first visit) or individual prenatal records (individual ANC records/cards after births or immediately postpartum); health facility surveys

What It Measures

Syphilis infection is a major cause of maternal morbidity and perinatal morbidity and mortality in the developing world. For many African countries, reported prevalence of syphilis among pregnant women at sentinel surveillance sites ranges between 10-15 percent, with over half of these pregnancies resulting in an adverse outcome, such as abortion, stillbirth, low birth weight, premature delivery, or congenital infection (WHO, 1991b). Because adverse outcomes from syphilis are preventable, and screening and treatment in pregnancy are highly cost effective, many countries have adopted universal syphilis screening for pregnant women as a national policy (Gloyd et al., 2001).

This indicator measures the extent to which ANC clients are screened for syphilis. Since all women attending for ANC should be screened for syphilis at least once during pregnancy, this measure can also potentially serve as a proxy measure of the quality of antenatal care services (UNFPA, 1998a).

Furthermore, when an explicit standard exists that all women should be tested at least once during pregnancy, the indicator may also be used as a benchmark to audit provider (or system) performance against compliance with local screening policy.

How to Measure It

Researchers may routinely collect data to calculate this indicator if antenatal clinic registries record completed syphilis screening. Most often, however, the information is collected in the context of special surveys that review the antenatal clinic cards of women who have had a recent birth. Researchers may conduct these surveys in facilities or in the community, if women keep their antenatal cards. Health facility exit interviews and provider observations (MEASURE DHS+, 2001; WHO, 1998a) may provide a baseline measure for evaluation purposes, but are limited because they assess women who have not yet completed antenatal care and who theoretically could still be tested (MEASURE DHS+, 2001; WHO, 1998a).

Strengths and Limitations

This indicator is a facility-based measure and does not represent the general population, particularly when ANC coverage is low. In addition, where the indicator is obtained by record review, the validity of the findings depends on the quality and completeness of the data. Incomplete data recording may further indicate low service quality.

Adequate syphilis screening does not equate with adequate syphilis treatment because studies show that despite effective screening, inadequate treatment may be an important cause of preventable perinatal death. In high prevalence areas, even when syphilis testing is theoretically universal, most women were not tested (Gloyd et al., 2001).

Definition

Proportion of babies who receive eye prophylaxis care within one hour of birth in a specified period.

Numerator: Number of babies who receive eye prophylaxis care within one hour of birth in a specified period.

Denominator: Total number of live births in the same period.

“*Eye prophylaxis*” involves cleaning the eyes after birth and applying either silver nitrate drops (1%), tetracycline ointment (1%), or erythromycin ointment (0.5%) within the first hour of birth (WHO, 1996a; Lawn et al., 2001). The type of medication used depends on the local epidemiological situation.

Measurement Tools

Health facility survey (direct observation of deliveries)

What It Measures

This indicator measures the prevention and management of ophthalmia neonatorum, defined as any conjunctivitis with discharge occurring during the first two weeks of life. In many countries where the prevalence of STIs is high and where eye prophylaxis is not widely practiced, ophthalmia in newborns is a common cause of blindness. Gonococcus and chlamydia trachomatis are two leading causes of ophthalmia neonatorum. If treatment is delayed or inappropriate, the infection may progress into systemic disease or result in permanent eye damage (WHO, 1996a; Lawn et al., 2001).

Gonococcal ophthalmitis can be prevented by cleaning the eyes immediately after birth and applying silver nitrate solution (1%), tetracycline

ointment (1%), or erythromycin ointment (0.5%) within the first hour of birth. Eye prophylaxis is one of the key elements in the Essential Newborn Care Package (WHO, 1996a) and is a highly cost-effective intervention, costing US \$1.40 per case averted when the rate of gonococcal infection is greater than 10% (WHO, 1991). When eye prophylaxis fails, it is most often because it was administered too late (after the first hour) or the eyes were flushed after administration of silver nitrate to prevent chemical conjunctivitis, or giving drops that were too concentrated after evaporation.

How to Measure It

This indicator is measured at the facility level in a defined geographic area and period. Data requirements are: (1) the number of infants who receive eye prophylaxis within one hour of birth in a specified period; and (2) the total number of live births in the same period. Valid data can only be obtained by direct observation of attendance at birth at health facilities with high client volume.

Where data on the numbers of live births for the denominator are unavailable, evaluators can estimate the total live births from the total population and crude birth rate in a specified area as follows:

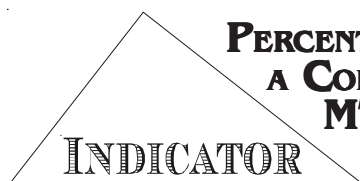
$$\text{Total expected births} = \text{population} \times \text{crude birth rate}$$

In settings where the crude birth rate is unknown, WHO recommends using 3.5% of the total population as an estimate of the number of pregnant women (i.e., number of live births or pregnant women = total population \times 0.035 [WHO, 1999a, 1999b]).

Strengths and Limitations

This indicator is difficult to measure and is most appropriate in settings where facility births are

common. Reliable estimates for individual facilities can only be obtained if there are large numbers of deliveries. In developing countries, facility data are not recommended for estimating the proportion of babies who receive eye prophylaxis care in the general population because a large proportion of births occur at home; hence, facility-based data may be subject to selection bias. Surveys are not a recommended approach for measuring this indicator as they are subject to recall bias, which is likely to increase with the length of recall period.



PERCENTAGE OF HIV-POSITIVE PREGNANT WOMEN RECEIVING A COMPLETE COURSE OF ARV PROPHYLAXIS TO REDUCE MTCT IN ACCORDANCE WITH A NATIONALLY APPROVED TREATMENT PROTOCOL (OR WHO/UNAIDS STANDARDS) IN THE PRECEDING 12 MONTHS

UNGASS Core Outcome Indicator

Definition

The percentage of HIV-positive pregnant women receiving a complete course of ARV prophylaxis to reduce MTCT in accordance with a nationally approved treatment protocol (or WHO/UNAIDS standards) in the preceding 12 months.

Numerator: Number of HIV-positive pregnant women receiving a complete course of ARV prophylaxis to reduce MTCT in accordance with a nationally approved treatment protocol (or WHO/UNAIDS standards) in the preceding 12 months.

Denominator: The estimated number of HIV-infected pregnant women giving birth in the preceding 12 months.

The definition of a “complete course of ARV prophylaxis” will depend on the country’s policy on ARV prophylaxis to reduce the risk of MTCT and may or may not include a dose for newborns. Details of the definition used should be provided.

Measurement Tools

Facility-based national MIS; program monitoring; HIV sentinel surveillance-based records; National Statistical Office estimates

A tool for the measurement of this indicator is provided in *Monitoring the Declaration of Commitment on HIV/AIDS: Guidelines on Construction of Core Indicators*.

What It Measures

This is an UNGASS national program and behavior indicator. It assesses progress in

preventing mother-to-child HIV transmission through the provision of ARV prophylaxis.

How to Measure It

The number of HIV-infected pregnant women who have been provided with ARV prophylaxis during the preceding 12 months in order to reduce the risk of MTCT is obtained from program monitoring records. Only those women who completed the full course should be included in the numerator. The denominator represents the estimated number of women in need of ARV, that is, the number of HIV-infected women to whom ARV prophylaxis to reduce the risk of MTCT could potentially have been given. The denominator is estimated by multiplying the total number of women who gave birth in the preceding 12 months (central statistics office estimates of births) by the most recent national estimate of HIV prevalence in pregnant women (HIV sentinel surveillance antenatal clinic estimates).

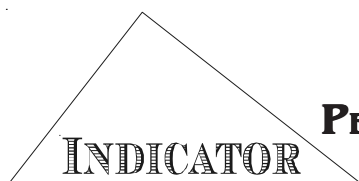
Whether women who receive ARV prophylaxis from the private sector and NGO clinics should be included in the calculation of the indicator is left to the discretion of the country concerned. This decision should be based on a frank appraisal of how often ARV for pregnant HIV-infected women is provided outside the government sector, and should be noted and applied consistently in calculating both the numerator and denominator. Private sector and NGO clinics that provide prescriptions for ARVs but assume that the drugs will be acquired elsewhere by the individuals are not included in this indicator, even though such clinics may be the major providers of services for the reduction of MTCT. The key feature is the actual provision of the drugs.

This indicator should be measured every two to three years.

Strengths and Limitations

This indicator has the following weaknesses:

- (1) ANC data are often incomplete and may not reflect the true situation.
- (2) There may be selection bias because only those women are included who self-select to access services.
- (3) Every country has its own definition of a full course of ARV treatment.
- (4) The indicator does not assess treatment compliance, and, as currently defined, measures need. It does not assess what percentage of women accessing ANC services where PMTCT services are available actually avail themselves of the intervention.
- (5) As the number of women provided with HAART increases over time, the need for specific ARV distribution to prevent vertical transmission may lessen. It will be necessary to develop specific indicators in order to capture information on this matter.



PERCENT OF PREGNANT WOMEN WHO RECEIVED AT LEAST TWO ANTENATAL CARE VISITS

Definition

Percent of pregnant women who received at least two antenatal care (ANC) visits.

Numerator: Number of pregnant women who received at least two ANC visits during a specified period.

Denominator: Total number of live births in the same period.

Measurement Tools

Clinic registries or individual prenatal records (individual ANC records/cards after births); population-based survey (DHS, KPC, MICS); health facility exit interviews

What It Measures

The main purpose of this indicator is to provide information about women's use of antenatal care services. Some studies have found that women's use of ANC is strongly associated with perinatal survival (McDonagh, 1996) more than it is associated with better maternal health outcomes. ANC coverage plays an important role, therefore, in the monitoring and evaluation of programs addressing newborn survival (Graham and Filippi, 1994).

How to Measure It

When calculating this indicator from a population-based survey, the numerator is the number of women who had a live birth in a specified period and who reported receiving at least two ANC visits during the pregnancy. The denominator is the total number of live births in the same period. The number of live births in the specified period can be a proxy for the total number of women who needed antenatal care (ANC) in the same period. Ideally, all births should be taken

into account when estimating this indicator. The usual practice is to consider only live births because of the difficulty in obtaining information about non-live births (Graham and Filippi, 1994). When survey data are used to measure this indicator, the denominator can be the total number of women who gave birth during the same period.

Where data on the number of live births are unavailable, evaluators can calculate total estimated live births using census data for the total population and crude birth rate in a specified area.

$$\text{Total expected births} = \text{population} \times \text{crude birth rate}$$

In settings where the crude birth rate is unknown, WHO recommends using 3.5% of the total population as an estimate of the number of pregnant women (i.e., number of live births or pregnant women = total population \times 0.035 [WHO, 1999a, 1999b]).

Strengths and Limitations

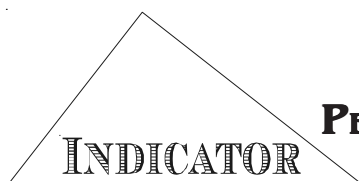
This indicator is responsive to change in the short term. Annual monitoring is feasible when the data are derived from routine data sources. While this indicator provides a crude measure of antenatal care utilization and takes into consideration the number of ANC visits (Rooney, 1992), it does not capture the timing of the visits, the reasons for seeking care, the skill of the provider, or the quality of care received.

For international comparisons, a reference period of three to five years is probably sufficient. Evaluators should avoid frequent surveys, because sampling error makes it difficult to assess whether small changes are real or due to chance variation. For comparison purpose, one must know whether the denominator used reflects all births (live births

as well as non-live births), the most recent birth, or all women. Overestimation of coverage occurs from the use of live births only in the denominator. Furthermore, observed differences in coverage may be due not to true changes in coverage of all pregnancies, but to differences in stillbirth and abortion rates.

While a birth-based analysis represents all births in the reference period, it over-represents women who have more than one birth. Women with more than one birth are also more likely to have other risk factors, such as high parity and lower rates of health services use. Therefore, the indicator is likely to be lower using a birth-based estimate than a women-based estimate, and this difference will be greater the longer the reference period used. One can obtain a women-based estimate by restricting the calculations to the most recent birth (Graham and Filippi, 1994). Because programs tend to target mothers rather than births, using a women-based denominator may be conceptually more appealing to program managers. However, an analysis based on all live and non-live births occurring in a specified period is essential for determining the impact of the number of ANC visits on pregnancy outcomes.

When the indicator is calculated from routine service statistics, the numerator may include women who are not counted in the denominator (i.e., those who attended two or more ANC visits but whose pregnancy did not result in a live birth). Routine service-based data may also suffer from incomplete records. Information from civil registration systems and population censuses can be used to estimate the denominators, but potential problems could arise if reporting is incomplete. Health facility exit interviews may provide a baseline measure for evaluation purposes but are limited because they assess women who have not completed antenatal care and who could theoretically still received two or more ANC visits. The content and quality of ANC visits, however, could be explored in exit interviews.



PERCENTAGE OF PREGNANT WOMEN WITH AT LEAST TWO DOSES OF TETANUS TOXOID VACCINE

Definition

Proportion of pregnant women receiving at least two doses of tetanus-toxoid (TT) vaccine during their last pregnancy.

Numerator: Total of TT2+TT3+TT4+TT5.

Denominator: Total number of live births.

Where TT2, TT3, TT4, and TT5 refer to the 2nd, 3rd, 4th, and 5th dose of tetanus-toxoid vaccine administered (WHO, 1999a; WHO, 1999c), respectively.

Measurement Tools

Service statistics; population-based surveys

What It Measures

Neonatal tetanus is a major global public health problem. Despite increasing coverage of women of childbearing age with at least two doses of tetanus toxoid in many countries, it is estimated that 180,000 cases of neonatal tetanus occurred in 2002, often with a high case-fatality rate (WHO, 2005). The protection of the newborn against neonatal tetanus is determined by the immunization status of the mother. In order to protect neonates, previously unimmunized women should receive two doses of TT or tetanus-diphtheria (Td) toxoid vaccine during their first pregnancy and one dose of TT or Td during each subsequent pregnancy up to a maximum of five doses (Table 3.3). This measure is additional to the use of clean practices during delivery and the care of the infant's umbilical cord. Protective antibody levels are attained in 80%–90% of individuals after the second dose and in 95%–98% of women after the third dose. A three-dose course of TT or Td provides protection against maternal and neonatal tetanus for at least five years. Fifth

doses of TT or Td given later prolong the duration of immunity throughout the childbearing years and possibly longer.

How to Measure It

From service statistics:

The data requirements are the total number of doses of T2 + TT3 + TT4 + TT5 given to pregnant women in a reference period (usually a year) and the number of live births in the same reference period.

From population-based surveys:

The numerator is the number of women giving birth during a reference period (e.g. five years) who report receiving at least two doses of tetanus-toxoid during their last pregnancy, and the denominator is the number of live births in the same reference period.

The number of live births serves as a proxy for the number of pregnant women. Where data on the numbers of the live births are unavailable, evaluators can estimate the total number of live births using census data for the total population and crude birth rates in a specified area as follows:

$$\text{Total expected births} = \text{population} \times \text{crude birth rate}$$

In settings where the crude birth rate is unknown, WHO recommends using 3.5% of the total population as an estimate of the number of pregnant women (i.e., number of live births or pregnant women = total population \times 0.035 [WHO 1999a, 1999b]).

Strengths and Limitations

Many national HIS routinely collect this indicator to provide TT2+ coverage estimates for women attending facilities for ANC or during campaigns.

Most population-based surveys also collect data on self-reported or card-documented TT coverage. Variations in the methods used to measure TT2+ coverage, as well as in the definition of the numerator and the denominator, give rise to differences in the magnitude and reliability of the estimates obtained. For example, service statistics record the total number of doses of a vaccine in the previous 12 months, whereas survey data tend to record the total number of women who report receiving at least two vaccinations during the last pregnancy in a reference period that may be up to five years or who can show an antenatal or similar card with TT doses recorded.

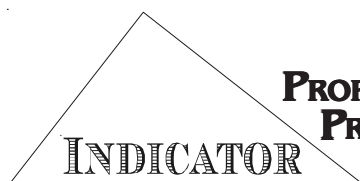
Service statistics have the disadvantage that they may be incomplete or inaccurate (WHO, 1999a). They are also subject to a selection bias and are not representative of the general population, particularly when ANC coverage is low. However, they provide the only way of monitoring coverage on a frequent basis and may be more reliable than self-reported data. Surveys provide the only means to obtaining population-based coverage, but because many surveys rely on self-reporting, they are subject to recall bias that is likely to increase with the length of the recall period.

Table 3.3. WHO recommended tetanus toxoid immunization schedule for women of childbearing age and pregnant women without previous exposure to TT, Td, or DTP

Dose of TT, Td, or DTP	Given	Level of protection	Duration of Protection
TT 1	At first contact or as early as possible in pregnancy	None	None
TT 2	At least four weeks after TT 1	80%	1-3 years
TT 3	At least 6 months after TT 2 or during subsequent pregnancy	95%	At least 5 years
TT 4	At least one year after TT 3 or during subsequent pregnancy	99%	At least 10 years
TT 5	At least one year after TT4 or during subsequent pregnancy	99%	For all child-bearing years and possibly longer

Td – Tetanus-Diphtheria toxoid vaccine

DTP – Diphtheria, Tetanus, Pertussis vaccine



PROPORTION OF PREGNANT WOMEN RECEIVING INTERMITTENT PREVENTIVE TREATMENT OR MALARIA PROPHYLAXIS, ACCORDING TO NATIONAL POLICY

Definition

Proportion of pregnant women receiving intermittent preventive treatment or malaria prophylaxis, according to national policy.

Numerator: Number of pregnant women receiving intermittent preventive treatment or malaria prophylaxis, according to national policy.

Denominator: Total number of pregnant women surveyed.

Malaria medication (prophylaxis or intermittent preventive treatment [IPT]) will vary according to local susceptibility and national policy. Most country policies in endemic areas require that all pregnant women receive two doses of the recommended antimalarial drug (sulfadoxine-pyrimethamine [SP]) at the first regularly scheduled ANC visit after quickening (first noted movement of the fetus) and during each regularly scheduled visit thereafter (WHO, 2002, 2005). However, even a single dose of SP is beneficial. SP is generally more effective than chloroquine because of the increasing prevalence of chloroquine resistance and the need for less frequent dosing when compared with chloroquine. WHO presently recommends an optimal schedule of four ANC visits, with three visits after quickening. The delivery of IPT with each scheduled visit will likely assure that a high proportion of women receive at least two doses of SP.

Measurement Tools

Facility records of antenatal patients; health facility surveys; population-based surveys; health information systems (HIS)

What It Measures

This indicator measures coverage of IPT among pregnant women. This is one of the core indicators for monitoring progress of Roll Back Malaria (RBM). Malaria is a major health risk for women and newborn in areas where *Plasmodium falciparum* malaria is endemic. In stable areas of malaria transmission, malaria infection causes anemia in the mother. The presence of malaria parasites in the placenta also damages placental integrity and interferes with the ability of the placenta to transport nutrients and oxygen to the fetus, thereby causing intrauterine growth retardation, a primary cause of low birth weight.

Pregnant women residing in low or unstable malaria transmission areas have a two to three-fold higher risk of developing severe disease as a result of malaria infection. In such areas, malaria can cause maternal death directly from infection or indirectly by causing severe anemia. In addition, a range of adverse pregnancy outcomes, including spontaneous abortion, still births, and congenital malaria, can result from malaria, causing increased risk of infant mortality among all babies born to mothers living in areas of unstable malaria transmission (WHO, 2002). IPT with SP during antenatal care significantly reduces the prevalence of maternal anemia and placental parasitemia and the incidence of low birth weight (Steketee et al., 2001).

How to Measure It

When data are collected by reviewing facility records, or through direct observation of ANC consultations or client exit interviews, the numerator is the number of pregnant women given or prescribed malaria medication in a given period.

Where data on the total number of pregnant women are absent, WHO recommends using 3.5% of the total population as an estimate of the number of pregnant women (i.e., number of pregnant women = total population x 0.035 [WHO, 1999a, 1999b]).

When the indicator is calculated from population-based surveys, the numerator is defined as the number of women who were given or who purchased malaria medication during their most recent pregnancy, and the denominator as the number of women who had a recent live birth. The time-periods for the most recent pregnancy/live birth should be specified for both the numerator and denominator. In most surveys, this period is normally restricted to three to five years before the survey.

In the year 2000, the African Summit on Roll Back Malaria adopted the Abuja Declaration, which established a goal that, by 2005, at least 60% of pregnant women at risk of malaria, especially those in their first pregnancies, should receive IPT. The key goal of the RBM partnership is to halve malaria-associated mortality by 2010 and again by 2015. Target 8 of the MDGs is to have halted by 2015 and begun to reverse the incidence of malaria and other major diseases. Programs/countries should be evaluated against these benchmarks (WHO and UNICEF, 2005).

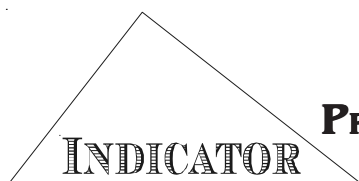
Strengths and Limitations

Some large household surveys, such as the DHS, routinely collect data for this indicator. In addition some health facility surveys that conduct record reviews, direct observation of ANC consultations, or exit interviews with ANC clients yield this information for client populations. The questions asked in most population-based surveys assume that women are able to report on malaria treatment reliably, but few validation studies have tested this assumption. Population-based studies also rely on self-reported data, which are subject to recall bias that is likely to increase with the length of the recall period.

One major limitation of this indicator is that current data collection approaches lack information on the completeness of the drug regimen taken during pregnancy. In addition to determining the type of malaria medication taken, information on the frequency and timing of drug administration is required to determine whether pregnant women are adequately protected against malaria. Information on the frequency and timing of drugs administered could theoretically be obtained if clinics maintain records on the numbers of patients attending and on the number of women given a first and second course of IPT or the number of packets of medicine disbursed.

Facility records measure the proportion of women given or prescribed malaria medication but do not reflect the proportion of women who took the medication. Compliance with the treatment will rarely be 100% and will vary depending on many different local factors. Where malaria is sporadic or seasonal, programs focus on screening women that present with symptoms and on treating those who are infected. Alternative indicators in this case include:

- Number of pregnant women presenting with malarial symptoms; and
- Percent of pregnant women treated for malaria according to locally established protocols.



PROPORTION OF PREGNANT WOMEN WHO KNOW TWO OR MORE NEWBORN DANGER SIGNS

Definition

Proportion of pregnant women who know two or more newborn danger signs.

Numerator: Number of pregnant women who know two or more newborn danger signs.

Denominator: Total number of pregnant women surveyed.

“*Know*” refers to the ability to spontaneously name the warning/danger signs of newborn complications.

Proposed “*danger signs*” include:

- Breathing difficulty, irregular or fast (> 60 breaths per minute)
- Feeding poorly (less than half of usual consumption)
- Jaundice, pallor, bleeding
- Convulsion, spasm, jitters
- Fever temperature greater than 38°C or low temperature less than 36°C
- Vomiting green, no stool in 24 hours of life, swollen abdomen

(Lawn, McCarthy, and Ross, 2001)

Measurement Tools

Health facility survey (exit interviews); population-based survey

What It Measures

The purpose of this indicator is to assess mothers’ knowledge and awareness of newborn danger signs and when to seek health care. Because most babies are born at home or are discharged from the hospital in the first 24 hours, increasing awareness

of the danger signs of newborn complications is of critical importance for improving newborn survival. In many developing countries, more babies die in the first week of life than any other time in childhood, and those who become ill shortly after birth may deteriorate and die rapidly. The warning signs of newborn illness may not be recognized, because they are often much less pronounced than those in an older child or adult. Nevertheless, mothers and families need to know about danger signs of newborn illness, where to go for treatment, and the reason for responding quickly to these danger signs.

How to Measure It

This indicator is derived from correct answers given spontaneously to knowledge questions asked during a health facility exit interview or a population-based survey. The signs and symptoms caretakers in different settings can consistently recognize should be given careful thought in each cultural context.

All pregnant women who were surveyed are included in the denominator, regardless of whether they know newborn warning/danger signs. Because the indicator is defined to reflect knowledge of a precise number of danger signs of newborns, individuals reporting fewer than two danger signs are not counted in the numerator.

When calculating this indicator from a population-based survey, the indicator is defined as the proportion of mothers who know two or more newborn danger signs and may be restricted to women who have had a recent live birth (for example, the proportion of mothers with a child under one year who know two or more newborn danger signs). The denominator is the total number of mothers surveyed. The time-period for the most recent live birth should be specified

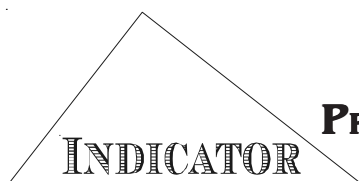
for both the numerator and denominator. In most surveys, this period is normally restricted to three to five years before the survey. If the sample size is sufficiently large, the indicator may be restricted to women who gave birth in the year preceding the survey.

Strengths and Limitations

This indicator is simple to measure at the population level. Disaggregation of the indicator by knowledge of individual danger signs, residence, or age group may provide useful information about gaps in knowledge.

A major limitation of this indicator is that little consensus exists on which signs and symptoms the public can use to improve the early diagnosis of serious illness at home. Algorithms shown to be sensitive and specific in clinical settings are too complex for use in the general population. Simpler measures are less specific and could lead to larger numbers of newborns receiving unnecessary treatment. However, having some healthy babies over-treated is preferable to having some sick babies under-treated and dying as a result.

Programs aimed at raising community awareness of neonatal illness should carry out formative research to determine what signs of illnesses are already recognized in the community and how to adapt general recommendations to a specific setting. More research is required to reach consensus on which signs and symptoms caretakers in different settings can consistently recognize.



PROPORTION OF DELIVERIES OCCURRING IN A HEALTH FACILITY

Definition

Proportion of deliveries occurring in a health facility.

Numerator: Number of deliveries occurring in a health facility in a specified period.

Denominator: Total number of live births in the same period.

Measurement Tools

Routine health service data; population-based survey (DHS, KPC, MICS)

What It Measures

The main purpose of this indicator is to provide information about coverage of institutional deliveries. Institutional delivery, especially at the time of obstetrical emergency, and skilled attendant at birth are associated with reduced maternal mortality (Koblinsky et al., 1999). Institutional deliveries have also been found to have strong beneficial effects on infant survival probabilities (Panis, 1994).

How to Measure It

When calculating this indicator from routine service statistics, the numerator is the number of pregnant women delivering at a facility in a specified period and the denominator is the estimated total number of births in the same period. The estimated number of births is a proxy for the numbers of women who need delivery care for a specific geographic area. Evaluators should count all births but usually only use live births in calculating this indicator because of the difficulty in obtaining information about non-live births (Graham and Fillippi, 1994)

Where data on the number of live births are unavailable, evaluators can calculate total estimated live births using census data for the total population and crude birth rate in a specified area.

$$\text{Total expected births} = \text{population} \times \text{crude birth rate}$$

In settings where the crude birth rate is unknown, WHO recommends using 3.5% of the total population as an estimate of the number of pregnant women (i.e., number of live births or pregnant women = total population \times 0.035 [WHO, 1999a, 1999b]).

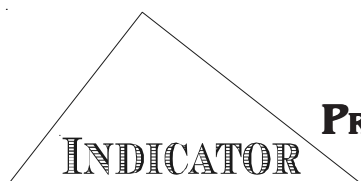
When data are derived from a population-based survey, the indicator is defined as the proportion of live births delivered in a health facility in a specified period and is based on mothers' reports of the place of delivery.

Strengths and Limitations

Measurement of this indicator from a population-based survey is straightforward. Annual monitoring is only possible if data come from routine sources. For international comparisons, a reference period of three to five years is probably sufficient. Frequent surveys are generally undesirable because the survey periods may overlap, and sampling error may make it difficult to assess whether small changes are real or due to chance variation.

If the indicator uses a birth-based analysis, that is counting all births in the survey period, it will over-represent women with multiple births in the survey period. Women with more than one birth are also more likely to have other risk factors, such as high parity and lower rates of health services use. Therefore, institutional delivery coverage may be under-estimated although the degree of underestimation is likely to be small.

When the indicator is calculated from routine service statistics, the numerator may include women not included in the denominator (i.e., those who attended two or more ANC visits but whose pregnancy did not result in a live birth). Routine service-based data may also suffer from incomplete records. Information from civil registration systems and population censuses can be used to estimate the denominators, but potential problems could arise if reporting is incomplete. Since the denominator for this calculation includes only women with live births and excludes women with fetal deaths and stillbirths, the only valid association will be neonatal mortality and not with perinatal mortality. It is to be noted that this indicator only measures institutional delivery coverage and does not provide any indication about the quality of care.



PROPORTION OF DELIVERIES WITH A SKILLED ATTENDANT AT BIRTH

Definition

Proportion of deliveries with a skilled attendant at birth.

Numerator: Number of deliveries with a skilled attendant at birth during a specified period.

Denominator: Total number of live births during the same period.

Skilled attendants are individuals with “midwifery skills (i.e., doctors, midwives, nurses) who have been trained to proficiency in the skills necessary to manage normal deliveries, diagnose, and manage or refer complicated cases” (WHO, 1999). Trained traditional birth attendants are not included in the definition of skilled attendant.

Measurement Tools

Routine health services data; population-based survey

What It Measures

This indicator measures the extent of women’s use of delivery care services. Many argue that increasing the proportion of deliveries with a skilled attendant is the single most critical intervention for reducing maternal mortality and increasing newborn survival (WHO, 1999b).

How to Measure It

The data requirements are: (1) the number of births attended by skilled health personnel in a defined time period; and (2) the number of live births in the same geographic area and reference period.

The number of live births is a proxy for the numbers of women who need delivery care. Ideally, all births should be counted when

calculating this indicator. However, due to the difficulty in obtaining information about non-live births, the usual practice is to only use live births (Graham and Fillippi, 1994).

Where data on the number of live births are unavailable, rough approximations can be made using census data for the total population and crude birth rates in a specified area as follows:

$$\text{Total expected births} = \text{population} \times \text{crude birth rate}$$

In settings where the crude birth rate is unknown, WHO recommends using 3.5% of the total population as an estimate of the number of pregnant women (i.e., number of live births or pregnant women = total population \times 0.035 [WHO 1999a, 1999b]).

When data are derived from a population-based survey, the indicator is defined as the proportion of births attended by trained medical personnel in a specified period. This is because survey respondents cannot assess skills.

Strengths and Limitations

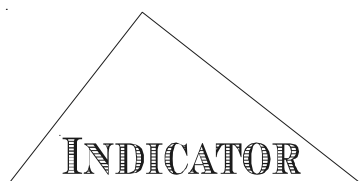
Annual monitoring is feasible when data are derived from routine data sources. For international comparisons, periods of three to five years are probably sufficient. Frequent surveys are generally undesirable because the survey periods may overlap, and sampling error makes it difficult to assess whether small changes are real or due to chance.

Differences in what definitions are used and in how skilled attendants are reported may lead to discrepancies between countries. Most surveys such as the DHS rely on women’s self-report, but how women interpret the question on “who assisted with delivery?” and whether they

accurately identify the health staff attending the delivery is unknown. Even if rates of skilled attendant deliveries are similar across countries, major differences are likely to exist in how providers are trained, in what providers are allowed to practice and do practice, and in what resources, equipment and supplies are at their disposal.

As this indicator uses a birth-based analysis, the sample will over-represent women with multiple births in the survey period. Women with more than one birth are also more likely to have risk factors, such as high parity and lower rates of health services use. Delivery coverage may therefore be underestimated, although this underestimate is likely to be small. Furthermore, the strong correlation between skilled attendant and institutional delivery makes assessing the impact of skilled attendant alone difficult to determine.

Evaluators can disaggregate skilled attendant at delivery by place of delivery to further document the degree of care received at the time of delivery. This measure of care or “skilled attendance” will vary by setting and attendant. A skilled attendant conducting a delivery in hospital, for example provides a higher level of “skilled attendance” than does a skilled attendant conducting a delivery at home.



MATERNAL MORTALITY RATIO (MMR)

Definition

The number of maternal deaths per 100,000 live births.

Numerator: All maternal deaths occurring within a reference period (usually one year).

Denominator: Total number of live births occurring within the reference period.

A “*maternal death*” (as cited in International Classification of Disease [ICD]-10 [WHO, 1992]) is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy. Death can stem from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. Maternal deaths fall into two groups, direct and indirect, as follows:

“*Direct obstetric deaths*” result from obstetric complications of the pregnant state (pregnancy, labor, and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.

“*Indirect obstetric deaths*” result from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but was aggravated by physiologic effects of pregnancy.

Measurement Tools

Vital registration; service statistics; population-based surveys; surveillance

What It Measures

Maternal mortality is widely acknowledged as a general indicator of the overall health of a

population, the status of women in society, and the functioning of the health system. High maternal mortality ratios are thus markers of problems of health status, gender inequalities, and health service delivery in a country. The maternal mortality ratio measures obstetric risk (i.e., the risk of dying once a woman is pregnant), but omits the risk of being pregnant (i.e., fertility in a population, the effect of which is reflected in the lifetime risk) (Graham and Airey, 1987). It is useful for advocacy purposes, but lacks information on the causes of high maternal mortality or the interventions required to reduce maternal deaths.

How to Measure It

Population-based surveys are the primary source of information for calculating the maternal mortality ratio in many developing countries. These types of surveys include the following:

- **Reproductive Age Mortality Surveys (RAMOS)** seek to identify all female deaths in a reproductive period, using a combination of approaches, such as cross-sectional household surveys, continuous population surveillance, hospital and health center records, and key informants (WHO, 1987).
- **Direct estimation**, which relies on asking questions about maternal deaths in a household during a recent interval of time, say one to two years. These questions can be asked in the context of a household survey or a census of all households, although as yet experience with the latter is fairly limited (Campbell, 1999).
- **The sisterhood method** goes some way to overcoming large sample size requirements by interviewing adult respondents about the survival of all their sisters. The indirect

method (Graham, Brass, and Snow, 1989) involves fewer questions to respondents but provides a pooled estimate that relates statistically to a point around 10–12 years prior to the survey. The direct method (Stanton, Abderrahim, and Hill, 2000) provides a more current estimate at about three to four years prior to the survey, but requires more questions and is more costly and time consuming.

The data sources and collection methods described above have very different strengths and weaknesses and yield estimates of varying reliability. For this reason, surveys to estimate maternal mortality should occur no more frequently than every five to ten years. When interpreting maternal mortality ratios, researchers must take into account the confidence intervals. Because of the imprecision in these estimates, modeling methods have also been developed (WHO, UNICEF, and UNFPA, 2001; AbouZahr and Wardlaw, 2001; UNFPA, 1998). This indicator is directly relevant to Goal 5 of the MDGs, which is to improve maternal health. Target 6 set by the MDGs is to reduce the maternal mortality ratio by three-quarters between 1990 and 2015.

Strengths and Limitations

Maternal deaths are difficult to investigate because of their comparative rarity on a population basis, as well other context-specific factors, such as reluctance to report abortion-related deaths, problem of memory recall, or lack of medical attribution (Campbell and Graham, 1991). Thus, no single source or data collection method is adequate for investigating all aspects of maternal mortality in all settings.

Few developing countries have vital registration systems that are sufficiently complete to provide reliable population estimates (AbouZahr, 1998). The main drawback of health services data in developing countries relates to the selectivity bias. Estimating the denominators for health-services-based maternal mortality rates may be challenging.

Without detailed knowledge of the catchment population, it is hard to gauge whether the maternal mortality ratio underestimates or overestimates the level for the general population. Other problems related to using health facility statistics include inaccuracies in routine registers and misclassification of deaths occurring outside maternity wards. Population-based surveys can provide up-to-date estimates but are time-consuming and costly because they require large sample sizes to obtain single-point estimates with sufficiently narrow confidence intervals to enable monitoring of trends. For further discussion of the limitations of various data sources in both the developing and developed world, see AbouZahr (1999); Berg, Danel, and Mora (1996); and Campbell and Graham (1990).

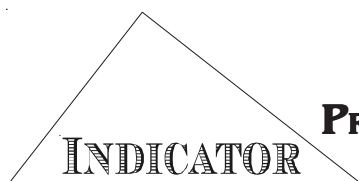
Due to the limitations inherent in most measurement methods, maternal mortality ratios are only a broad indication of the level of maternal mortality, rather than a precise measure. The use of confidence intervals around the estimates helps raise awareness that a point estimate is usually too imprecise to be used to monitor trends (Abou Zahr and Wardlaw, 2001). In addition, distinguishing between real and artificial changes in the maternal mortality ratio is complicated because observed differences do not necessarily indicate improved maternal health status (Graham, Fillipi, and Ronsman, 1996). Other important issues to consider include:

- Non-sampling errors such as changes in the accuracy of reporting or of classification over time or between districts or populations (Stanton, Abserrahim, and Hill 2000);
- Changes in the definition of a maternal death between ICD-9 and ICD-10 (WHO, 1992, 1997). Presentation of the maternal mortality ratio should thus clearly state which version is used. In the case of ICD-10, one must specify which of the three categories (direct and indirect maternal deaths up to 42 days

postpartum, late maternal deaths, pregnancy-related deaths)* are included in the numerator;

- Aggregate levels may hide wide differentials between population subgroups;
- Apparent differences in the maternal mortality ratio between rural and urban areas may simply reflect differences in the pattern (not level) of fertility, with more rural women who are grand multiparous and for whom the risk of death will likely be higher. Other possible confounders include general health status, such as levels of anemia or malaria, and socioeconomic factors.

* Late maternal deaths: direct or indirect obstetric causes more than 42 days but less than one year after termination of pregnancy. Pregnancy-related deaths: deaths while pregnant or within 42 days of the termination of pregnancy, irrespective of the cause.



PROPORTION OF NEWBORNS WHO RECEIVE THERMAL PROTECTION IMMEDIATELY AFTER BIRTH

Definition

Proportion of newborns who receive thermal protection immediately after birth in a specified period.

Numerator: Number of newborns receiving thermal protection immediately after birth in a specified period.

Denominator: Total number of live births in the same period.

Measurement Tools

Population-based surveys; facility surveys; community health provider observations

What It Measures

This indicator measures the prevalence of thermal protection of the newborn. In its current form, this indicator is applicable in settings where most deliveries occur at home. Thus, the indicator is a measure of the quality of performance of birth attendants.

Thermal protection is important for full-term newborns, but is critical for pre-term and low birth weight newborns because of increased risk of illness and death. A newborn is most sensitive to hypothermia during the first 6–12 hours after birth. Hypothermia occurs when the body temperature of the newborn drops below its normal temperature (36.5°C). Hypothermia can occur if a newborn is left wet and unprotected from cold while waiting for the placenta to be delivered. If babies are not protected immediately after birth, hypothermia can occur even in a moderate or warm environmental temperature. As the body temperature decreases, the baby becomes lethargic/weak, less active, hypotonic, and unable to suck. If the condition progresses, the infant may develop serious conditions like impaired

cardiac function, hemorrhage (especially pulmonary), jaundice, and eventually die.

The principle ways of providing newborns with thermal protection include delivery of the baby in a warm room, drying the baby thoroughly after birth, wrapping it in a dry warm cloth while keeping it out of draughts on a warm surface, and giving it to the mother as soon as possible, or by wrapping the baby in the Kangaroo care position with skin-to-skin contact with the mother. When separated from the mother, a newborn baby needs to be well protected from cold and/or heat. The most efficient way of protecting babies is to use clothes or wrap the baby in loose layers of light but warm material. If the baby is tightly wrapped with clothes, there is little air trapped between the body, and the cloth itself does not provide sufficient insulation.

How to Measure It

This indicator needs to be measured in a defined geographical area and period. In population-based surveys, the following information needs to be collected for the numerator: the number of newborns (a) who were dried and wrapped with a warm cloth, blanket, or placed in Kangaroo care, immediately after birth instead of letting them rest on the floor until the cord was cut, or placenta delivered; (b) who were not bathed at least for six hours after birth; and (c) whose heads were covered. In a population-based survey, these data are collected from women who had live births in a given reference period. All three criteria ought to be met for a newborn to be considered as having received thermal protection. The denominator is the number of live births occurring in the same reference period.

Data for calculating this indicator can also be collected through direct observation of providers in facilities. Where national policy on thermal protection of newborns exists, this should be used as

a standard against which to assess the practices of health care providers. If a written policy on the “warm chain” does not exist, the guidelines in Table 3.4 should be used to assess the practices of providers at the health facility level.

Strengths and Limitations

This indicator is difficult to measure and its measurement in surveys is exploratory. One major problem is that surveys rely on recall of the events at the time of delivery. As a result, this indicator is subject to recall bias, which is likely to increase with the length of the recall period. Recall bias can be minimized by keeping the reference period short. This would require a bigger geographic area from which to identify mothers who gave birth more recently.

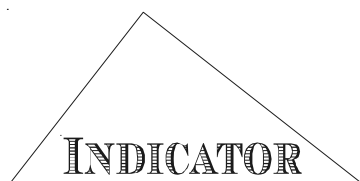
Since this is a self-reported indicator, there is also a possibility that mothers would report the recommended behavior rather than actual practice.

For example, in a community where the practice of bathing the newborn is prevalent and programs aimed at raising awareness regarding newborn care exist, mothers may be aware of the correct practice, but traditional norms may prevent them from adopting the behavior. One way to avoid this bias is through direct observation.

In settings where births are attended by community health workers or trained birth attendants, this indicator can be measured by directly observing the health worker. In that case, the indicator would measure the quality of health worker performance. Although better than self-reports, direct observation is not likely to be feasible in community settings. Direct observation of health workers may only be possible in health facilities that attend to a large number of births.

Table 3.4. Essential newborn care intervention sub-package

PACKAGE COMPONENT-WARM CHAIN	
At delivery	
◆	Ensure the delivery room is warm (25° to 35° C), with no drafts.
◆	Deliver the baby on a clean surface.
◆	Dry the baby immediately.
◆	Wrap the baby with clean dry cloth.
◆	Keep the baby close to the mother (ideally skin-to-skin) to stimulate early breastfeeding.
◆	Postpone bathing for 6 hours.*
After delivery	
◆	Keep the baby clothed, wrapped with the head covered.
◆	Minimize bathing, especially in cool weather or for small babies.
◆	Keep the baby close to the mother.
◆	Use kangaroo care for stable LBW babies or for rewarming stable bigger babies.
◆	Show the family how to avoid hypothermia, how to recognize it, and how to rewarm a cold baby. The family should aim to ensure that the baby's feet are warm.
* In high HIV prevalence areas, early bathing may be a strategy to prevent MTCT/HIV.	
Source: Lawn, McCarthy, and Ross (2001).	



TIMELY INITIATION OF BREASTFEEDING

Definition

Proportion of infants less than 12 months of age who were put to the breast within one hour of delivery (WHO, 1991).

Numerator: Number of infants less than 12 months of age who were put to the breast within one hour of delivery.

Denominator: Total number of infants less than 12 months of age.

Measurement Tools

Population-based surveys employing representative samples (e.g., DHS, MICS, KPC). Facility-based records may also be used to track trends in breastfeeding initiation among clients but not to measure the impact of interventions on women with infants in the population of the catchment area.

What It Measures

This indicator measures whether mothers in the population and/or in health facilities initiate early breastfeeding with its respective benefits to both mother (reduced postpartum haemorrhage) and infant (skin-to-skin contact and exposure to maternal antibodies in colostrum). Mothers are more likely to successfully initiate lactation, to encounter fewer problems breastfeeding, and to maintain optimal breastfeeding behaviors if they initiate breastfeeding shortly after birth. Breastfeeding should begin no later than one hour after the delivery of the infant.

How to Measure It

The data requirements for calculating this indicator from population-based data are the following: the number of infants less than 12 months of age in the population and the number of infants less than 12 months of age reported to

have been put to the breast within one hour of birth.

When facility data are used to calculate this indicator, the data requirements are the number of infants discharged from the facility during the reference period and the number of infants discharged who were put to the breast within one hour of birth during the same reference period. It is important to note that the two indicators (population-level and program-level) are not comparable.

Strengths and Limitations

In population-based surveys, mothers may have difficulty recalling correctly when they initiated breastfeeding for their youngest children and whether this was within one hour of delivery. This indicator may also mask changes in population or health facility practices that have occurred within one year. The facility-based indicator does not have as much recall bias, but facility-based rates cannot be used to determine population level trends in many settings because the data only reflect breastfeeding initiation by women who gave birth in facilities.

Sample Questions

- o Did you ever breastfeed [NAME]?
- o How long after birth did you first put [NAME] to the breast?



INDICATOR

EXCLUSIVE BREASTFEEDING RATE (EBR)

Definition

Proportion of infants aged less than 0-5 months who were exclusively breastfed in the last 24 hours.

Numerator: Number of infants aged 0-5 months (less than 180 days) who were exclusively breastfed in the last 24 hours.

Denominator: Total number of infants aged 0-5 months (less than 180 days) surveyed.

Exclusive breastfeeding is the practice of only giving breast milk to the infant, with no other solids or liquids, including water. Infants are allowed, however, to have drops of vitamins/minerals/medicines (WHO, 1991).

Measurement Tools

Population-based surveys employing representative samples (e.g., the DHS, KPC) and program records of exclusive breastfeeding rate (to track trends but not impact)

What It Measures

This indicator gives an overall measure of the degree to which women have adopted behaviors consistent with the recommendation that infants aged 0-5 months should be exclusively breastfed.* Relative to infants who are exclusively breastfed, those who are not breastfed at all have at least 14 times the risk of death due to diarrhea. The risk is greatest in the first two months of life (Murray et al., 1997). Even the introduction of herbal teas and water to infants who have been exclusively breastfed increases the risks of diarrheal morbidity and death. UNICEF and WHO recommend that all women breastfeed their children exclusively for the first 6 months.

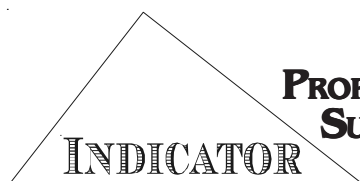
How to Measure It

The data requirements are the number of living infants under six months of age and a 24 hour recall of all liquids and solid food consumed by living infants less than six months of age. Respondents should be probed about the different types of liquids the infant may have received, including water, juice, milk, formula, and other liquids. The DHS country reports and Nutrition Reports both present the exclusive breastfeeding rate (EBR) for infants less than four months of age. However, programs can calculate the EBR for infants less than six months of age using DHS data.

Strengths and Limitations

This indicator should be interpreted as the percentage of infants who “are currently being exclusively breastfed,” rather than the percent that have been exclusively breastfed since birth. The use of a 24-hour recall period causes the indicator to slightly overestimate the percent of exclusively breastfed infants because some infants who are given other liquids irregularly may not have received them in the 24 hours before the survey. WHO’s *Indicators for Assessing Breast-Feeding Practices*, Wellstart International’s *Tool Kit for Monitoring and Evaluating Breastfeeding Practices and Programs* and the DHS reports all calculate EBR using the 24-hour recall method.

*The 2001 UN policy statement on HIV and infant feeding is as follows: “When replacement feeding is acceptable, feasible, affordable, sustainable, and safe, avoidance of all breastfeeding by HIV-infected mothers is recommended. Otherwise, exclusive breastfeeding is recommended during the first months of life. To minimize HIV transmission risk, breastfeeding should be discontinued as soon as feasible, taking into account local circumstances, the individual woman’s situation, and the risks of replacement feeding (including infections other than HIV and malnutrition). When HIV-infected mothers choose not to breastfeed from birth or stop breastfeeding later, they should be provided with specific guidance and support for at least the first two years of the child’s life to ensure adequate replacement feeding. Programmes should strive to improve conditions that will make replacement feeding safer for HIV-infected mothers and families” (WHO, 2001).



PROPORTION OF WOMEN WHO RECEIVE TWO HIGH-DOSE SUPPLEMENTS OF VITAMIN A WITHIN SIX WEEKS OF GIVING BIRTH

Definition

Proportion of women (both breastfeeding and non-breastfeeding) who receive two high-dose supplements (200,000 IU per dose) of vitamin A within six weeks of giving birth.

Numerator: Number of women (both breastfeeding and non-breastfeeding) who receive two high-dose supplements (200,000 IU per dose) of vitamin A within six weeks of giving birth.

Denominator: Total number of women who deliver within a given reference period.

Measurement Tools

Program statistics (usual source); population-based surveys, such as MICS, DHS, KPC

What It Measures

This indicator is a measure of extent of protection of the newborn against vitamin A deficiency (VAD). During lactation, maternal vitamin A requirements rise to replace the vitamin A lost daily in breast milk and to maintain the needs of the rapidly growing infants during at least the first 6 months of life. Vitamin A supplementation during lactation raises (and maintains) the concentration of vitamin A in the breast milk of women with VAD. Currently, WHO estimates that among children under 5 years of age, around 3 million have ocular signs of VAD, and 140 million have inadequate vitamin A status and are at increased risk of morbidity and mortality (WHO, 2000).

Different expert groups differ on the criteria for the “safe” infertile period after delivery during which a relatively high dose of vitamin A supplement may be given. The 1998 International

Vitamin A Consultative Group (IVACG) statement on Safe Doses of Vitamin A during Pregnancy and Lactation recommends that, in hyperendemic vitamin A-deficiency areas, breastfeeding mothers receive 200,000 IU vitamin A within eight weeks of delivery – provided the woman is not pregnant (IVACG, 1998). Non-breastfeeding women can be safely supplemented within six weeks of delivery. This level of supplementation will raise and maintain the vitamin A content of breast milk and will offset the depleting effect lactation may have on the mother’s own vitamin A stores (ACC/SCN, 1994).

To avoid confusion among health personnel about the “safe infertile period,” the Pan American Health Organization (PAHO) currently advises that all mothers take two doses of supplement (200,000 IU per dose and at least 24 hours between doses) within six weeks postpartum (PAHO, 2001). This recommendation is also advised by UNICEF.

How to Measure It

This indicator is usually calculated from service statistics, but can also be obtained for the general population from population-based surveys. The data requirements for calculating this indicator are the total number of births during a given reference period and the number of women receiving two high-dose vitamin A supplements within six weeks of delivery. Findings should be disaggregated by mother’s lactational status, and by urban/rural residence or socioeconomic level, if sample size permits.

Strengths and Limitations

One potential problem with the calculation of this indicator is that women may deliver at a different place from the one where they receive the supplementation. If the indicator is based on an

overall figure for a district, it is generally more accurate than if it is based on data for specific clinics. Similarly, it is essential to specify whether this indicator measures supplements distributed through outreach workers to mothers delivering at home or only those given at service delivery points.

Evaluators can adapt this indicator so that it refers to all women, not just to those in the postpartum period, to evaluate interventions aimed at all women through programs such as “Healthy Days” or “National Immunization Days” (Bertrand and Escudero, 2000).

An alternative indicator reflecting the adequacy of the program in meeting the needs of specific clients is the number of capsules distributed per eligible client.



INDICATOR

PRETERM BIRTH RATE (PBR)

Definition

Percentage of infants born alive before 37 completed weeks of gestation per 100 live births in a given period.

Numerator: Number of infants born alive before 37 completed weeks of gestation in a given period.

Denominator: Total number of live births in the same period.

“Preterm birth:” A preterm birth is defined as a live birth before 37 completed weeks of gestation.

“Live birth:” A “live birth” is described by the United Nations (2001) as “the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.”

“Gestational age:” is the number of completed weeks since the last menstrual period of the mother; a “full-term” baby is a baby born between 39 and 42 completed weeks of gestation.

Measurement Tools

Population-based surveys; vital registration; service statistics; routine HIS

What It Measures

This indicator is a measure of pregnancy outcome. Preterm birth has been identified as one of the most important causes of neonatal mortality

worldwide. Preterm birth accounted for about 24% of neonatal deaths globally in 1999, an estimated 960,000 deaths per year (Save the Children, 2001), and is an important determinant of neonatal morbidity, including neuro-developmental handicaps, chronic respiratory problems, and infections. Pre-term babies may also find it difficult to breastfeed because the sucking reflex may not be present at birth and the stomach not sufficiently developed to accept milk immediately.

The lower the gestational age at delivery, the greater is the chance of death or handicaps. A moderately pre-term baby (32–37 weeks of gestation) has a 6–20 times higher mortality rate than a full-term baby (Kramer, 1987). A severely preterm baby (less than 32 weeks gestation) has up to a 100 percent chance of dying, depending on gestation and the care available. To reduce mortality in this group of babies, high-tech care is required. Mild and moderate preterm birth (32–37 weeks of gestation) is much more common and accounts for a more significant number of preventable neonatal deaths than severely preterm babies (Kramer et al., 2000).

How to Measure It

To calculate this indicator, two pieces of information are needed: the number of preterm births in a given population and reference period and the total number of live births in the same population and reference period. The reference period is usually one year but it could also be five years.

The preterm birth rate can be calculated at the facility level to monitor the outcome of delivery in health facilities using data collected by routine HIS or through record reviews (birth registers or delivery room logs). Reliable estimates for

individual facilities can only be obtained if there are large numbers of deliveries. Facility data are not recommended for estimating the preterm birth rate for the general population. Because a large proportion of births occur at home in developing countries, facility-based data may be subject to selection bias.

The pre-term birth rate can also be measured through a population-based survey. However, the data may not be reliable as a valid assessment of gestational age is often not available. Where data on the number of live births are unavailable, evaluators can estimate the total number of live births using census data for the total population and crude birth rates in a specified area as follows:

$$\text{Total expected births} = \text{population} \times \text{crude birth rate}$$

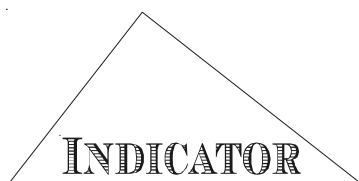
In settings where the crude birth rate is unknown, WHO recommends using 3.5% of the total population as an estimate of the number of pregnant women (i.e., number of live births or pregnant women = total population \times 0.035 [WHO, 1999a, 1999b]).

The preterm birth rate is usually calculated at the national level. Sub-national estimates can also be calculated if sample sizes are sufficiently large.

Strengths and Limitations

This indicator is important for measuring progress toward the prevention of preterm birth, which is a crucial strategy for improving pregnancy outcome. However, obtaining reliable estimates of gestational age in the general population is difficult. Gestational age is subject to considerable error due to recall, post-conception bleeding, irregular or long/short menstrual cycles, delayed ovulation, and unrecognized fetal loss. In developing countries, few babies are assessed for gestational age. Antenatal ultrasound is the “gold standard” for assessing gestational age, but is unavailable for most women.

Length of gestation is usually based on the first day of the mother’s last menstrual period. Relying on the date of the woman’s last menstrual period to calculate gestational age is feasible if these data are known and if the woman has a regular menstrual cycle close to 28 days. Where women often breastfeed until their next pregnancy, the last menstrual period may be unknown or the woman’s menstrual cycle may be irregular, which may make this method unreliable (Lawn et al., 2000). It may also be difficult to explain changes in the preterm birth rate as trends may reflect changes in the frequency of multiple pregnancies, obstetric intervention, increased proportion of deliveries attended by a skilled birth attendant, increased access to and use of EmOC, and changes in the number of deaths and increased registration/reporting of preterm babies. In addition, the availability of consistent international comparisons of preterm birth rates is limited.



PROPORTION OF LIVE BIRTHS WITH LOW BIRTH WEIGHT

Definition

Proportion of live births with low birth weight in a specified period (e.g., 12 months).

Numerator: Number of births weighing < 2500 grams (g) in a specified period.

Denominator: Total number of live births in the same period.

Low birth weight (LBW) is defined as a body weight at birth of less than 2500g.

Measurement Tools

Population-based surveys; health services data; routine HIS

What It Measures

This indicator measures one of the major objectives of safe pregnancy/neonatal interventions: to prevent low birth weight. LBW is also a proxy indicator to quantify the magnitude of intrauterine growth retardation (IUGR) in developing countries because valid assessment of gestational age is generally not available. IUGR is a condition in which fetal growth has been impaired. In developing countries, maternal under-nutrition and maternal ill health, including malaria, anemia, and acute and chronic infections (e.g., sexually-transmitted infections [STIs]), are major causes.

Low birth weight is the single most important predictor of newborn well-being and survival. Low-birth-weight babies are ten times more likely to die than babies weighing over 3kg. They are also more likely to have impaired cognitive development and to develop acute illnesses such as diarrhea and pneumonia in early infancy (ACC/SCN, 2000). Because maternal under nutrition is a major determinant of LBW, high rates of LBW

should be interpreted not only as an indicator of newborn under-nutrition, morbidity, and mortality, but also as an indicator of maternal well-being. One of the goals of the World Summit for Children is to reduce the incidence of low birth weight to less than ten percent (ACC/SCN, 2000).

How to Measure It

The data requirements are: (1) number of newborns with a birth weight less than 2,500g in a defined time period (e.g. 12 months); and (2) number of live births in the same time period. The denominator is the number of live births occurring in the same reference period. Where data on the number of live births are unavailable, evaluators can estimate the total number of live births using census data for the total population and crude birth rates in a specified area as follows:

$$\text{Total expected births} = \text{population} \times \text{crude birth rate}$$

In settings where the crude birth rate is unknown, WHO recommends using 3.5% of the total population as an estimate of the number of pregnant women (i.e., number of live births = total population x 0.035 [WHO, 1999a, 1999b]).

Since low birth weight is due to many complex factors, changes in low-birth-weight incidence occur slowly. Estimates every five years are probably reasonable and consistent with the schedules of many large surveys (e.g., the DHS). Evaluators must recognize that this indicator will be slow to change, even with well-executed interventions.

Strengths and Limitations

Several points pertain to LBW. First, aggregate figures of low-birth-weight incidence may hide important differentials between high-risk subgroups. Second, heaping of birth weight recording

in multiples of 500g is common and affects the incidence of low birth weight. Heaping is particularly a problem with survey data but also affects facility data to some degree.* Third, survey data rely on women's report of their infants' birth weight and are subject to recall bias. Validation studies from the United States suggest that mothers are able to recall their baby's weight accurately, but we are not aware of similar large-scale studies conducted in developing countries.

Obtaining reliable estimates of low birth weight in the general population is difficult. In many developing countries, the majority of births occur at home and babies are not weighed; thus, the data that are available come from a relatively small proportion of facility births. Many household surveys collect data on birth weight, but since the weights reported are mainly from facility births, these data are also subject to selection bias. Some household surveys (such as the DHS) ask mothers to state whether their baby was smaller than average or very small; and at an aggregate level these data may be used to estimate incidence of low birth weight at a national level. Regional estimates are also possible if the sample size is sufficiently large (Boerma et al., 1996).

* Heaping occurs when respondents do not know the exact weight. Estimated weights are often reported on certain preferred weights, such as multiples of 100 or 500 grams.



INDICATOR

LATE FETAL DEATH RATE (LFDR)

Definition

Number of late fetal deaths per 1,000 births (live births plus late fetal deaths) in a given period.

Numerator: Number of babies born dead after 28 weeks of gestation (or birth weight over 1kg) in a given period.

Denominator: Total number of births (live births plus fetal deaths) in the same period.

A “*late fetal death*” is defined as death of a fetus after 28 weeks of gestation.

The WHO definition of a “*fetal death*,” also adopted by the United Nations and the National Center for Health Statistics (NCHS), is death before the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy. The death is indicated by the fact that after such separation, the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definitive movement of voluntary muscles.

A “*live birth*” is described by the United Nations (2001) as “the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.”

The terms stillbirth and fetal death are sometimes used interchangeably.

Measurement Tools

Population-based surveys; vital registration; service statistics; routine HIS

What It Measures

The LFDR reflects directly prenatal and intrapartum care. It is a measurement of quality of maternal health care services. There are an estimated four million late fetal deaths each year. Common causes of late fetal death are preventable maternal STIs such as syphilis, intrapartum birth asphyxia, pre-term birth, birth defects, maternal hypertension, and maternal diabetes.

How to Measure It

This indicator requires two pieces of information for a given population and reference period: the number of live-born babies and the number of fetal deaths from 28 weeks gestation (equivalent to birth weight over 1kg). WHO usually refers to the expected weight at a given gestational age since gestational assessment is often unavailable (WHO, 1992). At the facility level, the numerator can be measured from birth registers or delivery room logs and from case reviews at the health facility (or in the community). Some countries such as Malaysia have nationwide systems for reporting late fetal deaths.

The denominator is the number of live births plus the number of fetal deaths occurring in the same reference period. Where data on the number of live births are unavailable, evaluators can estimate the total number of live births using census data for the total population and crude birth rates in a specified area as follows:

$$\text{Total expected births} = \text{population} \times \text{crude birth rate}$$

In settings where the crude birth rate is unknown, WHO recommends using 3.5% of the total population as an estimate of the number of pregnant women (i.e., number of live births or pregnant women = total population \times 0.035 [WHO, 1999a, 1999b]).

Fetal deaths or stillbirths are under-recorded in many settings. However, they can be estimated by using the ratio of stillbirths to early neonatal deaths, which is usually 1:1. Thus, if the number of deaths during the first week of life is known, the number of late fetal deaths can be estimated as this will be equal to the number of neonatal deaths. In some situations, such as high rates of syphilis infection, there may be more stillbirths than neonatal deaths.

Strengths and Limitations

This indicator suffers from under-reporting and under recording. Health facility-based data significantly underestimate the problem of late fetal deaths because in many settings, many late fetal deaths and live births occur outside the health system, which will cause substantial selection bias. Therefore, facility data are not recommended for estimating the LFDR for the general population.

Both the coverage and quality of data on late fetal deaths are insufficient and unreliable in many developing countries due to sociocultural reasons, health system barriers, and the poor coverage and quality of vital registration systems. Sociocultural barriers to obtaining information on pregnancy and birth outcomes include seclusion of women and newborns at home, misconceptions about the importance of registration and data collection, and acceptance of fetal-neonatal deaths as normal. Barriers within the health system include the lack of motivation for staff to collect necessary data, perceptions of the viability of the baby, and errors in the coding of cause of death. Barriers to registration include issues of accessibility and affordability and lack of awareness of the benefits of registration (Lawn et al., 2001).

Pregnancy histories, now included in many surveys including the DHS, are another source of data for calculating this indicator. However, there has been relatively less experience with pregnancy histories than with birth histories because of concerns about the quality of retrospectively reported pregnancy histories. Common problems with data quality include the omission of late fetal and early neonatal deaths and difficulty in obtaining accurate information on gestational age or birth weight, leading to the misclassification of some stillbirths as late spontaneous abortions.

International comparisons are limited by nonstandard definitions and terminology for late fetal deaths and highly variable application of these definitions. For example, ICD-10 defines late fetal deaths from 22 to 40 weeks gestation. For international comparisons, a birth weight of at least 1000g (or of 28 weeks gestation of more if weight is unavailable) is recommended. Errors or confusion may arise in distinguishing between a live birth and a late fetal death.



INDICATOR

PERINATAL MORTALITY RATE (PMR)

Definition

Number of perinatal deaths per 1000 total births (live births and fetal deaths) in a given period.

Numerator: Sum of fetal deaths and deaths to live-born babies within the first seven completed days (i.e., age 0-6 days) of life in a given period.

Denominator: Total number of births (live births and fetal deaths) in the same period.

A “*perinatal death*” is a fetal death or an early neonatal death.

The WHO definition of a “*fetal death*,” also adopted by the United Nations and the National Center for Health Statistics (NCHS), is death before the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy. The death is indicated by the fact that after such separation, the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definitive movement of voluntary muscles.

A “*fetal death*” is the death of a fetus weighing 500g or more or of 22 weeks gestation or more if weight is unavailable (ICD-10). The terms stillbirth and fetal death are sometimes used interchangeably. A “*late fetal death*” is defined as death of a fetus after 28 weeks of gestation.

An “*early neonatal death*” (END) is the death of a live newborn within the first 7 completed days (i.e., 0-6 days) of life. Note: The day of birth is counted as day 0, so that “within the first 7 completed days” or “within 1 week” includes babies 0-6 days old.

A “*live birth*” is described by the United Nations (2001) as “the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.”

Great variation exists both between and within countries on how the fetal death component of perinatal mortality is recorded, particularly for early fetal deaths that occur at 22 to 27-weeks gestation. For international comparison, WHO (1992) suggests including only deaths of fetuses weighing at least 1000g or of 28-weeks gestation or more if weight is unavailable. Presentations of the PMR should include a clear statement of the definition of perinatal mortality used. In practice, in most developing countries, accurate data on birth weight or gestational age are difficult to obtain.

Measurement Tools

Population-based surveys; vital registration; service statistics; routine HIS

What It Measures

The PMR is a key outcome indicator for newborn care and directly reflects prenatal, intrapartum, and newborn care. It is estimated that perinatal deaths account for approximately 7 percent of the global burden of disease (World Bank, 1993). The early neonatal component of the PMR may respond relatively quickly to programmatic interventions, for example, following the introduction of

elements of the WHO “Essential Newborn Care Package.” The fetal death component may decline more slowly because it depends more on interventions that influence primarily maternal health and on the availability of technologies such as caesarian section.

How to Measure It

This indicator requires three pieces of information: the number of fetal deaths in a given population in a given period (i.e. 12 months); the number of deaths of live-born babies at age 0–6 days in the same population and period; and the number of births (live births plus fetal deaths) in the same population and period.

The PMR obtained from large population-based surveys may be calculated at the sub-national level if sample sizes are sufficiently large.

Strengths and Limitations

Because the PMR includes both fetal deaths and deaths in the first week of life, it avoids the problems of defining a live birth. There are, however, problems with the identification of a fetal death or stillbirth. According to WHO, a fetal death occurs after the twenty-second week of gestation. However, different countries often use slightly different definitions, making international comparisons of the PMR difficult.

In many countries, vital registration data are not sufficiently complete to allow reliable estimation of the PMR. Techniques now exist for collecting data on stillbirths, live births, and early neonatal deaths in population-based surveys through pregnancy histories. These pregnancy histories are now included in many surveys, including the DHS. However, there has been relatively less experience with pregnancy histories than with birth histories because of concerns about the quality of retrospectively reported pregnancy histories.

Data quality is an issue. Common problems with data quality include:

- Omission of stillbirths and early neonatal deaths. It is estimated that perinatal mortality rates are under-reported by at least 40% (WHO and UNICEF, 1996) and by as much as 500% in countries with high death rates (Lumbignon, Panamonta, Laopaiboon, Pothinam, and Patithat, 1990; McCaw-Binns, Fox, Foster-Williams, Ashley, and Irons, 1996).
- Difficulty in obtaining accurate information on gestational age or birth weight leading to the misclassification of stillbirths as late spontaneous abortions.
- Heaping of the reported age at death of live births on 7 days, leading to the misclassification of early neonatal deaths as late neonatal deaths.*

Prospective population-based surveys of pregnant women provide better quality data, but are expensive to undertake.

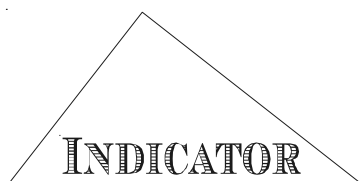
Survey-based estimates are generally subject to relatively large sampling errors, making it difficult to detect changes over short periods unless the changes are quite large. Retrospective survey-based estimates are often based on a five-year period prior to the survey.

The following caveats bear mention. The PMR is sensitive to changes in the quality of data. For example, a rise in the PMR may indicate deterioration in perinatal outcomes, or an improvement in the reporting of perinatal deaths. Therefore, an assessment of data quality is an essential component of analysis. In this context, evaluators often find it useful to separate the PMR into its two components: stillbirths and early

* Heaping occurs when respondents do not know the exact age at death. Estimated ages at death are often reported on certain preferred ages, such as seven days, leading to a distorted age distribution of deaths in which too many deaths are reported at the preferred age, and too few at the ages just before and after.

neonatal deaths. Data quality is generally more problematic for stillbirths than for early neonatal deaths, because of the ambiguity over the definition of fetal deaths and problems of obtaining gestational age (WHO, 1996a).

Facility data are not recommended for estimating the PMR for the general population because in many settings, many perinatal deaths and live births occur outside the health system. Facility-based estimates of the PMR should also be interpreted with caution because the rate is sensitive to the types of deliveries occurring in the facility. Consequently, the PMR may rise or fall in response to changes in the mix of deliveries in a facility. In small facilities, the PMR will be potentially unstable because of the small number of deliveries and perinatal deaths; thus, the PMR may be ineffective for monitoring change over time in a single facility. Facility-based data are more useful for monitoring in countries where a large proportion of births take place in facilities and where the completeness of routine reporting is high.



INDICATOR

CAUSE-SPECIFIC PERINATAL MORTALITY RATE

Definition

Number of perinatal deaths from a specific cause per 1,000 births (live births and fetal deaths) in a given period.

Numerator: Number of perinatal deaths from a specific cause in a given period x 1,000 (or 10,000 or 100,000).

Denominator: Total number of births (live births and fetal deaths) in the same period.

A “*perinatal death*” is a fetal death or an early neonatal death.

The terms “still birth” and “fetal death” are sometimes used interchangeably.

Specific causes that are commonly measured include:

- Lethal or severe congenital abnormalities;
- Acute intrapartum events, resulting in intrapartum stillbirths or neonatal deaths due to “asphyxia;” and
- Infections, which may be highly specific, e.g., syphilis infections as a cause of still births and early neonatal deaths.

The exact causes of death being coded may differ depending upon the program or locality where the indicator is being collected.

The WHO definition of a “*fetal death*,” also adopted by the United Nations and the National Center for Health Statistics (NCHS), is death before the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy. The death is indicated by the fact that after such separation, the fetus does not breathe or show any other

evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definitive movement of voluntary muscles.

A “*fetal death*” is the death of a fetus weighing 500g or more or of 22 weeks gestation or more if weight is unavailable (ICD-10). The terms stillbirth and fetal death are sometimes used interchangeably.

An “*early neonatal death*” (END) is the death of a live newborn within the first 7 completed days (i.e., 0-6 days) of life. Note: The day of birth is counted as Day 0, so that “within the first 7 completed days” or “within 1 week” includes babies 0-6 days old.

A “*live birth*” is described by the United Nations (2001) as “the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.”

Great variation exists both between and within countries on how the fetal death component of perinatal mortality is recorded, particularly for early fetal deaths that occur at 22 to 27-weeks gestation. For international comparison, WHO (1992) suggests including only deaths of fetuses weighing at least 1000g or of 28-weeks gestation or more if weight is unavailable. Presentations of the PMR should include a clear statement of the definition of perinatal mortality used. In practice, in most developing countries, accurate data on

birth weight or gestational age are difficult to obtain.

Measurement Tools

Facility-based perinatal death audits; community/demographic surveillance; vital registration; verbal autopsy

What It Measures

This indicator measures death from specific causes during the perinatal period. Measurement of cause-specific perinatal mortality is important for several reasons, including the following: (1) to establish the relative public health importance of the different causes of death; (2) to evaluate trends over time for specific causes of death; (3) to evaluate health interventions aimed at reducing mortality from specific causes of death; (4) to investigate the circumstances surrounding the deaths in order to identify ways to reduce unnecessary death; and (5) to facilitate research into factors associated with mortality from specific causes of death.

How to Measure It

This indicator can be measured at the health facility, district, community, or national levels, (although death coding at the community level may be less reliable), or a more simple surrogate measure of a specific cause may need to be used. Perinatal Death Audits (PNDAs) are being increasingly promoted in developing countries, particularly at facility level. Several training programs are available for PNDAs with supporting software, including the Perinatal Education Program, a distance education program available on the internet that has been used to train over 30,000 doctors and nurses, largely in South Africa (www.pepcourse.co.za), with the Perinatal Problem Identification Program Software used to analyze the data (www.ppip.co.za).

In areas where medical certification of cause of death is rare, verbal autopsy is often used to identify the causes of death among infants and

children. Demographic surveillance, where all deaths are reported on a regular basis throughout the year may be used to identify deaths.

In verbal autopsy, differing methods can be used to get a verbal account of the cause of death. In an open-ended history, the caregiver or next-of-kin is asked to tell about the events leading up to the child death in their own words and probed to follow-up on particular aspects. Close-ended questions ask whether specific symptoms and signs were present during the final illness. “Expert” opinion or computerized algorithms are then applied to allocate the presumed cause of death using the descriptive data.

Strengths and Limitations

It is difficult to assign causes of death, even at the health facility level. At the community level, data collection is often retrospective and reliant upon verbal autopsy, rather than on a clinically determined cause of death. These factors contribute to bias and may make the validity and reliability of the data questionable. Failure to enumerate all deaths can lead to an invalid measure of proportionate cause of death. For example, selective undercounting of deaths in the first hour of life will disproportionately reduce the numbers of deaths due to asphyxia and severe preterm birth. Unless the neonatal mortality rate is high, and/or a large number of births are included, the cause-specific mortality rate may be misleading, as small numbers will not allow for the investigation of time trends.

Vital registration systems often do not have sufficient coverage to provide accurate data about cause-specific mortality in developing countries. Usually a 90% coverage rate is taken as a cut-off for representation. Demographic surveillance tends to cover limited geographic areas, thus the underlying cause-specific mortality in these areas cannot be necessarily generalized to wider populations, as some of the populations under surveillance are not typical due to multiple trials and interventions.

Misclassification of the cause of death not only affects estimates of levels of cause-specific mortality over time, but it also compares cause-specific mortality rates between two population groups. In mortality surveys, the accuracy of the indicator depends on the ability of respondents to describe the final illness as well as the way in which diseases are understood and described in the community. Clear case definitions and the use of hierarchical categories for allocating cause of death will minimize subsequent errors.

One limitation of cause-specific mortality rates is that the death of a child is commonly the result of more than one cause. Some verbal autopsy questionnaires, such as those developed by WHO, Johns Hopkins School of Hygiene and Public Health, and the London School of Hygiene and Tropical Medicine, allow for multiple causes of death, while others only allow for one. When interpreting this indicator, it is important to know whether multiple causes of death are allowed for in the coding since the sum of the proportions for each cause of death will generally be greater than 1.00 when multiple causes of death are allowed. For this reason, many analyses do restrict the major cause of death to one cause per child. The Perinatal Problem Identification Program in South Africa allows for the coding of primary obstetric causes of death (for stillbirths and neonatal deaths), final causes of death (in neonatal deaths), and avoidable causes of death that are patient related, health care worker related, and administrative.



INDICATOR

BIRTH WEIGHT SPECIFIC MORTALITY RATE (BWSMR)

Definition

The Birth Weight Specific Mortality Rate (BWSMR) is a stratification of a “newborn mortality rate” by birth weight grouping. For example, the Birth Weight Specific Neonatal Mortality Rate (BWSNMR) for births weighing 2500g or more is calculated as:

Numerator: Number of neonatal deaths weighing 2500g or more at birth.

Denominator: Total number of live births weighing 2500g or more at birth.

And for births under 2500g, the BWSNMR is calculated as:

Numerator: Number of neonatal deaths weighing under 2500g at birth.

Denominator: Total number of live births weighing under 2500g at birth.

Measurement Tools

Service statistics; HIS (in highly developed systems)

What It Measures

Birth weight is the most sensitive predictor of infant survival and a good predictor of maternal health and well-being. The mortality rate for low birth weight babies is much higher than for those with a normal birth weight. Stratifying newborn deaths by birth weight helps to determine the cause of death and therefore to identify where interventions are needed. For example, deaths of very small babies are more likely related to maternal causes predisposing to intrauterine growth retardation and preterm birth, whereas deaths of normal birth weight babies are more

likely to be related to intrapartum asphyxia and poor obstetric care. In the first case, interventions should focus on the mother (improving nutrition and reducing antenatal infection) and, in the second case, should focus on improving the quality of delivery care. Evaluators can obtain additional information by stratifying birth weight by time of death (Table 3.5).

How to Measure It

The data requirements for calculating this indicator are the number of deaths in a particular birth weight grouping and the total number of births in the same weight grouping.

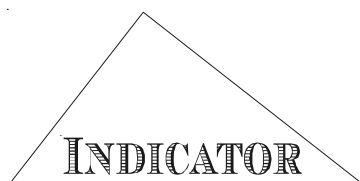
Strengths and Limitations

Information for this indicator can only be collected in settings where all babies are weighed. It is therefore most appropriate for use in health facilities but has been collected in some community settings as part of maternal and perinatal health area surveillance systems (Lawn et al., 2001).

One useful application of this type of disaggregation is to examine the number of intrapartum deaths in normal birth weight babies. If the quality of obstetric care is good (and women are not presenting very late in labor), then very few intrapartum deaths should occur because deliveries are expedited rapidly. The proportion of fetal deaths in babies of normal birth weight may serve as a proxy indicator for intrapartum asphyxia and quality of delivery care.

Table 3.5. Potential causes of death for specific age and birth weight categories

Weight	Fetal Death	Intrapartum Death	Early Neonatal Death	Late Neonatal Death
Less than 2500g	Maternal infection, e.g., syphilis, other STIs Medical complication APH Hypertensive disease	Complications of preterm labor/IUGR Asphyxia	Complications of preterm labor/IUGR Infection	Infection, ARI Late complications of prematurity Tetanus
2500g and above	Maternal infection, e.g., syphilis, other STIs, malaria Medical complication APH Hypertensive disease	Asphyxia and birth trauma Maternal infection	Asphyxia and birth trauma Infection	Infection, ARI Tetanus



NUMBER OF NEONATAL TETANUS CASES

Definition

The number of neonatal tetanus (NT) cases in a given year, in a defined population, including both suspected and confirmed cases.

A “*suspected case*” is any neonatal death between the 3rd and 28th day after birth in which the cause of death is unknown; or any neonate reported as having suffered from neonatal tetanus between the 3rd and 28th day after birth and not investigated.

A “*confirmed*” case is any neonate with a normal ability to suck and cry during the first 2 days of life, and who between the 3rd and 28th day after birth cannot suck normally and becomes stiff or has convulsions (i.e., jerking of the muscles) or both.

The basis for case classification is entirely clinical and does not depend on laboratory confirmation. NT cases reported from hospitals are considered confirmed (WHO, 1999a).

Measurement Tools

Population-based NT mortality surveys; neonatal tetanus surveillance systems; population-based surveys

What It Measures

Neonatal tetanus is a major public health problem in the developing world. Neonatal tetanus is responsible for 14% (215,000) of all neonatal deaths (WHO, 1998a). This indicator measures achievement towards the goal of eliminating neonatal tetanus by 2005 from the remaining countries in which it still poses a significant disease burden. WHO defines elimination of tetanus as a reduction of neonatal tetanus cases to fewer than one case per 1000 live births in every district of every country (WHO, 1999a).

How to Measure It

The data requirement is the number of neonatal tetanus cases or deaths. In countries with tetanus toxoid (TT) immunization coverage of over 90 percent and a clean delivery rate over 80 percent, the number of neonatal tetanus cases is taken as the number of neonatal tetanus deaths reported. In countries with lower coverage, an estimate of the number of NT cases is based on an estimate of NT deaths calculated from the number of live births, the neonatal tetanus mortality rate (NTMR), TT2+ coverage and vaccine efficacy (VE) (see below).

$$\text{Number of NT deaths in 1 year} = \text{Live births} \times \text{NTMR} \times (1 - \text{TT2+} \times \text{VE})$$

Where:

NTMR = the baseline Neonatal Tetanus Mortality Rate (mortality rate in unvaccinated cases)

TT2+ = the proportion of pregnant women receiving at least two doses of TT vaccine

VE = Vaccine efficacy (estimated as 0.95)

The NTMR used is the latest value reported in each country where a nationwide survey was undertaken; if no surveys were conducted, a rate of 1, 5, 10, or 15 cases per 1000 live births is allocated on the basis of the NTMR reported in countries with similar risk factors. In Latin America the WHO Regional Office (AMRO) uses a correction factor for the sensitivity of the surveillance system to adjust for the numbers of reported neonatal tetanus deaths (WHO, 1994a).

Some countries occasionally conduct NT mortality surveys, and most countries with a high proportion of neonatal tetanus deaths carry out routine

surveillance in “high risk” areas. Countries with NT surveillance systems assess their progress annually. However, in most cases surveillance systems function poorly, and since high-risk populations for NT tend to live in rural areas with very limited access to health care, neonatal tetanus continues to be seriously underreported. Community-based NT mortality surveys, for example, suggest that routine surveillance systems detect only two to eight percent of all cases (WHO, 1994a). For this reason, WHO recommends estimating the number of NT cases using the formula presented above. Demographic surveys, providing neonatal mortality at 4-14 days on a 3-5 year basis, serve to evaluate surveillance data.

Strengths and Limitations

A number of problems needs to be mentioned. First, this indicator reflects the overall magnitude of the problem of neonatal tetanus deaths but does not offer a precise estimate because of serious underreporting from surveillance data and because of the many assumptions inherent in the WHO calculation. Second, because this indicator is reported as a number rather than as a proportion, countries with lower rates of NT deaths but larger populations will rank ahead of countries with proportionately higher deaths rates. Third, aggregate figures at a national level may disguise pockets of high risk in certain subgroups (for example in rural populations or low-caste groups).

Surveillance systems reporting the number of NT cases should also give the percent completeness of reporting (number of NT reports received/the number of reports expected in the same time period). Neonatal-tetanus deaths should also be reported in conjunction with TT2+ coverage and the proportion of live births with a skilled attendant (as a proxy for proportion of clean deliveries).

In countries where NT is a recognized problem, population-based surveys may provide information on levels and trends of neonatal mortality. These surveys provide information on neonatal mortality at 4-14 days, which is a sensitive indicator of NT mortality (Boerma et al., 1996).



INDICATOR

NEONATAL MORTALITY RATE (NMR)

Definition

Number of neonatal deaths per 1000 live births in a given period.

Numerator: Number of deaths within the first 28 completed days of life (0-27 days) in a given period x 1000.

Denominator: Total number of live births in the same period.

The NMR is often broken down into early and late mortality rates. The Early Neonatal Mortality rate (ENMR) is calculated as follows:

Numerator: Number of deaths within the first seven completed days of life (0-6 days) in a given period x 1000.

Denominator: Total number of live births in the same period.

The late neonatal mortality rate (LNMR) is calculated as follows:

Numerator: Number of deaths within 7-27 completed days in a given period x 1000.

Denominator: Total number of live births in the same period.

A “neonatal death” is defined as a death within the first 28 completed days of life (0-27 days).

A “live birth” is described by the United Nations (2001) as “the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite

movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.”

Note: The day of birth is counted as day 0, so that “within the first 7 completed days” or “within 1 week” includes babies 0-6 days old.

Measurement Tools

Census; population-based surveys (e.g., DHS, MICS, KPC); vital registration system; service statistics

What It Measures

The NMR is a key outcome indicator for newborn care and directly reflects prenatal, intrapartum, and neonatal care. Early neonatal deaths are more closely associated with pregnancy-related factors and maternal health, whereas late neonatal deaths are associated more with factors in the newborn’s environment.

How to Measure It

To calculate this indicator, two pieces of information are needed: the number of neonatal deaths in a given population and reference period, and the number of live births in the same population and reference period. The reference period is usually one year but it could also be five years.

Where data on the numbers of live births for the denominator are unavailable, evaluators can calculate total estimated live births using census data for the total population and crude birth rates in a specified area.

Total expected births = population x crude birth rate

In a setting where the crude birth rate is unknown, WHO recommends using 3.5% of the total population as an estimate of the number of pregnant women (number of live births or pregnant women = total population x 0.035 [WHO 1999a; WHO 1999b]).

Routine HIS may collect data for this indicator to obtain estimates of the NMR for facilities. Facility data are not recommended for estimating the NMR for the general population, because in many settings, many neonatal deaths and live births occur outside the health system, which will cause substantial selection bias.

The NMR is usually calculated at the national level. Sub-national estimates can also be calculated if sample sizes are sufficiently large. The NMR is sometimes calculated at a facility level to monitor the outcome of delivery and newborn care in health facilities. Reliable estimates for individual facilities can only be obtained for very large facilities if there are large numbers of deliveries and neonatal admissions.

Strengths and Limitations

In many countries, vital registration data are not sufficiently complete to allow reliable estimation of the NMR. The standard techniques for collecting data on live births and neonatal deaths in population-based surveys have been widely applied in programs such as the WFS and DHS. Data quality is an important issue; common problems include omission of deaths, particularly very early neonatal deaths, and heaping of the reported age at death on 7, 28, or 30 days.* Heaping on these digits is particularly problematic because it will lead to the misclassification of early neonatal deaths as late neonatal deaths (seven days) or late neonatal deaths as post-neonatal deaths (28 and 30 days).

* Heaping occurs when respondents do not know the exact age at death. Estimated ages at death are often reported on certain preferred ages, such as 7, 28, or 30 days, leading to a distorted age distribution of deaths in which too many deaths are reported at these preferred ages, and too few at the ages just before and after.

The NMR may respond fairly quickly to programmatic interventions, for example, immunizing all pregnant women in areas of high tetanus prevalence. However, survey-based estimates are generally subject to relatively large sampling errors, so it is impossible to detect changes over short periods of time unless the changes are quite large. Also, changes in neonatal mortality rates are usually a long-term phenomenon and thus occur slowly. Therefore, we recommend collecting estimates of the NMR every three to five years or longer.

One limitation is that the NMR is sensitive to changes in data quality. For example, a rise in the NMR may indicate deterioration in newborn health outcomes, or it may indicate an improvement in the reporting of neonatal deaths. Therefore, assessing data quality is essential to analysis.

Also, comparisons of facility-based estimates of the NMR should be interpreted carefully because the NMR in a facility is very sensitive to the case mix of deliveries and neonatal admissions. A higher NMR in one facility may not suggest poorer quality of neonatal care in that facility because the NMR may rise or fall with changes in the case-mix. Also, improvements in prenatal and intrapartum care and advances in medical technology may increase the NMR because babies who may otherwise have been stillbirths may survive delivery only to die in the neonatal period. For these reasons, we recommend that evaluators break down facility-based estimates of the NMR by birth weight (see **Birth Weight Specific Mortality Rate**) and by admission status (direct admission or transfer-in) as a proxy for case mix.

References

- AbouZahr C. (1998). Maternal Mortality Overview. In: Murray CJL and Lopez AD (eds). *Health Dimensions of Sex and Reproduction. Global Burden of Disease and Injury Series III*, 111-164. Geneva, Switzerland: World Health Organization.
- AbouZahr C. (1999). Measuring Maternal Mortality: What Do We Need To Know? In: Berer M and Ravindran TKS (eds). *Safe Motherhood Initiatives: Critical Issues: Reproductive Health Matters*, 13-23. Oxford: Blackwell Science Ltd.
- AbouZahr, C. and Wardlaw T. (2001). Maternal Mortality at the End of the Decade: Signs of Progress? Geneva, Switzerland: World Health Organization. Bulletin of the World Health Organization.
- ACC/SCN News. (1994). Maternal and Child Nutrition. Number 11.
- ACC/SN. (2000). Pojda J, and Kelly L (eds.). *Low Birthweight: Report of a Meeting in Dhaka, Bangladesh 14-17th June 1999*. Geneva, Switzerland: ACC/SCN in collaboration with ICDDR, B. Nutrition Policy Paper, No. 18.
- Bang AT, Bang RA, Baitule SB, Reddy MH, and Deshmukh MD. (1999). Effect of Home-based Neonatal Care and Management of Sepsis on Neonatal Mortality: Field Trial in Rural India (comments). *Lancet*, 354, 9194:1955-1961.
- Berg C, Danel I, and Mora G. (1996). *Guidelines for Maternal Mortality Epidemiological Surveillance*. Washington, D.C.: OPS.
- Bertrand JT, and Escudero G. (2003). *Compendium of Indicators for Evaluating Reproductive Health Programs*. Chapel Hill, NC: MEASURE Evaluation.
- Bertrand JT, and Tsui A (eds.). (1995). *Indicators for Reproductive Health Program Evaluation*. Chapel Hill, NC, University of North Carolina at Chapel Hill: Carolina Population Center, EVALUATION Project.
- Boerma JT, Weinstein KI, Rutstein SO and Sommerfelt AE. (1996). *Data on Birthweight in Developing Countries: Can Surveys Help?* Geneva, Switzerland: World Health Organization. Bulletin of the World Health Organization, 74, 2:209-216.
- Campbell O. (1999). Measuring Progress in Safe Motherhood Programmes: Uses and Limitations of Health Outcome Indicators. In: Berer M and Ravindran TKS (eds.). *Safe Motherhood Initiatives: Critical Issues: Reproductive Health Matters*, 31-42. Oxford: Blackwell Science Ltd.
- Campbell OMR, and Graham WJ. (1990). *Measuring Maternal Mortality and Morbidity: Level and Trends*. London, England: Maternal and Child Epidemiology Unit. Publication No.2. London School of Hygiene and Tropical Medicine.
- Campbell OMR, and Graham WJ. (1991). *Measuring Determinants of Maternal Mortality and Morbidity: Defining and Selecting Outcomes and Determinants, and Demonstrating Association*. London, England: Maternal and Child Epidemiology Unit, London School of Hygiene and Tropical Medicine. Publication No 4.

Graham W, and Airey P. (1987). Measuring Maternal Mortality: Sense and Sensitivity. *Health Policy and Planning*, 2(4):323-333.

Donnay F. (2000). Maternal Survival in Developing Countries: What Has Been Done, What Can Be Achieved in the Next Decade. *International Journal of Gynaecology and Obstetrics*, 70(1):89-97.

De Brouwere V, Tonglet R, and Van Lerberghe W. (1998). Strategies for Reducing Maternal Mortality in Developing Countries: What Can We Learn from the History of the Industrialized West? *Tropical Medicine and International Health*, 3:771-782.

Espeut D. (1998). *Perinatal Mortality in Developing Countries: A Review of the Current Literature and Methodological Issues in Community-based Assessment*. Arlington, VA: John Snow Inc. MotherCare Technical Working Paper No. 5.

Gloyd S, Chai S, and Mercer MA. (2001). Antenatal Syphilis in Sub-Saharan Africa: Missed Opportunities for Mortality Reduction. *Health Policy and Planning*, 16(1):29-34.

Goodburn EA. (2002). Using Process Indicators to Monitor and Evaluate Obstetric Services in Developing Countries. *Journal of the American Medical Women's Association*, 57(3):145-8.

Graham W, and Filippi V. (1994). *Monitoring Maternal Health Goals: How Well do the Indicators Perform?* London, England: Maternal and Child Epidemiology Unit, London School of Hygiene and Tropical Medicine.

Graham W, Brass W, and Snow RW. (1989). Estimating Maternal Mortality: The Sisterhood Method. *Studies in Family Planning*, 20(3):125-135.

Graham W, Fillipi V, and Ronsmans C. (1996). Demonstrating Programme Impact Using Maternal Mortality. *Health Policy and Planning*, 11(1):16-20.

IVACG. (1997). *IVACG Statement: Maternal Night Blindness: Extent and Associated Risk Factors*. Washington, DC: International Vitamin A Consultative Group. Retrieved from http://www.who.int/vaccines-diseases/en/vitamina/PDF/13_MATERNAL_NIGHT.PDF

IVACG. (1998). *IVACG Statement: Safe Doses of Vitamin A during Pregnancy and Lactation*. Washington, DC: International Vitamin A Consultative Group. Retrieved from http://ivacg.ilsa.org/file/a5_pregnancy.pdf

Koblinsky MA, Campbell O, and Heichelheim J. (1999). Organizing Delivery Care: What Works for Safe Motherhood? *Bulletin of the World Health Organization*, 77(5):399-406.

Kramaer MS. (1987). Determinants of LBW: Methodological Assessment and Meta-Analysis. *Bulletin of the World Health Organization*, 65(5):663-737.

Kramer MS, Demissie K, Yang H, Platt RW, Sauve R, and Liston R. (2000). The Contribution of Mild and Moderate Preterm Birth to Infant Mortality. Fetal and Infant Health Study Group of the Canadian Perinatal Surveillance System. *Journal of the American Medical Association*, 284(7):843-849.

Lawn J, McCarthy B, and Ross SR. (2001). *The Healthy Newborn: A Reference Manual for Program Managers*. CARE, Centers for Disease Control. CCHI and World Health Organization.

Lumbignon P, Panamonta M, Laopaiboon M, Pothinam S, and Patithat N. (1990). Why Are Thai Official Perinatal and Infant Mortality Rates So Low? *International Journal of Epidemiology*, 19:997-1000.

McCaw-Binns AM, Fox K, Foster-Williams KE, Ashley DE, and Irons B. (1996). Registration of Births, Stillbirths and Infant Deaths in Jamaica. *International Journal of Epidemiology*, 25:807-813.

McDonagh M. (1996). Is Antenatal Care Effective in Reducing Maternal Morbidity and Mortality? *Health Policy Planning* 11,1:1-15

MEASURE DHS+. (2000). *Service Provision Assessment (SPA) Tool Kit*. Baltimore, MD: Macro International Inc.

MEASURE DHS+. (2001). *Service Provision Assessment Guidelines and Field Instruments* (Unpublished). Calverton, Maryland: ORC Macro.

Ministry of Health [Kenya], National Council for Population and Development [Kenya], and ORC Macro. (2000). *Kenya Service Provision Assessment Survey 1999*. Calverton, Maryland: Ministry of Health, National Council for Population and Development, and ORC Macro.

O'Gara C, Newsome MH, and Viadro C. (1995). *Indicators for Reproductive Health Evaluation: Final Report of the Subcommittee on Breastfeeding*. Chapel Hill, NC: Carolina Population Center.

PAHO. (2001). *Integrated Vision for Vitamin A Supplementation in the Americas*. Washington, D.C.: Pan American Health Organization. Regional Meeting Report.

Panis CW, and Lillard LA. (1994). Health Inputs and Child Mortality: Malaysia. *Journal of Health Economics*, 13(4):455-89.

Safe Motherhood Inter-Agency Group. (1997). *The Safe Motherhood Action Agenda: Priorities for the Next Decade*. Report on the Safe Motherhood technical consultation. October 1997, Colombo, Sri Lanka. Retrieved from http://www.safemotherhood.org/resources/pdf/e_action_agenda.pdf

Save the Children. (2001). *The State of the World's Newborns*. Washington, D.C.: Save the Children Fund.

Stanton C, Abderrahim N, and Hill K. (2000). An Assessment of DHS Maternal Mortality Indicators. *Studies in Family Planning*, 31(2):111-123.

Steketee RW, Nahlen BL, Parise ME, and Menendez C. (2001). The Burden of Malaria in Pregnancy in Malaria-endemic Areas. *American Journal of Tropical Medicine and Hygiene*, 64,1/2:S28-35.

Saugstad OD, Rootwelt T, and Aalen O. (1998). Resuscitation of Asphyxiated Newborn Infants with Room Air or Oxygen: An International Controlled Trial: The Resair 2 Study. *Pediatrics*, 102z(1):E1.

United Nations. (2001). *Principles and Recommendations for a Vital Statistics System Revision 2*. New York: United Nations. Sales No. E.01.XV11.10.

UNAIDS. (2002). *Monitoring the Declaration of Commitment on HIV/AIDS: Guideline on Construction of Core Indicators*. Geneva, Switzerland: UNAIDS. Retrieved from http://www.unaids.org/UNGASS/docs/JC718-CoreIndic_en.pdf

UNFPA. (1998a). *Indicators for Population and Reproductive Health Programmes*. New York, NY: UNFPA, Technical and Policy Division.

UNICEF/WHO/UNFPA. (1997). *Guidelines for Monitoring and Evaluating the Availability and Use of Obstetric Services*. New York: United Nations Children's Fund.

Villar J, and Khan-Neelofur D. (2000). Pattern of Routine Antenatal Care for Low-risk Pregnancy. *Cochrane Database Systems Review*, 2:CD000934.

WHO. (1987). *Studying Maternal Mortality in Developing Countries: A Guidebook*. Geneva, Switzerland: World Health Organization. WHO/ FHE/87.7.

WHO. (1991). *Indicators for Assessing Breastfeeding Practices*. Geneva, Switzerland: World Health Organization. Report of an Informal Meeting. Division of Diarrhoeal and Acute Respiratory Disease Control, June 11-12.

WHO. (1991b). *Maternal and Perinatal Infections: A Practical Guide*. Geneva, Switzerland: World Health Organization. Report of a WHO Consultation. Maternal Health and Safe Motherhood Programme, Division of Family Health.

WHO. (1992). *International Statistical Classification of Disease and Related Health Problems, 10th Revision*. Geneva, Switzerland: World Health Organization. WHO 1:1238.

WHO. (1996a). *Mother-Baby Package: Implementing Safe Motherhood in Countries*. Geneva, Switzerland: World Health Organization. Maternal Health and Safe Motherhood Program, Division of Family Health. WHO/FHE/MSM/94.11.

WHO. (1996c). *Indicators for Assessing Vitamin A Deficiency and Their Application in Monitoring and Evaluating Intervention Programs*. Geneva, Switzerland: World Health Organization. WHO Nutrition 96.10.

WHO. (1997). *Monitoring Reproductive Health: Selecting a Short List of National and Global Indicators*. Geneva, Switzerland: World Health Organization, Division of Family and Reproductive Health.

WHO. (1998a). *Postpartum Care for the Mother and Newborn: A Practical Guide*. Geneva, Switzerland: World Health Organization, Maternal and Newborn Health/Safe Motherhood Unit, Division of Reproductive Health (Technical Support). WHO/RHT/MSM/98.3.

WHO. (1998b). *Basic Newborn Resuscitation: A Practical Guide*. Geneva, Switzerland: World Health Organization. WHO/RHT/MSM/98.1. Retrieved from http://www.who.int/reproductive health/publications/MSM_98_1_table of contents.en.html

WHO. (1999). *A Joint WHO/UNFPA/UNICEF/World Bank Statement on Reduction of Maternal Mortality*. Geneva, Switzerland: World Health Organization.

WHO. (1999a). *Indicators to Monitor Maternal Health Goals: Report of a Technical Working Group, Geneva, 8–12 November 1993*. Geneva, Switzerland: World Health Organization, Division of Family Health.

WHO. (1999b). *Reduction of Maternal Mortality: A Joint WHO, UNFPA, UNICEF, World Bank Statement*. Geneva, Switzerland: World Health Organization.

WHO. (1999c). *Field Manual for Neonatal Tetanus Elimination*. Geneva, Switzerland: World Health Organization, Department of Vaccines and Other Biologicals. WHO/V&B/99.14. Retrieved from <http://www.who.int/vaccines-documents/DocsPDF/www9563.pdf>

WHO. (2000). *Nutrition for Health and Development*. Geneva, Switzerland: World Health Organization. WHO/NHD/006.

WHO (2000a). *Maternal and Neonatal Tetanus Elimination by 2005: Strategies for Achieving and Maintaining Elimination*. Geneva, Switzerland: World Health Organization. WHO/V&B/02.09. Retrieved from <http://www.who.int/vaccines-documents/DocsPDF02/www692.pdf>

WHO. (2001). *New Data on the Prevention of Mother-to-Child Transmission of HIV and Their Policy Implications: Conclusions and Recommendations*. World Health Organization: Geneva, 2001. Technical Consultation on Behalf of the UNFPA/UNICEF/WHO/UNAIDS Inter-Agency Task Team on Mother-to-Child Transmission of HIV. WHO/RHR/01.28.

WHO. (2001a). *Fifty-Fourth World Health Assembly, May 14–22, 2001*. Geneva, Switzerland: World Health Organization.

WHO. (2002). *Strategic Framework for Malaria Control during Pregnancy in the WHO Africa Region*. [Final Draft.]

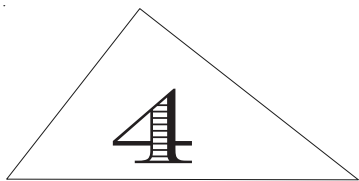
WHO. (2005). *Global Immunization Vision and Strategy: Facts and Figures*. Geneva, Switzerland: World Health Organization. Retrieved from http://www.who.int/vaccines/GIVS/english/Global_imm._data_EN.pdf

WHO and UNICEF. (1996). *Revised 1990 Estimates of Maternal Mortality: A New Approach by WHO and UNICEF*. Geneva, Switzerland: World Health Organization.

WHO. (2000). *Framework for Monitoring Progress and Evaluating Outcomes and Impact*. Geneva, Switzerland: World Health Organization. WHO/CDS/RBM/2000.25. Retrieved from http://whqlibdoc.who.int/hq/2000/WHO_CDS_RBM_2000.25.pdf

WHO, UNICEF, and UNFPA. (2001). *Maternal Mortality in 1995: Estimates Developed by WHO, UNICEF and UNFPA*. Geneva, Switzerland: World Health Organization. WHO/RHR/01.9.

World Bank. (1993). *1993 World Development Report: Investing in Health*. New York, NY: Oxford University Press.



IMMUNIZATION

Indicators:

- Proportion of infants born protected against neonatal tetanus
- BCG coverage
- DTP1 coverage
- DTP3 coverage
- OPV3 coverage
- Measles coverage
- HepB3 coverage
- Hib3 coverage
- Dropout from DTP1 to DTP3
- Fully immunized child (FIC)
- Vaccine wastage rate

CHAPTER 4. IMMUNIZATION

Child immunization is one of the most cost-effective public health interventions for reducing child morbidity and mortality. The ultimate goal of immunization programs is to reduce the incidence of vaccine-preventable diseases in children by attaining high levels of coverage with potent vaccines administered at the appropriate ages (and recommended intervals between doses for multiple dose vaccines). The traditional six target diseases are poliomyelitis, diphtheria, tetanus, pertussis, measles, and tuberculosis. WHO has recommended that the hepatitis B vaccine be included in national schedules for delivering the primary series of vaccines to children under one year. In many African countries, national immunization policy includes giving yellow fever vaccine at the same time as measles. Countries are also being encouraged to introduce new and previously underutilized vaccines such as *Haemophilus Influenzae* Type B. These vaccinations form part of the basic childhood immunization package in countries where they are appropriate or where resources are available.

Immunization program managers and service providers need continuous information to answer the following questions (USAID, 2003):

- (1) Are immunization services accessible to the target population?
- (2) How many individuals in the target population are being vaccinated? Who is not being vaccinated and why?
- (3) Does the quality of services meet program standards?
- (4) Are resources being used efficiently?
- (5) Are service strategies meeting their objectives?
- (6) Are mortality and morbidity from routine diseases being reduced?

Table 4.1 provides an illustrative framework for monitoring immunization programs. Monitoring in this context is keeping a close watch on the various functional or operational aspects of immunization programs related to routine immunization, new vaccine introduction, polio eradication, surveillance, and so forth. The critical inputs for monitoring immunization programs are vaccines, refrigerators, temperature charts, needles, syringes, and so forth. Outputs may include immunization sessions, health education sessions, outreach, and quality services. The main outcome is immunization coverage. The intended impact is reduced incidence of vaccine-preventable diseases and lower infant and child mortality.

Evaluations are carried out periodically to answer the following kinds of questions (USAID, 2003):

- (1) What do clients, health workers, managers, and/or other stakeholders think about the service or specific aspects of it? What do they like? What do they dislike?
- (2) Were stated objectives achieved? How?
- (3) Which inputs led to improvements and which did not? Were there any unintended, positive outcomes? What were they? How can they be replicated?
- (4) How efficiently were activities implemented?
- (5) Which strategies should be continued?

An evaluation can undertake a comprehensive study of the whole health system, or focus on a service or program within the system, or a single function such as cold chain, disease surveillance, or training. Health service evaluations usually focus on outcomes (e.g. changes in immunization coverage), processes (e.g. vaccine delivery), and/or client satisfaction. Impact evaluations examine the effects of activities on morbidity and mortality but are less common because they are time

Table 4.1. Illustrative inputs, processes, outputs, and outcomes for monitoring immunization programs

Inputs	Processes	Outputs	Outcomes	Impact
<ul style="list-style-type: none"> • Vaccines • Refrigerators • Temperature charts • Vaccination cards • Needles, syringes • Etc. 	<ul style="list-style-type: none"> • Training • Supervision • Service delivery • Surveillance • Etc. 	<p><i>Functional Outputs</i></p> <ul style="list-style-type: none"> • Immunization sessions held • Education sessions held • Health workers trained in EPI • Etc. <p><i>Service Outputs</i></p> <ul style="list-style-type: none"> • Quality services • Client satisfaction 	<ul style="list-style-type: none"> • Increased coverage • Reduced dropout • Increased parents' knowledge of when to return 	<ul style="list-style-type: none"> • Reduced disease incidence • Lower infant and child mortality

consuming and costly and because of the difficulty of determining cause and effect relationships.

Measurement Tools and Data Sources

Many tools are available for identifying immunization service delivery problems and how best to address them. Routine monitoring tools include patient registers, vaccination cards, tickler files, tally sheets, and immunization monitoring charts. Patient registers are used to identify children who are due for a vaccination, monitor missed opportunities, check the accuracy of reporting and target case investigations. Vaccination cards and home-based records enable caretakers and health workers to monitor a child's progress towards full immunization. These tools are valuable if patient records are poorly maintained or if a child moves from one facility to another. Tickler files are boxes in which children's vaccination cards are filed according to the month in which the next vaccination is due and aid in monitoring missed opportunities for vaccination. Tally sheets are forms on which health

workers make a mark every time a vaccination is administered and which are used for reporting to the district level and monitoring the accuracy of reporting from health facilities to the district. Immunization charts monitor a health facility's progress toward coverage objectives.

Other methods that can be used to monitor and evaluate program performance include immunization program reviews (conducted nationally following guidelines available from WHO); system reviews of the cold-chain or vaccine logistics systems (methods available from WHO); health facility surveys (for information concerning the availability of vaccines, essential equipment and supplies, and observations of health worker vaccination practices); and reviews of vaccine safety (methods available from WHO). System reviews of the cold-chain and vaccine logistics system look at refrigerator temperature, storage facility adequacy, and injection safety. Health facility surveys and periodic reviews of immunization practices use direct observation to

examine counseling, vaccine safety, availability of essential vaccines, equipment, and supplies. Supervisory-based monitoring has also been used in many countries to monitor and evaluate health worker practices. Tools such as the *Immunization Services Assessment Guide* (sometimes called “the common assessment tool”) are available from WHO/EPI for adaptation and enable users to conduct a comprehensive assessment of all levels of immunization services and to examine their relationship to the health system as a whole (USAID, 2003).

Sources of data for calculating immunization coverage are routine reports (also referred to as “program statistics” or “administrative data”) and household surveys. Small sample surveys using lot quality assurance methods have been used in some places to assess the quality of service, track coverage over time, and validate immunization coverage at individual health service units, or both, for the purpose of directing attention and support to the facilities or areas that need it most. It is often used in areas that do not correspond to official reporting sites, such as urban slums (USAID, 2003). Periodic evaluation of population coverage is frequently conducted using large-scale population-based surveys such as the DHS, the KPC, the Arab League’s PAPCHILD, CDC’s Reproductive Health Survey, or UNICEF’s Multiple Indicator Surveys. Many of these surveys use either basic cluster designs or complex stratified sampling designs.

Other population-based surveys include immunization coverage surveys, seventy-five household surveys, and missed opportunity surveys. Immunization coverage surveys use a standard WHO methodology for determining immunization coverage based on a survey of a small number of individuals (210 in 30 clusters of seven individuals each). Seventy-five household surveys focus on households that have easy access to health facilities. These surveys are based on the assumption that if people in the 75 to 100 households that are closest to the health facilities

are not receiving services, then use of services in the wider catchment area must be poor. Seventy-five household surveys are useful in areas where the population is stable and coverage is unknown (USAID, 2003; *WHO Training for Mid-level Managers: Increase Immunization Coverage, Annex C*). While surveys are important they are not good tools for routine monitoring as they are conducted periodically (every three to five years). Therefore, immunization programs rely on routine data to measure coverage.

Surveillance of vaccine-preventable diseases (and adverse events following immunization) is an important component of immunization programs and can be used as a tool to identify the presence of vaccine-preventable diseases and guide actions to prevent them from becoming public health problems. Many countries have had vertical disease surveillance programs for polio and tuberculosis. Recognizing that a fragmented approach to disease surveillance can be costly, inefficient, and result in duplication of effort, many countries are now moving towards integrated systems of disease surveillance and response. WHO-AFRO and CDC have developed a set of indicators for monitoring and evaluating the quality of integrated disease surveillance and response activities, which are discussed in the next chapter.

Methodological Challenges of Estimating Coverage

Following are some key methodological challenges of estimating immunization coverage. Immunization coverage rates are usually based on routine data derived from tally sheets that are filled out at the health facility level. Although surveys are not the primary tool for monitoring immunization programs, both routine and survey-based data are covered in this section. Coverage rates can vary greatly by source of data. Users have to be aware, therefore, of the strengths and limitations of each data source in order to make sense of any data.

Routine data are relatively inexpensive but have a number of weaknesses that may result in invalid or unreliable estimates of immunization coverage.

Routine data are based on data collected by health facilities and other providers on the number of children immunized with specific vaccines. These data are available monthly and can be used at every administrative level. The data are usually aggregated at the district level, which is precisely the level at which managers have responsibility for improving the performance of immunization services. Routine data, therefore, are more appropriate than surveys for active monitoring of immunization programs. In addition, routine data are relatively inexpensive and can add additional elements for little marginal cost, as opposed to surveys.

However, routine data have a number of weaknesses that concern both the numerator and denominator. At the facility and district levels, pressures to achieve targets may result in an upward bias in the reporting, while a lack of interest in record keeping and reporting may lead to underestimates of coverage (Bos and Batson, 2000). These errors are compounded when district or regional estimates are aggregated at the central level.

Another weakness lies in the estimation of the denominators for routine-based coverage rates. Complete vital registration is the most reliable source of data for the estimation of the denominators for routine-based coverage. However, vital registration systems are incomplete and of poor quality in many low- and middle-income countries. Estimates of the denominators are therefore based on counts or estimates by local health personnel, or on projections from the latest census data. Use of the latest census data can introduce considerable uncertainty depending on how long ago the census was conducted. Projections are usually made with cohort-component methods for which estimates of fertility and mortality rates are required. Census estimates of the number of women of reproductive ages are then multiplied by the age-specific fertility

rates to obtain the number of births. Estimates of infant mortality are then used to reduce the number of births to obtain an estimate of the surviving number of children 0-11 months of age (Bos and Batson, 2000).

At the district level, estimates of the denominators may also be affected by migration. As a result of net in-migration, districts may report routine coverage rates greater than 100 percent of the assumed target population. The difficulty of providing accurate denominators is a major obstacle to obtaining accurate national immunization coverage estimates from routine data (Bos and Batson, 2000).

The quality of routine immunization data may be affected by problems related to the accuracy, completeness, and timeliness of reporting.

The reliability of routine immunization coverage estimates depends in large measure on the quality, accuracy, timeliness and completeness of administrative immunization reporting systems. The lack of completeness of reporting may also hinder the compilation of reports for given reporting periods. The WHO document “*EPI Information System Global Summary, September 1998*” included an article that examined the consistency and reliability of reported routine child immunization coverage estimates from 217 countries and territories worldwide over the period 1991 to 1996. That study found that 24 percent of the expected 6,000 reports were missing. The Immunization Data Quality Audit to be performed in the context of the Global Alliance for Vaccines and Immunization Monitoring and Evaluation Activities (WHO, 2002) provides a mechanism for determining the reliability of a country’s routine immunization reporting system.

Sampling errors from survey-based estimates tend to become larger at the sub-national level making it difficult to compare different districts or measure changes over time.

A survey is geographically representative only at the level at which the sample is drawn. Due to

cost issues (the larger the sample size, the more expensive the survey), it is often not possible to draw samples that are representative at the district level. Sampling errors (used to construct confidence intervals to indicate a probability that the true estimate of coverage is within these intervals) tend to be larger at the district level, making it difficult to compare different districts or measure district-level changes in coverage over time. Although they are often available from surveys, regional estimates may mask district-level disparities, especially when coverage is low. Therefore, the utility of nationally representative surveys for monitoring immunization coverage may be low at the district level where EPI managers have the responsibility to take appropriate actions to improve service delivery.

Low availability of health cards makes it difficult to use survey-based data to estimate the timeliness of immunization coverage.

Survey findings on immunization rely on both health cards presented by mothers and history to measure whether and when vaccines were received. If filled out correctly, health cards are reliable records of children's immunization coverage or of mothers' receipt of tetanus toxoid immunization. Because not all mothers can produce a health card at the time of the survey, they are also asked about their receipt of tetanus toxoid injections or the child's receipt of recommended vaccines. While mother's recall of a child's immunization history has been found to be quite accurate in a number of studies, mothers may not remember accurately which vaccines or how many doses (of a multiple-dose vaccine) their children have received, nor the exact dates of vaccination (Goldman and Pebley, 1994). Poor recall may result in biased estimates of immunization coverage and make it difficult to estimate accurately the timeliness of immunization.

The timing of surveys relative to National Immunization Days (NIDs) for polio immunization or large-scale measles immunization campaigns may affect coverage rates.

If NIDs or measles campaigns occur just before or during the period a survey is conducted in the field, or just after the survey has been completed, coverage rates may be affected. In the first case, coverage rates may be biased upwards, especially if efforts are not sustained. If a large immunization campaign is conducted right after the completion of the survey, there may be a discrepancy between the survey- and the campaign-based estimates. Using DTP3 coverage rates avoids this potential issue, as DTP is generally not included in campaigns.

Survey data are associated with an inbuilt time lag in coverage estimates.

Although population-based surveys can be used for estimating the proportion of the population protected against vaccine-preventable diseases, they are collected every three to five years. Surveys typically provide coverage estimates for children 12-23 months of age and include the vaccinations that these children receive up to the age of 12 months. This is the recommended methodology for survey-based estimates for immunization coverage. Some surveys include the vaccinations that children receive up to the time of the survey, which means that vaccinations given to children when they were older than 12 months of age are included, thereby inflating immunization coverage. In both cases, survey estimates provide information about immunization coverage at least 12-23 months earlier and are less able than routine data to provide data at intervals that permit corrective action to be taken.

Selection of Indicators

This chapter presents immunization coverage and dropout rates, which are used by many programs as indicators of the availability, accessibility, and use of services, as well as of other program characteristics, and the vaccine wastage rate. The indicators are listed below:

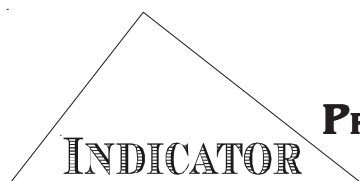
- Proportion of infants born protected against neonatal tetanus
- BCG coverage
- DTP1 coverage
- DTP3 coverage
- OPV3 coverage
- Measles coverage
- HepB3 coverage
- Hib3 coverage
- Dropout from DTP1 to DTP3
- Fully immunized child
- Vaccine wastage rate

These are the main indicators used by governments, organizations, donors, and community leaders to monitor progress toward immunization objectives and to make strategic decisions on resource allocation. However, the indicators presented in this chapter do not constitute a comprehensive set of indicators for monitoring and evaluating immunization programs. Coverage rates for DTP2, and the first and second doses of OPV, HEPB, and HIB are not included here but can easily be calculated by adapting the general definition of annual immunization coverage (i.e., the proportion of the target population that has been vaccinated) and survey-based coverage (i.e., the proportion of children 12–23 months who were immunized with a specific vaccine before 12 months of age).

Many output measures and indicators of health system performance that are used by managers to assess quality, efficiency, effort, and impact are not

covered in this chapter. Examples of indicators of quality include the number of immunization sessions that are actually held compared to the number planned; vaccine usage; use of a sterile syringe and needle for each injection; and parents' knowledge of common side effects and when to return for additional immunizations. Readers are referred to *Immunization Essentials: A Practical Field Guide* for further details about these and other indicators of quality (USAID, 2003). Indicators for monitoring the information system are also not addressed, but should measure the accuracy as well as the completeness and timeliness of reporting. No one indicator can stand alone. A mix of indicators is necessary to obtain a more complete picture of services and to identify problems that should be investigated, as well as likely solutions.

The wording of some coverage indicators, such as DTP3 may be modified slightly to reflect the level at which monitoring is implemented. For example, GAVI uses DTP3 coverage by district as an indicator of progress towards its goals whereas many governments use national-level estimates to measure whether they are achieving their objectives. It should also be noted that the description of each coverage indicator includes instructions on how to estimate the number of surviving children for use in calculating the indicator from routine data and a discussion of the relative strengths and limitations of routine- and survey-based coverage estimates. While this approach may seem redundant compared to combining all the coverage rates into one overall indicator, it ensures that the description of each coverage indicator is as complete as possible and consistent with the format used in the rest of the guide.



PROPORTION OF INFANTS BORN PROTECTED AGAINST NEONATAL TETANUS

Definition

Proportion of infants born protected against neonatal tetanus in a specified period (usually 12 months).

Numerator: Number of infants born protected against neonatal tetanus in a specified period.

Denominator: Total number of live births in the specified period.

“Protection at birth:” For prevention of neonatal and maternal tetanus, WHO recommends giving women a series of five doses of tetanus toxoid (TT). Each dose increases the level and protection against tetanus. A woman who receives five doses of tetanus toxoid is fully immunized throughout her childbearing years. If the mother has not received five lifetime TT doses, the child is considered “fully protected” against neonatal tetanus if the mother received at least two TT doses within the past three years, or three doses within the past five years, or four doses within the past 10 years. Table 4.2 presents the tetanus toxoid immunization schedule for women of childbearing age and pregnant women without previous exposure to tetanus toxoid-containing vaccines.

Measurement Tools

Routine administrative data; population-based surveys (e.g. MICS)

What It Measures

This indicator measures the percent of births protected against neonatal tetanus at the time of delivery among clients in a given program or in the general population. While neonatal tetanus was eliminated in industrialized countries as far back as the 1950s, it is still a major killer of infants in the developing world, responsible for no less

than 200,000 infant deaths every year and accounting for 14% of all neonatal deaths. Up to 70% of all babies that develop the disease die in their first month of life. The goal of eliminating maternal and neonatal tetanus by 2005 was declared by UNICEF, WHO, and UNFPA. In this context, elimination is defined as a rate of neonatal tetanus below 1 per 1000 live births per year at the district level (WHO, 2000d).

How to Measure It

The data requirements for calculating PAB coverage from routine administrative data are the number of doses of TT given to each pregnant woman, the date each dose was given, and the number of children who received DTP1. Mothers who bring children for DTP1 immunization are asked for their immunization cards to determine how many valid doses of tetanus toxoid have been received. A dose is considered valid when the minimum required interval between doses has been observed, as shown in Table 4.2. The period of protection given by the number of doses the mother has had is then determined and compared with the date of birth of the child. If the child was born during the period of protection provided by the last valid dose, then the child is considered protected at birth. The number of children protected at birth against neonatal tetanus is cumulated monthly and annually. PAB coverage is calculated from routine data by dividing the number of children protected at birth according to their mother’s TT vaccination history in a specified period by the total number of children who received DTP1 in that specified period (WHO, 1998).

To estimate the extent of protection at birth in the Multiple Indicator Cluster Surveys, all women age 15–49 are first asked whether they have ever given birth, and if so, the date of the last live birth,

Table 4.2. Tetanus toxoid immunization schedule for women of childbearing age and pregnant women without previous exposure to tetanus toxoid-containing vaccines (TT, Td, or DTP)

Dose of TT, Td, or DTP	When to give	Expected duration of protection*
1	At first contact or as early as possible in pregnancy	None
2	At least four weeks after TT1	One to three years
3	At least six months after TT2 or during subsequent pregnancy	At least five years
4	At least one year after TT3 or during subsequent pregnancy	At least 10 years
5	At least one year after TT4 or during subsequent pregnancy	For all childbearing years and possibly longer

Notes:

- (a) Increasing numbers of women have documentation of prior receipt of vaccines containing tetanus toxoid, e.g. in early childhood or at school age. As the women reach childbearing age the incidence of maternal and neonatal tetanus is expected to decline further: three properly spaced doses of DTP given in childhood are considered equivalent in protection to two doses of TT/Td given in adulthood.
- (b) Recent studies suggest that the duration of protection may be longer than indicated in the table. This matter is currently under review.
- (c) Td – Tetanus-Diphtheria toxoid. Bivalent boosters given to children aged seven years and over and to adolescents and adults with reduced diphtheria component to avoid reactions.

Source: <http://who.int/vaccines/en/tetanus.shtml>

and whether or not that child was alive at the time of the interview. If the last child was born in the period 0-11 months before the survey, the mother was then asked whether she had a vaccination card or other documentary evidence of vaccination. If a card is presented to the interviewer, it is used to assist in obtaining information on the number of tetanus toxoid doses received while the woman was pregnant with her last child. If the mother reports two or more doses during her last pregnancy, the survey does not ascertain whether she ever had earlier TT doses. If the mother

reports only one dose or none while she was pregnant with her last child, information is then collected on earlier doses of TT (that is, doses received during or before the next-to-last pregnancy or between pregnancies). If the date on which TT was administered is unknown, the woman is asked to estimate how many years ago she received the last dose of TT. In settings where the percentage of mothers having cards is low and the precise dates of TT immunization are unknown, the indicator can be estimated using both card and history information.

Strengths and Limitations

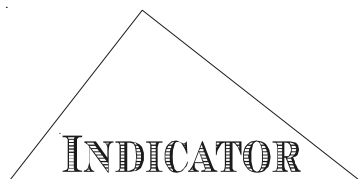
This indicator provides a means of monitoring TT coverage through routine reporting that is potentially more accurate than the “TT2+” method in countries with high coverage of DTP1 vaccine.* The indicator can also be used to reduce missed opportunities for tetanus toxoid vaccination. Mothers of children classified as “not protected” can be vaccinated immediately, and at subsequent visits if need be, to ensure that their next child will be protected against neonatal tetanus.

Variations in the definition of the numerator and denominator for measuring protection at birth against neonatal tetanus may give rise to differences in the magnitude and reliability of the indicator. For example, program statistics record the total number of doses of a vaccine in the previous 12 months, whereas the MICS surveys tend to record the number of doses given during both the current and earlier pregnancies and doses administered at times other than those specified in order to get at the number of lifetime doses. Some surveys such as the DHS report the number of women who received at least two vaccinations during their last pregnancy in a reference period that may be up to five years. The MICS-approach of estimating protection at birth has the advantage of including doses of TT that were not administered during the last pregnancy in the definition of the numerator.

Routine administrative data have the disadvantage that they may be incomplete or inaccurate (WHO, 1999a). They are also subject to selection bias and are not representative of the general population, particularly when ANC coverage is low. However, they provide the only way of monitoring coverage on an annual basis and may be more reliable than self-reported data.

Surveys provide the only means of obtaining population-based coverage, but because the mother’s vaccination card may not be available to help the interviewer ascertain the number and timing of doses received, surveys may tend to rely on self-reporting. Such reports are subject to recall bias that is likely to increase with the length of the recall period. Poor recall may result in a downward bias in estimates of the share of births protected. In settings where receiving injections is common, respondents may also erroneously report having received tetanus toxoid.

* In the “TT2+” method, the numerator is calculated as the number of protective doses of TT (TT2, TT3, TT4 and TT5) given to pregnant women during a calendar year, and the denominator as the estimated number of live births during that calendar year. However, the sum of TT+ doses underestimates the number of protected pregnant women, since only pregnant women who received a TT dose during their pregnancy are counted. Other pregnant women excluded from the numerator of the “TT2+” indicator may have already received TT5 and consequently were not vaccinated during pregnancy.



INDICATOR **BCG COVERAGE**

Definition

When calculating Bacille Calmette-Guerin (vaccine) (BCG) coverage from population-based surveys, the definition is as follows:

Proportion of children age 12-23 months who were immunized with BCG before 12 months of age.

Numerator: Number of children age 12-23 months who were immunized with BCG before 12 months of age.

Denominator: The number of children 12-23 months of age surveyed.

When calculating annual coverage of BCG from routine data, the definition is as follows:

Proportion of infants 0-11 months of age in a specified calendar year who were immunized with BCG in that calendar year

Numerator: Number immunized by 12 months with BCG in a specified calendar year

Denominator: Total number of surviving infants less than 12 months of age in the same year

Measurement Tools

Population-based surveys (DHS, EPI Cluster Survey, KPC, MICS); routine administrative data

What It Measures

This indicator measures protection of children against military tuberculosis or tuberculous meningitis. Tuberculosis is estimated to result in 2.6 million deaths worldwide annually and 3.8

million notified cases. Although the disease is more common in adults, it is usually more serious in infants, children, and adolescents. With the deterioration of public health services in some countries, and with the advent of HIV infection, the number of TB cases has escalated. Presently, WHO and UNICEF recommend that, for asymptomatic HIV-infected children living in areas where the risk of tuberculosis is high, BCG still be given at birth or as soon as possible thereafter in accordance with standard childhood immunization policies, but that it be withheld in infants thought to have symptomatic HIV-infection.

How to Measure It

When collecting data through household surveys, caretakers are asked to present the child's vaccination card to the interviewer so that it can be used to record the actual dates at which vaccinations were given. If a health card cannot be presented, then all of the information about vaccination of children is collected from the mother, based on her memory about whether or not the child received those vaccinations. Interviewers may check the child for the BCG scar to validate the mother's report. The BCG coverage rate calculated on the basis of both card and history information is recommended. The indicator can be measured at both the national and sub-national/district levels.

To determine the level of BCG coverage from routine data, two pieces of information are needed: The first is the number of doses of BCG administered to children aged 0-11 months within a given calendar year (the numerator). The second is the number of infants surviving to 12 months of age (live births – infant deaths) in the target

population in that specified calendar year. The box below illustrates how to calculate the annual coverage rate for BCG vaccine.

Calculating Annual Coverage for BCG Vaccine for 2003 from Routine Administrative Data

BCG coverage
Number immunized by 12 months with BCG in 2003 X 100
Number of surviving infants <12 months of age in 2003

The difficulty of calculating and interpreting immunization coverage rates from routine data often stems from problems related to estimating the size of the target population. These problems, in turn, are the result of inaccurate or outdated census counts, population migrations, and unforeseen changes in birth rates or infant mortality. Where data on the numbers of surviving infants are unavailable, the total number of live births can be estimated from the total population and crude birth rate and infant mortality rate in a geographic area as follows:

$$\text{Number of surviving infants} = \text{Total population} \times \text{crude birth rate} \times (1 - \text{IMR})$$

For example:

Estimating the Number of Surviving Infants: Example
Total population: 5,500,000
Crude birth rate (CBR): 30/1000
Infant mortality rate (IMR): 80/1000
Number of surviving infants = Total population x CBR x (1 - IMR)
= 5,500,000 x 30/1000 x (1 - 0.080)
= 5,500,000 x 0.030 x 0.920
= 151,800
Source: <i>Immunization Essentials: A Practical Field Guide</i> (USAID, 2003).

If the population figures presented in the previous column cannot be obtained from a national or community census and if no data are available on the crude birth rate or infant mortality rate, the number of children under one year in the population can be estimated by multiplying the total population by 4% (WHO, 2002b). For example, if the total population is 30,000, then the number of children under one year is 30,000 x 4/100 = 1200. If a more precise percentage of children under one year in the population is known, this estimate should be used to calculate the annual target population.

As for other EPI vaccines monitoring of BCG immunization coverage, based on doses of vaccine administered in the target age group (usually infants < 1 year of age) should be done on a monthly basis at the health facility and district level (WHO, 1996). This requires estimating the monthly target population. The monthly target population can be estimated by dividing the number of children under one year of age by 12. (If the annual target population of children under one year of age is 1200, the monthly target is 1200/12 = 100.)

One of the milestones established by GAVI is that by 2010 or sooner all countries will have routine immunization coverage at 90% nationally, with at least 80% coverage in every district.

Strengths and Limitations

This indicator can be easily calculated from administrative data monitoring the number of doses administered to the target population. Estimates based on routine data are relatively inexpensive to collect. Unlike surveys, routine data can also be analyzed monthly and are available at any administrative level. The use of routine administrative data for calculating indicators over time will provide information on trends and thus guide management decisions. Furthermore, disaggregation of the routine-based estimates by districts/subnational units serves

program purposes as specific areas within each district/subnational unit where special attention and resources need to be diverted may be identified. This is particularly relevant in the context of health sector reform and decentralization. Routine data are more appropriate, therefore, for active monitoring of immunization programs. However, caution needs to be exercised in the use of administrative data on the number of doses administered due to potential problems with the completeness of reporting (i.e., the proportion of sites submitting reports) and the degree to which data from the private sector are included in routine reports.

Population-based surveys can provide more accurate and representative data for estimating coverage and can be helpful in validating the routine reporting system. However, conducting a survey is expensive and not done frequently. Furthermore, care should be taken when designing cluster surveys to ensure geographical representation and to avoid selection bias. Card-based data increase the validity of survey estimates, but the vaccination card may not be widely available.



INDICATOR **DTP1 COVERAGE**

Definition

When calculating DTP1 coverage from population-based surveys, the definition is as follows:

Proportion of children age 12-23 months who received the first dose of Diphtheria, Tetanus, and Pertussis (DTP1) vaccine before 12 months of age.

Numerator: Number of children age 12-23 months who were immunized with first dose of DTP (DTP1) before 12 months of age.

Denominator: The number of children 12-23 months of age surveyed.

When calculating annual coverage of DTP1 from routine data, the definition is as follows:

Proportion of infants 0-11 months of age in a specified calendar year who were immunized with DTP1 in that calendar year.

Numerator: Number immunized by 12 months with DTP1 in a specified calendar year.

Denominator: Total number of surviving infants less than 12 months of age in the same year.

Measurement Tools

Population-based surveys (DHS, EPI Cluster Survey, KPC, MICS); routine administrative data

What It Measures

The indicator measures coverage of the first dose in a three-dose series of DTP and is commonly

used as an approximation of availability of, access to, and initial use of immunization services by children. It reflects that the child has been in contact with a health worker and initiated vaccination. The indicator assumes that there is a functioning EPI program in place including health providers trained in EPI and adequate supplies to carry out immunization services, and that the community understands information regarding immunization.

How to Measure It

When collecting data through household surveys, caretakers are asked to present the child's vaccination card to the interviewer so that it can be used to record the actual dates at which vaccinations were given. If a health card cannot be presented, then all of the information about the vaccination of children is collected from the mother, based on her memory about whether or not the child received those vaccinations. For DTP (and polio) vaccines, follow-up questions are asked about the number of times the child received the vaccine. The DTP1 coverage rate calculated on the basis of both card and history information is recommended. The indicator can be measured at the national and sub-national/district levels.

DTP1 coverage by age 12 months can also be calculated from routine data. Daily tallies of vaccinations are added at the end of the month and converted into a percentage as a measure of coverage. The data requirements for calculating DTP1 coverage from routine data are the number of infants immunized by age 12 months with DTP1 vaccine in the specified calendar year (numerator) and the number of infants surviving to 12 months of age (live births – infant deaths) in the target population in that specified calendar

year. The box below illustrates how to calculate the annual coverage rate for DTP1 vaccine.

Calculating Annual Coverage for DTP1 Vaccine for 2003 from Routine Administrative Data

DTP1 coverage
$\frac{\text{Number immunized by 12 months with DTP1 in 2003} \times 100}{\text{Number of surviving infants <12 months of age in 2003}}$

The difficulty of calculating and interpreting immunization coverage rates from routine data often stems from problems related to estimating the size of the target population. These problems, in turn, are the result of inaccurate or outdated census counts, population migrations, and unforeseen changes in birth rates or infant mortality. Where data on the numbers of surviving infants are unavailable, the total number of live births can be estimated from the total population and crude birth rate and infant mortality rate in a geographic area as follows:

$$\text{Number of surviving infants} = \text{Total population} \times \text{crude birth rate} \times (1 - \text{IMR})$$

For example:

Estimating the Number of Surviving Infants: Example
Total population: 5,500,000
Crude birth rate (CBR): 30/1000
Infant mortality rate (IMR): 80/1000
$\begin{aligned} \text{Number of surviving infants} &= \\ &\text{Total population} \times \text{CBR} \times (1 - \text{IMR}) \\ &= 5,500,000 \times 30/1000 \times (1 - 0.080) \\ &= 5,500,000 \times 0.030 \times 0.920 \\ &= 151,800 \end{aligned}$
Source: <i>Immunization Essentials: A Practical Field Guide</i> (USAID, 2003).

If the population figures presented in the previous column cannot be obtained from a national or community census and if no data are available on the crude birth rate or infant mortality rate, the number of children under one year in the population can be estimated by multiplying the total population by 4% (WHO, 2002b). For example, if the total population is 30,000, then the number of children under one year is $30,000 \times 4/100 = 1200$. If a more precise percentage of children under one year in the population is known, this estimate should be used to calculate the annual target population.

As with other EPI vaccines, monitoring of DTP1 coverage, based on doses of vaccine administered in the target age group (usually infants < 1 year of age), should be done on a monthly basis at the health facility and district level (WHO, 1996). This requires estimating the monthly target population. The monthly target population can be estimated by dividing the number of children under one year of age by 12. (If the annual target population of children under one year of age is 1200, the monthly target is $1200/12 = 100$).

One of the milestones established by GAVI is that by 2010 or sooner all countries will have routine immunization coverage at 90% nationally with at least 80% coverage in every district. The cut-off DTP1 coverage can be adjusted depending on the local situation/progress and what a country considers “high” or “low” coverage (WHO, 2002b).

Strengths and Limitations

In countries with established immunization programs, one can use the DTP1 coverage rate as a measure of the availability of and access to immunization services by children. Knowledge of the DTP1 coverage rate permits the estimation of the percentage of children who have never been reached by immunization services (Never-reached = 100% minus DTP1 % coverage). However, this indicator is a crude measure in that it does not take into account the timeliness of the first dose of DTP.

Related indicators are:

- Proportion of districts/subnational units reporting < 50% DTP1 coverage
- Proportion of districts/subnational units reporting 50-79% DTP1 coverage
- Proportion of districts/subnational units reporting $\geq 80\%$ DTP1 coverage

These indicators measure the performance of different units at the subnational level against expected national targets and are easily calculated from administrative data monitoring the number of doses administered to the target population.

Estimates based on routine data are relatively inexpensive to collect. Unlike surveys, routine data can also be analyzed monthly and are available at any administrative level. The use of routine administrative data for calculating indicators over time will provide information on trends and thus guide management decisions. Furthermore, disaggregation of the routine-based estimates by districts/subnational units serves program purposes as specific areas within each district/subnational unit where special attention and resources need to be diverted may be identified. This is particularly relevant in the context of the health sector reform and decentralization currently underway. Routine data are more appropriate, therefore, for active monitoring of immunization programs. However, caution needs to be exercised in the use of administrative data on the number of doses administered due to potential problems with the completeness of reporting (i.e., the proportion of sites submitting reports) and the degree to which data from the private sector are included in routine reports.

Population-based surveys can provide more accurate and representative data for estimating DTP coverage and can be helpful in validating the routine reporting system. However, conducting a survey is expensive and not done frequently. Furthermore, care should be taken when designing cluster surveys to ensure geographical representation and to avoid selection bias. Card-based data increase the validity of survey estimates, but the vaccination card may not be widely available.

INDICATOR DTP3 COVERAGE

Definition

When calculating DTP3 coverage from population-based surveys, the definition is as follows:

Proportion of children age 12-23 months who received three doses of DTP (DTP3) vaccine by age 12 months.

Numerator: Number of children age 12-23 months who received three doses of DTP vaccine by age 12 months.

Denominator: Total number of children age 12-23 months surveyed.

When calculating annual coverage of DTP3 from routine data, the definition is as follows:

Proportion of infants 0-11 months of age in a specified calendar year who were immunized with DTP3 in that calendar year.

Numerator: Number immunized by 12 months with DTP3 in a specified calendar year.

Denominator: Total number of surviving infants less than 12 months of age in the same year.

Measurement Tools

Population-based surveys (DHS, EPI Cluster Survey, KPC, MICS); routine administrative data

What It Measures

This indicator measures the ability of the health system to deliver a series of vaccinations. It indicates continuity of use of immunization services by caretakers and client satisfaction with services. Hence, it measures the effectiveness of routine service delivery.

How to Measure It

When collecting data through household surveys, caretakers are asked to present the child's vaccination card to the interviewer so that it can be used to record the actual dates at which vaccinations were given. If a health card cannot be presented, then all of the information about vaccination of children is collected from the mother, based on her memory about whether or not the child received those vaccinations. For DTP (and polio) vaccines, follow-up questions are asked about the number of times the child received the vaccine. The DTP3 coverage rate calculated on the basis of both card and history information is recommended. The indicator can be measured at the national and sub-national/district levels.

DTP3 coverage by age 12 months can also be calculated from routine data. Daily tallies of vaccinations are added at the end of the month and converted into a percentage as a measure of coverage. The data requirements for calculating DTP3 coverage from routine data are the number of infants immunized by age 12 months with DTP3 vaccine in the specified calendar year (numerator) and the number of infants surviving to 12 months of age (live births – infant deaths) in the target population in that specified calendar year. The box below illustrates how to calculate the annual coverage rate for DTP3 vaccine.

Calculating Annual Coverage for DTP3 Vaccine for 2003 from Routine Administrative Data

DTP3 coverage
$\frac{\text{Number immunized by 12 months with DTP3 in 2003} \times 100}{\text{Number of surviving infants <12 months of age in 2003}}$

The difficulty of calculating and interpreting immunization coverage rates from routine data often stems from problems related to estimating the size of the target population. These problems, in turn, are the result of inaccurate or outdated census counts, population migrations, and unforeseen changes in birth rates or infant mortality. Where data on the numbers of surviving infants are unavailable, the total number of live births can be estimated from the total population and crude birth rate and infant mortality rate in a geographic area as follows:

$$\text{Number of surviving infants} = \text{Total population} \times \text{crude birth rate} \times (1 - \text{IMR})$$

For example:

Estimating the Number of Surviving Infants: Example

Total population: 5,500,000
Crude birth rate (CBR): 30/1000
Infant mortality rate (IMR): 80/1000

$$\begin{aligned} \text{Number of surviving infants} &= \\ &\text{Total population} \times \text{CBR} \times (1 - \text{IMR}) \\ &= 5,500,000 \times 30/1000 \times (1 - 0.080) \\ &= 5,500,000 \times 0.030 \times 0.920 \\ &= 151,800 \end{aligned}$$

Source: *Immunization Essentials: A Practical Field Guide* (USAID, 2003).

If the above population figures cannot be obtained from a national or community census and if no data are available on the crude birth rate or infant mortality rate, the number of children under one year in the population can be estimated by multiplying the total population by 4% (WHO, 2002b). For example, if the total population is 30,000, then the number of children under one year is $30,000 \times 4/100 = 1200$. If a more precise percentage of children under one year in the population is known, this estimate should be used to calculate the annual target population.

As with other EPI vaccines monitoring of DTP3 immunization coverage, based on doses of vaccine administered in the target age group (usually infants < 1 year of age) should be done on a monthly basis at the health facility and district level (WHO, 1996). This requires estimating the monthly target population. The monthly target population can be estimated by dividing the number of children under one year of age by 12. (If the annual target population of children under one year of age is 1200, the monthly target is $1200/12 = 100$).

One of the milestones established by GAVI is that by 2010 or sooner all countries will have routine immunization coverage at 90% nationally with at least 80% coverage in every district. The cut-off DTP3 coverage can be adjusted depending on the local situation/progress and what a country considers “high” or “low” coverage (WHO, 2002b).

Strengths and Limitations

In countries with established immunization programs, the DTP3 coverage rate can be used as a proxy for full immunization coverage. However, the indicator is a crude measure in that it does not take into account the timeliness of each of the doses of DTP or the interval between doses.

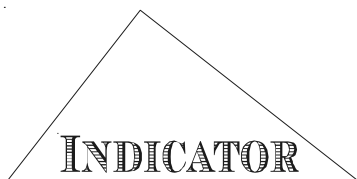
Related indicators are:

- Proportion of districts/subnational units reporting < 50% DTP3 coverage
- Proportion of districts/subnational units reporting 50-79% DTP3 coverage
- Proportion of districts/subnational units reporting $\geq 80\%$ DTP3 coverage

These indicators conform to GAVI requirements, and measure the performance of different units at the subnational level against expected national targets. The indicators are easily calculated from administrative data monitoring the number of doses administered to the target population.

Estimates based on routine data are relatively inexpensive to collect. Unlike surveys, routine data can also be analyzed monthly and are available at any administrative level. The use of routine administrative data for calculating indicators over time will provide information on trends and thus guide management decisions. Furthermore, disaggregation of the routine-based estimates by districts/subnational units serves program purposes as specific areas within each district/subnational unit where special attention and resources need to be diverted may be identified. This is particularly relevant in the context of health sector reform and decentralization. Routine data are more appropriate, therefore, for active monitoring of immunization programs. However, caution needs to be exercised in the use of administrative data on the number of doses administered due to potential problems with the completeness of reporting (i.e., the proportion of sites submitting reports) and the degree to which data from the private sector are included in routine reports.

Population-based surveys can provide more accurate and representative data for estimating DTP coverage and can be helpful in validating the routine reporting system. However, conducting a survey is expensive and not done frequently. Furthermore, care should be taken when designing cluster surveys to ensure geographical representation and to avoid selection bias. Card-based data increase the validity of survey estimates, but the vaccination card may not be widely available.



INDICATOR **OPV3 COVERAGE**

Definition

Proportion of children age 12-23 months who received three doses of oral polio vaccine (OPV3) by age 12 months.

Numerator: Number of children age 12-23 months who received three doses of OPV by age 12 months.

Denominator: Total number of children age 12-23 months surveyed.

When calculating annual coverage of OPV3 from routine data, the definition is as follows:

Proportion of infants 0-11 months of age in a specified calendar year who were immunized with OPV3 in that calendar year.

Numerator: Number immunized by 12 months with OPV3 in a specified calendar year.

Denominator: Total number of surviving infants less than 12 months of age in the same year.

Measurement Tools

Population-based surveys (DHS, EPI Cluster Survey, KPC, MICS); routine administrative data

What It Measures

This indicator measures the ability of the health system to deliver a series of vaccinations. It indicates continuity of use of immunization services by caretakers, and client satisfaction with services. Hence, it measures the effectiveness of routine service.

How to Measure It

When collecting data through household surveys, caretakers are asked to present the child's vaccination card to the interviewer so that it can be used to record the actual dates at which vaccinations were given. If a dose of OPV is given at a health facility within the first two weeks of life (this dose being referred to as OPV0), this is not counted as one of the three doses required to calculate the numerator for this indicator. If a health card cannot be presented, then all of the information about the vaccination of children is collected from the mother, based on her memory about whether or not the child received those vaccinations. Follow-up questions are asked about the number of times the child received the vaccine.

To calculate this indicator, campaign-administered doses should be excluded. These doses do not reflect the utilization of routine immunization services. For that reason, survey-based questions must indicate whether OPV doses were received through the routine system or campaigns. The OPV3 coverage rate calculated on the basis of both card and history information is recommended. The indicator can be measured at the national and sub-national/district levels.

OPV3 coverage by age 12 months can also be calculated from routine data. Daily tallies of vaccinations are added at the end of the month and converted into a percentage as a measure of coverage. The data requirements for calculating OPV3 coverage from routine data are the number of infants immunized by age 12 months with OPV3 vaccine in the specified calendar year (numerator) and the number of infants surviving to 12 months of age (live births – infant deaths)

in the target population in that specified calendar year. The box below illustrates how to calculate the annual coverage rate for OPV3 vaccine.

Calculating Annual Coverage for OPV3 Vaccine for 2003 from Routine Administrative Data

OPV3 coverage
Number immunized by 12 months with OPV3 in 2003 X 100
Number of surviving infants < 12 months of age in 2003

The difficulty of calculating and interpreting immunization coverage rates from routine data often stems from problems related to estimating the size of the target population. These problems, in turn, are the result of inaccurate or outdated census counts, population migrations, and unforeseen changes in birth rates or infant mortality. Where data on the numbers of surviving infants are unavailable, the total number of live births can be estimated from the total population and crude birth rate and infant mortality rate in a geographic area as follows:

$$\text{Number of surviving infants} = \text{Total population} \times \text{crude birth rate} \times (1 - \text{IMR})$$

For example:

If the population figures presented in the previous column cannot be obtained from a national or

community census and if no data are available on the crude birth rate or infant mortality rate, the number of children under one year in the population can be estimated by multiplying the total population by 4% (WHO, 2002b). For example, if the total population is 30,000, then the number of children under one year is $30,000 \times 4/100 = 1200$. If a more precise percentage of children under one year in the population is known, this estimate should be used to calculate the annual target population.

As with other EPI vaccines, monitoring of OPV3 immunization coverage, based on doses of the vaccine administered in the target age group (usually infants < 1 year of age), should be done on a monthly basis at the health facility and district level (WHO, 1996). This requires estimating the monthly target population. The monthly target population can be estimated by dividing the number of children under one year of age by 12. (If the annual target population of children under one year of age is 1200, the monthly target is $1200/12 = 100$).

One of the milestones established by GAVI is that by 2010 or sooner all countries will have routine immunization coverage at 90% nationally with at least 80% coverage in every district. The cut-off OPV3 coverage can be adjusted depending on the local situation/progress and what a country considers “high” or “low” coverage (WHO, 2002b).

Strengths and Limitations

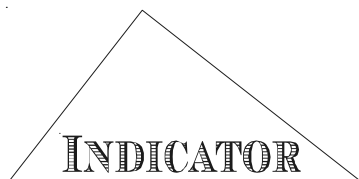
Estimates based on routine data are relatively inexpensive to collect. Unlike surveys, routine data can also be analyzed monthly and are available at any administrative level. The use of routine administrative data for calculating indicators over time will provide information on trends and thus guide management decisions. Furthermore, disaggregation of the routine-based estimates by districts/subnational units serves program purposes as specific areas within each district/subnational unit where special attention and

Estimating the Number of Surviving Infants: Example
Total population: 5,500,000
Crude birth rate (CBR): 30/1000
Infant mortality rate (IMR): 80/1000
 Number of surviving infants = Total population x CBR x (1 - IMR)
 = 5,500,000 x 30/1000 x (1 - 0.080)
= 5,500,000 x 0.030 x 0.920
= 151,800
 Source: <i>Immunization Essentials: A Practical Field Guide</i> (USAID, 2003).

resources need to be diverted may be identified. This is particularly relevant with the health sector reform and decentralization currently underway. Routine data are more appropriate, therefore, for active monitoring of immunization programs.

However, caution needs to be exercised in the use of routine data on the number of doses administered due to potential problems with the completeness of reporting (i.e., the proportion of sites submitting reports) and the degree to which data from the private sector are included in routine reports.

Population-based surveys can provide more accurate and representative data for estimating OPV3 coverage and can be helpful in validating the routine reporting system. However, conducting a survey is expensive and not done frequently. Furthermore, care should be taken when designing cluster surveys to ensure geographical representation and to avoid selection bias. Card-based data increase the validity of survey estimates, but the vaccination card may not be widely available.



MEASLES COVERAGE

Definition

When calculating measles coverage from population-based surveys, the definition is as follows:

Proportion of children age 12-23 months who were immunized with measles vaccine before age 12 months.

Numerator: Number of children age 12-23 months who were immunized with measles vaccine before age 12 months.

Denominator: Total number of children age 12-23 months surveyed.

When calculating annual measles coverage from routine data, the definition is as follows:

Proportion of infants 0-11 months of age in a specified calendar year who were immunized with measles vaccine in that calendar year.

Numerator: Number immunized by 12 months with measles vaccine in a given year.

Denominator: Total number of surviving infants less than 12 months of age in the same year.

Measurement Tools

Population-based surveys (DHS, EPI Cluster Survey, KPC, MICS); routine administrative data

What It Measures

This indicator measures protection against measles, a disease of major public health importance. Measles remains one of the leading causes of child mortality in developing countries and causes approximately 10% of all deaths among

children aged less than five years (WHO, 1994). In combination with disease surveillance data, this indicator measures progress towards measles control and elimination. The priorities for countries pursuing accelerated measles control include improving routine vaccination coverage levels to at least 80% in all districts of every country, and achieving at least 90% coverage nationwide. Priorities for countries and regions with a measles elimination goal include improving routine vaccination coverage levels to at least 90% in all districts of every country, resulting in nationwide coverage greater than or equal to 95% (CDC, 1999).

How to Measure It

When collecting data through household surveys, caretakers are asked to present the child's vaccination card to the interviewer so that it can be used to record the actual dates at which vaccinations were given. If a health card cannot be presented, then all of the information about vaccination of children is collected from the mother, based on her memory about whether or not the child received those vaccinations. In some situations, children may have received measles doses during campaigns. To calculate this indicator, campaign-administered doses should be excluded. These doses do not reflect the utilization of routine immunization services. For that reason, survey-based questions must inquire as to whether the measles dose was received through the routine system or campaigns. The measles coverage rate calculated on the basis of both card and history information is recommended. The indicator can be measured at both the national and sub-national/district levels.

Measles-containing vaccine (MCV) coverage by age 12 months can also be calculated from routine data. Daily tallies of vaccinations are added at the

end of the month and converted into a percentage as a measure of coverage. The data requirements for calculating measles vaccine coverage from routine data are the number of infants immunized by 12 months with measles vaccine in the specified calendar year (numerator) and the number of infants surviving to 12 months of age (live births – infant deaths) in the target population in that specified calendar year. Measurement of the numerator should be taken with caution so as *not* to include children over one year of age. The box below illustrates how to calculate the annual coverage rate for measles vaccine.

Calculating Annual Coverage for Measles Vaccine for 2003 from Routine Administrative Data

Measles coverage
$\frac{\text{Number immunized by 12 months with measles vaccine in 2003} \times 100}{\text{Number of surviving infants < 12 months of age in 2003}}$

The difficulty of calculating and interpreting immunization coverage rates from routine data often stems from problems related to estimating the size of the target population. These, in turn, are the result of inaccurate or outdated census counts, population migrations, and unforeseen changes in birth rates or infant mortality. Where data on the numbers of surviving infants are unavailable, the total number of live births can be estimated from the total population and crude birth rate and infant mortality rate in a geographic area as follows:

$$\text{Number of surviving infants} = \text{Total population} \times \text{crude birth rate} \times (1 - \text{IMR})$$

For example:

Estimating the Number of Surviving Infants: Example

Total population: 5,500,000
Crude birth rate (CBR): 30/1000
Infant mortality rate (IMR): 80/1000

$$\begin{aligned} \text{Number of surviving infants} &= \\ &\text{Total population} \times \text{CBR} \times (1 - \text{IMR}) \\ &= 5,500,000 \times 30/1000 \times (1 - 0.080) \\ &= 5,500,000 \times 0.030 \times 0.920 \\ &= 151,800 \end{aligned}$$

Source: *Immunization Essentials: A Practical Field Guide* (USAID, 2003).

If the above population figures cannot be obtained from a national or community census and if no data are available on the crude birth rate or infant mortality rate, the number of children under one year in the population can be estimated by multiplying the total population by 4% (WHO, 2002b). For example, if the total population is 30,000, then the number of children under one year is $30,000 \times 4/100 = 1200$. If a more precise percentage of children under one year in the population is known, this estimate should be used to calculate the annual target population.

As with other EPI vaccines, monitoring of measles immunization coverage based on doses of the vaccine administered in the target age group (usually infants < 1 year of age) should be done on a monthly basis at the health facility and district level (WHO, 1996). This requires estimating the monthly target population. The monthly target population can be estimated by dividing the number of children under one year of age by 12. (If the annual target population of children less than one year of age is 1200, the monthly target is $1200/12 = 100$).

One of the milestones established by GAVI is that by 2010 or sooner all countries will have routine immunization coverage at 90% nationally with at least 80% coverage in every district. It should be noted that even with very high immunization coverage (95%), *susceptibles will continue to accumulate fairly rapidly* as the measles vaccine is not 100% effective (WHO, 1996).

Strengths and Limitations

Estimates based on routine data are relatively inexpensive to collect. Unlike surveys, routine data can also be analyzed monthly and are available at any administrative level. The use of routine administrative data for calculating indicators over time will provide information on trends and thus guide management decisions. Furthermore, disaggregation of the routine-based estimates by districts/subnational units serves program purposes as specific areas within each district/subnational unit where special attention and resources need to be diverted may be identified. This is particularly relevant in the context of health sector reform and decentralization. Routine data are more appropriate, therefore, for active monitoring of immunization programs.

Caution needs to be exercised in the use of administrative data on the number of doses administered due to potential problems with the completeness of reporting (i.e., the proportion of sites submitting reports) and the degree to which data from the private sector are included in routine reports.

This indicator does not indicate the capability of the health system to deliver a series of vaccines. It also does not take into account the timeliness of measles vaccination. Immunization for measles should be given as soon as possible after the child completes nine months of life to avoid the risk of infection by the wild measles virus. The numerator includes children who may have received the vaccine before the age of 9 months, thus conferring uncertain immunity. The numerator may also include children older than 12 months of age, thus

inflating coverage among the infant population. This may be because the tally and reporting forms do not include a column for recording immunizations received by children older than 12 months of age. Furthermore, supplementary doses may be confused with routine doses when measuring this indicator.

Population-based surveys provide more accurate and representative data for estimating coverage and can be helpful in validating the routine reporting system. However, conducting a survey is expensive and not done frequently. Furthermore, care should be taken when designing cluster surveys to ensure geographical representation and to avoid selection bias. Card-based data increase the validity of survey estimates, but the vaccination card may not be widely available.

Definition

When calculating HepB3 coverage from population-based surveys, the definition is as follows:

Proportion of children age 12-23 months who received three doses of Hepatitis B (HepB3) vaccine by age 12 months.

Numerator: Number of children age 12-23 months who received three doses of HepB vaccine by age 12 months.

Denominator: Total number of children age 12-23 months surveyed.

When calculating annual HepB3 coverage from routine data, the definition is as follows:

Proportion of infants 0-11 months of age in a specified calendar year who were immunized with HepB3 in that calendar year.

Numerator: Number of children immunized by 12 months with HepB3 in a given year.

Denominator: Total number of surviving infants less than 12 months of age in the same year.

Measurement Tools

Population-based surveys (DHS, EPI Cluster Survey, KPC, MICS); routine administrative data

What It Measures

Universal infant immunization against Hepatitis B is now recognized as the proper strategy for every country for the long-term control of chronic HBV infection and its sequelae (cirrhosis and liver cancer). If the vaccine is administered before infection, it prevents the development of the

disease and the carrier state in almost all individuals. On a population basis, HepB is most effective when used routinely as part of the infant immunization schedule, although it can be used in persons of any age. HepB vaccine schedules are very flexible and the vaccine can be added to coincide with DTP schedules so that additional visits for HepB vaccination would not be necessary.

In countries with high perinatal transmission, babies are frequently infected at the time of birth. In those countries with the ability to reach newborns, Hepatitis B vaccine should be offered as soon as possible after birth, preferably within the first 24 hours of life. As WHO recommends, the routine vaccination of all infants as an integral part of national immunization schedules should be the highest priority in all countries. In countries of high disease endemicity (HepB surface antigen (HbsAg) prevalence [8% or more]), routine infant HepB vaccination can rapidly reduce transmission because most chronic infections are acquired as a result of spread either from mother to baby or from child to child in the first year of life (WHO, 2003).

The indicator measures HepB coverage. The indicator is applicable to countries where routine infant HepB vaccination has been introduced. It assumes that there is a functioning EPI program in place including health providers trained in immunization and adequate supplies to carry out EPI services, and that the community understands information regarding immunization.

How to Measure It

When collecting data through household surveys, and in countries where HepB vaccination is provided with DTP vaccination, HepB3 coverage may be calculated based on a child's vaccination card and an interview with his/her caretaker. During the survey, caretakers are asked to present

the child's vaccination card to the interviewer so that it can be used to record the actual dates at which vaccinations were given. If a health card cannot be presented, then all of the information about vaccination of children is collected from the mother, based on her memory about whether or not the child received those vaccinations. Similar to DTP (and polio) vaccines, follow-up questions can be asked about the number of times the child received the HepB vaccine.

The HepB3 coverage rate calculated on the basis of both card and history information is recommended. The indicator can be measured at both the national and sub-national/district levels. In countries where a high proportion of chronic infections are acquired perinatally (e.g. South East Asia), a birth dose of Hepatitis B vaccine may be given to infants when feasible. If a dose of HepB is given at a health facility within first two weeks of life, this dose is referred to as HepB1, and is counted as one of the three doses required to calculate the numerator for this indicator.

HepB3 coverage by age 12 months can also be calculated from routine data. Daily tallies of vaccinations are added at the end of the month and converted into a percentage as a measure of coverage. The data requirements for calculating HepB3 coverage from routine data are the number of infants immunized by 12 months with HepB3 vaccine in the specified calendar year (numerator) and the number of infants surviving to 12 months of age (live births – infant deaths) in the target population in that specified calendar year. The box below illustrates how to calculate the annual coverage rate for HepB3 vaccine.

Calculating Annual Coverage for HepB3 Vaccine for 2003 from Routine Administrative Data

HepB3 coverage
$\frac{\text{Number immunized by 12 months with HepB3 in 2003} \times 100}{\text{Number of surviving infants < 12 months of age in 2003}}$

The difficulty of calculating and interpreting immunization coverage rates from routine data often stems from problems related to estimating the size of the target population. These, in turn, are the result of inaccurate or outdated census counts, population migrations, and unforeseen changes in birth rates or infant mortality. Where data on the numbers of surviving infants are unavailable, the total number of live births can be estimated from the total population and crude birth rate and infant mortality rate in a geographic area as follows:

$$\text{Number of surviving infants} = \text{Total population} \times \text{crude birth rate} \times (1 - \text{IMR})$$

For example:

Estimating the Number of Surviving Infants: Example

Total population: 5,500,000
Crude birth rate (CBR): 30/1000
Infant mortality rate (IMR): 80/1000

$$\begin{aligned} \text{Number of surviving infants} &= \\ \text{Total population} \times \text{CBR} \times (1 - \text{IMR}) &= \\ &= 5,500,000 \times 30/1000 \times (1 - 0.080) \\ &= 5,500,000 \times 0.030 \times 0.920 \\ &= 151,800 \end{aligned}$$

Source: *Immunization Essentials: A Practical Field Guide* (USAID, 2003).

If the above population figures cannot be obtained from official census data or a community census and if no data are available on the crude birth rate or infant mortality rate, the number of children under one year in the population can be estimated by multiplying the total population by 4% (WHO, 2002b). For example, if the total population is 30,000, then the number of children under one year is $30,000 \times 4/100 = 1200$. If a more precise percentage of children under one year in the population is known, this estimate should be used to calculate the annual target population.

One of the milestones established by GAVI is that by 2010 or sooner all countries will have routine immunization coverage at 90% nationally with at least 80% coverage in every district. As many countries are at the early stages of the integration of Hepatitis B vaccine into their routine immunization programs, this indicator will typically remain low for some time.

Strengths and Limitations

This indicator can be easily calculated from administrative data monitoring the number of doses administered to the target population. Estimates based on routine data are relatively inexpensive to collect. Unlike surveys, routine data can also be analyzed monthly and are available at any administrative level. The use of routine administrative data for calculating indicators over time will provide information on trends and thus guide management decisions. Furthermore, disaggregation of the routine-based estimates by districts/subnational units serves program purposes as specific areas within each district/subnational unit where special attention and resources need to be diverted may be identified. This is particularly relevant in the context of the health sector reform and decentralization currently underway. Routine data are more appropriate, therefore, for active monitoring of immunization programs. However, caution needs to be exercised in the use of administrative data on the number of doses administered due to potential problems with the completeness of reporting (i.e., the proportion of sites submitting reports) and the degree to which data from the private sector are included in routine reports.

Population-based surveys provide more accurate and representative data for estimating coverage and can be helpful in validating the routine reporting system. However, conducting a survey is expensive and not done frequently. Furthermore, care should be taken when designing cluster surveys to ensure geographical representation and to avoid selection bias. Card-based data increase the validity of survey estimates, but the vaccination card may not be widely available.



INDICATOR **HIB3 COVERAGE**

Definition

When calculating Hib3 coverage from population-based surveys, the definition is as follows:

Proportion of children age 12-23 months who received three doses of Haemophilus Influenzae Type B (Hib3) vaccine by age 12 months.

Numerator: Number of children age 12-23 months who received three doses of Hib vaccine by age 12 months.

Denominator: Total number of children age 12-23 months surveyed.

When calculating annual Hib3 coverage from routine data, the definition is as follows:

Proportion of infants 0-11 months of age in a specified calendar year who were immunized with Hib3 in that calendar year.

Numerator: Number of children immunized by 12 months with Hib3 in a given year.

Denominator: Total number of surviving infants less than 12 months of age in the same year.

Measurement Tool

Population-based surveys (DHS, EPI Cluster Survey, KPC, MICS); routine administrative data

What It Measures

Since 1998, WHO has recommended that Hib vaccine be included in routine infant immunization programs in all countries where resources permit its use and the burden of disease is established. One of the milestones set by the

Global Alliance for Vaccines and Immunization is that by 2005, 50% of the poorest countries with high disease burden and adequate delivery systems will have introduced Hib vaccine (GAVI, 2001). Where it has been studied carefully, Hib is typically the leading cause of bacterial meningitis in infants and children less than five years old and accounts for one-third to one-half of all cases of bacterial meningitis in this age group. Studies have also shown that Hib accounts for up to one-quarter of the severe pneumonia cases in young children. WHO (2000c) estimates that without vaccination, 400,000 children die each year of Hib disease. Infants 0-11 months of age require a primary dose schedule of three doses of Hib conjugate vaccine in the first year of life. This indicator measures Hib3 coverage and the impact of the integration of Hib vaccine into the routine national immunization program.

How to Measure It

In countries that are newly integrating Hib vaccination into national immunization programs, Hib3 coverage by age 12 months should be calculated from routine data. Daily tallies of vaccinations are added at the end of the month and converted into a percentage as a measure of coverage.

Hib3 coverage by age 12 months can also be calculated from routine data. Daily tallies of vaccinations are added at the end of the month and converted into a percentage as a measure of coverage. The data requirements for calculating Hib3 coverage from routine data are the number of infants immunized by 12 months with Hib3 vaccine in the specified calendar year (numerator) and the number of infants surviving to 12 months of age (live births – infant deaths) in the target population in that specified calendar year. The

box below illustrates how to calculate the annual coverage rate for Hib3 vaccine.

Calculating Annual Coverage for Hib3 Vaccine for 2003 from Routine Administrative Data

Hib3 coverage
$\frac{\text{Number immunized by 12 months with Hib3 in 2003} \times 100}{\text{Number of surviving infants < 12 months of age in 2003}}$

When using administrative data, caution must also be taken not to include children aged 12 months and older in the calculation of coverage rates.

The difficulty of calculating and interpreting immunization coverage rates from routine data often stems from problems related to estimating the size of the target population. These, in turn, are the result of inaccurate or outdated census counts, population migrations, and unforeseen changes in birth rates or infant mortality. Where data on the numbers of surviving infants are unavailable, the total number of live births can be estimated from the total population and crude birth rate and infant mortality rate in a geographic area as follows:

$$\text{Number of surviving infants} = \text{Total population} \times \text{crude birth rate} \times (1 - \text{IMR})$$

For example:

Estimating the Number of Surviving Infants: Example
Total population: 5,500,000
Crude birth rate (CBR): 30/1000
Infant mortality rate (IMR): 80/1000
 Number of surviving infants = Total population \times CBR \times (1 - IMR)
 = 5,500,000 \times 30/1000 \times (1 - 0.080)
= 5,500,000 \times 0.030 \times 0.920
= 151,800
 Source: <i>Immunization Essentials: A Practical Field Guide</i> (USAID, 2003).

If the population figures presented in the previous column cannot be obtained from official census data or a community census and if no data are available on the crude birth rate or infant mortality rate, the number of children under one year in the population can be estimated by multiplying the total population by 4% (WHO, 2002b). For example, if the total population is 30,000, then the number of children under one year is 30,000 \times 4/100 = 1200. If a more precise percentage of children under one year in the population is known, this estimate should be used to calculate the annual target population.

In countries in which Hib vaccine has been administered to infants for a number of years, the indicator can also be calculated using household survey data. When using survey data, the indicator is defined as the proportion of children age 12-23 months who received three doses of Hib vaccine by age 12 months. The numerator is defined as the number of children age 12-23 months who received three doses of Hib vaccine by age 12 months. The denominator for survey-based estimates is the total number of children age 12-23 months surveyed.

When collecting data through household surveys, caretakers are asked to present the child's vaccination card to the interviewer so that it can be used to record the actual dates at which vaccinations were given. If a health card cannot be presented, then all of the information about vaccination of children is collected from the mother, based on her memory about whether or not the child received Hib3 vaccinations. Similar to DTP (and polio) vaccines, follow-up questions can be asked about the number of times the child received the Hib3 vaccine. This should include only vaccinations that the child has received through the routine system, and *not* those received during any national Hib campaigns that may have been conducted. The Hib3 coverage rate calculated on the basis of both card and history information is recommended. The indicator can be measured at the national and sub-national/district levels.

One of the milestones established by GAVI is that by 2010 or sooner all countries will have routine immunization coverage at 90% nationally with at least 80% coverage in every district. As many countries are at the early stages of the integration of Hib vaccine into their routine immunization programs, this indicator will typically remain low for some time.

Strengths and Limitations

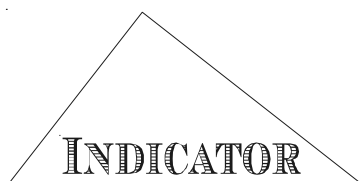
This indicator can be easily calculated from administrative data monitoring the number of doses administered to the target population. Estimates based on routine data are relatively inexpensive to collect. Unlike surveys, routine data can also be analyzed monthly and are available at any administrative level. The use of routine administrative data for calculating indicators over time will provide information on trends and thus guide management decisions. Furthermore, disaggregation of the routine-based estimates by districts/subnational units serves program purposes as specific areas within each district/subnational unit where special attention and resources need to be diverted may be identified. This is particularly relevant with the health sector reform and decentralization currently underway. Routine data are more appropriate, therefore, for active monitoring of immunization programs.

Caution needs to be exercised in the use of administrative data on the number of doses administered due to potential problems with the completeness of reporting (i.e., the proportion of sites submitting reports) and the degree to which data from the private sector are included in routine reports. As a result, coverage estimated through this indicator may be less accurate in places where data quality is poor.

Population-based surveys provide more accurate and representative data for estimating coverage and can be helpful in validating the routine reporting system. However, conducting a survey is expensive and not done frequently. Furthermore, care should be taken when designing

cluster surveys to ensure geographical representation and to avoid selection bias.

Estimates based on mother's recall may be complicated by the fact that Hib conjugate vaccines are available as a monovalent vaccine (Hib conjugate vaccine only) or in combination with other routine vaccines (e.g., DTP, DTP-Hepatitis B). It may be difficult for mothers to know whether a child received Hib vaccine if a combination vaccine is used, especially in the early phases of the introduction of Hib vaccine into the routine national immunization program. Another limitation with estimates based on mother's recall is low recognition of this causative agent combined with the fact that most local languages do not have a specific name for the disease. Hib can cause meningitis and pneumonia, but it is only one cause of those diseases. This is unlike the case with measles, pertussis, and polio, which are all recognizable distinct diseases in the vernacular. Card-based data increase the validity of survey estimates, but the vaccination card may not be widely available. Note that this indicator does not take into account the timeliness of Hib vaccination.



DROPOUT FROM DTP1 TO DTP3

Definition

Survey data

Proportion of children age 12-23 months who received DTP1 but did not receive DTP3 immunization before age 12 months.

Numerator: Number of children 12-23 months who received DTP1 minus number of children 12-23 months who had not received DTP3 immunization by their first birthday.

Denominator: Number of children 12-23 months who received DTP1 before age 12 months.

Routine data

DTP1-DTP3 dropout rate

Numerator: Cumulative total of DTP1 minus cumulative total of DTP3 immunizations given to children below the age of one year during a specified reference period (for example, during the past 12 months).

Denominator: Cumulative total of DTP1 given to children below the age of one year during the same period.

Measurement Tools

Population-based surveys (DHS, EPI Cluster Survey, KPC, MICS); routine administrative data

What It Measures

This indicator measures the continuation of immunization and perceived quality of services, that is, whether children were in contact with EPI services but dropped out of the system before the series was completed. Dropout rates based on routine administrative data also provide a useful

summary measure of the overall performance of routine immunization services and may reflect the quality of communication between parents and health workers.

How to Measure It

When using surveys, the data requirements for measuring this indicator are the number of children age 12-23 months who received DTP1 vaccine and the number who received DTP3 vaccine before the age of 12 months. Based on this information, one can calculate the proportion of children who dropped out of the system. It is recommended that dropout rates be based on both card and history information. DTP1-DTP3 dropout rates are usually calculated from routine administrative data as the difference in the cumulative totals of DTP1 and DTP3 doses administered to children below the age of one year in a given reference period (for example, during the last 12 months), divided by the cumulative number of doses of DTP1 administered during the same period. Dropout rates can be calculated using either absolute numbers or percentages.

The quality of utilization is considered good if the dropout rate in the target age group is less than 10 percent and poor if the dropout rate in the target age group is 10% or higher (WHO, 2002).

Strengths and Limitations

One advantage of this indicator is that it can be used to uncover reasons for dropout. For program purposes, EPI managers will find it important to know, for example, whether high dropout rates occur because mothers do not remember to bring children to the health center for subsequent doses, or because mothers are unaware of the need for a subsequent dose of the vaccine, or because of

vaccine stock-out, or some other reason. Each of these reasons has different implications for programming.

This indicator can be easily calculated from administrative data monitoring the number of doses of DTP1 and DTP3 vaccine that are administered to the target population. Estimates based on routine data are relatively inexpensive as they make use of data that are currently being collected. The indicator also does not require estimates of the size of the target population, a major problem in calculating and interpreting immunization coverage rates from routine data. Using routine data, the indicator can be calculated at multiple levels: national, regional, district, and health facility. As dropout rates can be calculated at the health facility level without requiring data from additional sources, they can allow a health facility to monitor its own performance without the need for higher level monitoring and evaluation specialists. However, when routine data are aggregated across various health facilities and districts, caution needs to be exercised in their use due to potential problems with the completeness and timeliness of reporting (e.g., the proportion of sites submitting reports) and the degree to which data from the private sector are incorporated into the reporting system.

Population-based surveys provide more representative data for estimating dropout and can be helpful in validating the routine reporting system. However, conducting a survey is expensive and not done frequently. Furthermore, care should be taken when designing cluster surveys to ensure geographical representation and avoid selection bias. Card-based data increase the validity of survey estimates, but the vaccination card may not be widely available.

This indicator cannot stand on its own and must be interpreted in the light of actual coverage levels. The indicator does not give a complete picture of dropouts that may be occurring between other antigens (USAID, 2003). Consequently, programs

typically calculate the following additional dropout rates from routine data:

(1) BCG to DTP1 dropout rate:

Numerator: Cumulative total of BCG minus cumulative total of DTP3 immunizations given to children below the age of one year during a specified reference period (for example, during the past 12 months)

Denominator: Cumulative total of BCG immunizations given to children below the age of one year during the same period

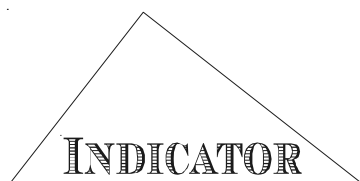
A high BCG to DTP1 dropout rate may indicate missed opportunities to give the vaccination card and to provide information on where and when to bring the baby for other vaccinations. Possible solutions include making sure that mothers who give birth at maternity centers and whose babies receive BCG are given: (a) a vaccination card for the baby; (b) information on where and when to bring the baby for other vaccinations; and (c) encouragement to get the baby immunized again as soon as he or she reaches six weeks of age.

(2) DTP3 to measles dropout rate:

Numerator: Cumulative total of DTP3 minus cumulative total of measles immunizations given to children below the age of one year during a specified reference period (for example, during the past 12 months)

Denominator: Cumulative total of DTP3 immunizations given to children below the age of one year during the same period

A high DTP3 to measles dropout rate may indicate poor health worker and caretaker communication. Possible solutions include informing parents about preventing measles by means of vaccination and reminding parents when and where to bring the child in for measles vaccine.



INDICATOR

FULLY IMMUNIZED CHILD (FIC)

Definition

Proportion of children age 12-23 months who received three doses of Oral Polio Vaccine (OPV), three doses of DTP, and one dose each of Bacille Calmette-Guerin (BCG) and measles vaccines before age 12 months.*

Numerator: Number of children age 12-23 months who received three doses of OPV, three doses of DTP, and one dose each of BCG and measles vaccine before age 12 months.

Denominator: Total number of children aged 12-23 months survey.

Measurement Tools

Population-based surveys (DHS, EPI Cluster Survey, KPC, MICS)

What It Measures

This indicator measures the success of the immunization program in delivering all recommended vaccines in the childhood schedule in the first year of life. It also measures public demand and the perceived quality of services.

How to Measure It

During household surveys, caretakers are asked to present the child's vaccination card to the interviewer so that it can be used to record the actual dates at which vaccinations were given. If a card is available, the interviewer is required to

copy carefully the dates on which the child received vaccinations against each of the six diseases targeted by the EPI program, namely tuberculosis, diphtheria, pertussis, tetanus, poliomyelitis and measles.

If the mother/caretaker cannot produce a vaccination card for the child, she is asked whether the child has received a vaccination against tuberculosis (BCG); diphtheria, tetanus and pertussis (whooping cough) (DTP); poliomyelitis (OPV); and measles. In many surveys, interviewers also check to see whether a BCG scar is present. For OPV and measles vaccine, it is important to specify routine immunization systems, and differentiate from supplemental immunization activities, as the source where the child received immunization. For DTP and OPV (as well as HepB and Hib, where these have been incorporated into the routine national immunization program) information is obtained on the number of doses given.

The source of the data needs to be noted for each child surveyed. Card-based information increases the validity of the data assuming that the information on the card is complete and accurate. However, the absence of a card does not necessarily mean that the child is not vaccinated and it is recommended that coverage estimation be based on both card and history information.

For a child to be fully immunized, s/he should receive at least one dose of BCG, three doses of OPV, three doses of DTP, and one dose of measles vaccine before the first birthday. The indicator can be measured at the district or national level. If a dose of OPV is given at a health facility within the first two weeks of life (this dose being referred to as OPV0), this is not counted as one of the three doses required to achieve full immunization.

* Note that the definition of a "fully immunized child" should correspond to the national immunization policy in a given country. The definition will change as new and underutilized vaccines (such as HepB, Hib and Yellow Fever) are introduced.

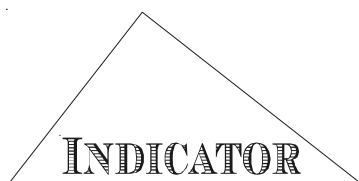
With new vaccines being introduced, what it means to be a “fully immunized child” may differ by country. Thus, global comparison of this indicator may be limited in the future.

Strengths and Limitations

This indicator is useful for measuring progress toward the EPI goal of reducing morbidity, disability, and mortality due to six common vaccine-preventable diseases. However, the indicator is only a measure of completion of the recommended immunization schedule, and does not measure protection. The impact of immunization on disease is dependent on the timing and number of doses received, as well as the efficacy of vaccine. The indicator does not reflect whether vaccines are given at the recommended ages or at the recommended minimum interval of four weeks between consecutive doses of DTP and OPV (and HEPB and Hib, if included in national definitions). The impact on disease may also be higher than what FIC would lead you to expect. For example, measles coverage might be 60%, but FIC might be only 40% – as it is in many countries in Africa because children have not received all the DTP doses.

While complete vaccination coverage before the age of 12 months is the preferred immunization indicator, it is generally not available from routine service statistics. Information can usually be derived from population-based surveys. Surveys are expensive and done infrequently; so this indicator can only be estimated every 3–5 years (though in some countries, such as Bangladesh, it is estimated every two years). The absence of vaccination cards limits the reliability of this indicator. Care should be taken when designing cluster surveys to ensure representation and to avoid selection bias by following the protocol.

With the addition of new vaccines such as HEPB to the WHO recommended immunization schedule for children below the age of one year, the current definition of “fully immunized child” is problematic and comparisons across countries are limited.



VACCINE WASTAGE RATE

Definition

Proportion of vaccine that is supplied but never administered to a child or mother during a specified reference period (e.g. one year).

Numerator: Doses supplied minus doses administered x 100.

Denominator: Doses supplied.

“Doses supplied” is calculated from stock records by adding the starting balance of usable vaccine doses at the beginning of a designated period to the new doses received during that period and subtracting the balance remaining at the end of the period: *Starting balance + doses received – balance remaining = doses supplied* (USAID, 2003).

Measurement Tools

Vaccine supply and distribution reviews; vaccine stock control ledgers

What It Measures

This indicator provides a measure of the quality and efficiency of the immunization service delivery system. Wastage may be due to service delivery/ programmatic reasons: for example, it may be possible to extract only 17 doses out of a 20-dose vial because some vaccine is left unused in the “dead space” of each syringe. After reconstitution, freeze-dried vaccines (like measles vaccine and BCG) must be discarded after six hours. Wastage may occur if few children are immunized from a vial, leading to the unused portions being discarded. In addition, wastage may occur if reserve vials with doses remain after ice in a vaccine carrier has run out and there is no Vaccine Vial Monitor (VVM) available. This may be a problem in very hot climates. Wastage may also be caused by logistics problems or incorrect handling of vaccines; cold chain breakdown; freezing of DTP,

HBV, and TT; and a manufacturer providing short expiry dated vaccine (which cannot possibly be distributed and used before expiry) (WHO, 2001).

How to Measure It

This indicator is measured by reviewing vaccine supply and distribution records and/or vaccine stock control ledgers, on a regular basis. The number of doses supplied needs to be calculated as indicated above before wastage can be computed. As some level of wastage is expected even in the best system, this indicator is not expected to ever reach zero. Remote areas may need to open more vials per population than urban areas, thus programs in rural areas may need to accept higher wastage rates to increase coverage. The acceptable wastage level depends on each program and is based on experience and analysis of local situations (for example, whether a country has adopted the WHO policy on the continued use of opened multi-dose vials of certain vaccines on subsequent days). In general, wastage rates higher than 20% can be an indicator of program problems discussed below.

Strengths and Limitations

This indicator is useful in forecasting vaccine needs and can be used by program managers to uncover program problems (e.g., repeated instances of lower-than-planned attendance at immunization sessions; poor stock management; cold chain failure that exposes vaccines to unacceptably high or low extremes of temperature; incorrect mixing of freeze-dried vaccine; incorrect dosage [e.g., the administration of three drops of OPV instead of two, or the injection of 0.6 ml of vaccine instead of 0.5 ml]; inappropriately large vial sizes for vaccines other than BCG which is only available in 20 dose vials; or failure to comply with a multi-dose vial policy, etc.).

The vaccine wastage rate may also be used as a financial monitoring indicator (e.g., to calculate the cost of a fully immunized child with and without wastage). However, using vaccine wastage solely as a tool for economic/financial monitoring is not useful. A poorly functioning logistics system will not have the information required to calculate this indicator. Depending on the country, determining vaccine wastage for diphtheria, tetanus, and pertussis may be difficult because they are administered through a number of different vaccine combinations.

References

- Bonhoeffer J, Kohl K, Chen R, Duclos P, Heijbel H, Heininger U, Jefferson T, Loupi E, and The Brighton Collaboration. (2002). The Brighton Collaboration: Addressing the Need for Standardized Case Definitions of Adverse Events Following Immunization (AEFI). *Vaccine*, 21:298-302.
- Bos E, and Batson A. (2000). *Using Immunization Coverage Rates for Monitoring Health Sector Performance: Measurement and Interpretation Issues*. Washington, DC: The World Bank. HNP Discussion Paper.
- CDC. (1999). Global Measles Control and Regional Elimination, 1998-1999. *Morbidity and Mortality Weekly Report*, 48/49:1124-1130.
- GAVI. (2001). *Global Alliance for Vaccines and Immunization*. Geneva, Switzerland: World Health Organization. Fact Sheet No. 169.
- Goldman N, and Pebley AR. (1994). Health Cards, Maternal Reports and the Measurement of Immunization Coverage: The Example of Guatemala. *Social Science and Medicine*, 38(8):1075-89.
- Hauri AM, Armstrong GL, and Hutin YJF. (2003). In: Comparative Quantifications of Health Risks: Global and Regional Burden of Diseases Attributable to Selected Major Risk Factors. *Contaminated Injections in Health Care Settings*. Geneva, Switzerland: World Health Organization.
- Kane A, Lloyd J, Zaffran M, Simonsen L, & Kane M. (1999). *Transmission of Hepatitis B, Hepatitis C and Human Immunodeficiency Viruses Through Unsafe Injections in the Developing World: Model-based Regional Estimates*. Geneva, Switzerland: World Health Organization. Bulletin of the World Health Organization, 77(10):801-807.
- Nelson KE, Williams CM, and Graham NMH. (2001). *Infectious Disease Epidemiology – Theory and Practice*. Gaithersburg, MD: Aspen Publication.
- Simonsen L, Kane A, Lloyd J, Zaffran M, and Kane M. (1999). *Unsafe Injections in the Developing World and Transmission of Bloodborne Pathogens: A Review*. Geneva, Switzerland: World Health Organization. Bulletin of the World Health Organization, 77(10):789-800.
- Szklo M, and Nieto FJ. (2000). *Epidemiology – Beyond the Basics*. Gaithersburg, MD: Aspen Publication.
- USAID. (2003). *Immunization Essentials: A Practical Field Guide*. Washington, DC: USAID.

WHO. (1994). Expanded Programme on Immunization – Accelerated Measles Strategies. *Weekly Epidemiology Record*, 69:229-34.

WHO. (1996). *Using Surveillance Data and Outbreak Investigations to Strengthen Measles Immunization Programmes*. Retrieved from <http://www.who.int/vaccines-documents>

WHO. (1998). *Module 11: Monitoring Immunization Coverage*. Geneva, Switzerland: World Health Organization, Global Programme for Vaccines and Immunization, Expanded Programme on Immunization. WHO/EPI/TRAM/98.11.

WHO. (1999). *Indicators to Monitor Maternal Health Goals: Report of a Technical Working Group, Geneva, 8-12 November 1993*. Geneva, Switzerland: World Health Organization, Division of Family Health.

WHO. (2000). *Global Eradication of Poliomyelitis*. Retrieved June 27, 2003, from <http://www.who.int/vaccines-documents/>

WHO. (2000c). *Hib Immunization: Introducing Haemophilus Influenza Type B Conjugate Vaccine into National Immunization Programmes*. Geneva: World Health Organization, Department of Vaccines and Biologicals. AIDE-MEMOIRE.

WHO. (2000d). *Maternal and Neonatal Tetanus Elimination by 2005: Strategies for Achieving and Maintaining Elimination*. UNFPA/UNICEF/WHO. WHO/V&B/02.09. Retrieved from <http://www.who.int/vaccines-documents/DocsPDF02/www692.pdf>

WHO. (2001). *Hepatitis B Immunization: Introducing Hepatitis B Vaccine into National Immunization Programmes*. Geneva, Switzerland: World Health Organization, Department of Vaccines and Biologicals. AIDE-MEMOIRE.

WHO. (2001a). *Vaccine Wastage and Monitoring the EPI*. Retrieved from http://www.who.int/vaccines-access/vacman/technet21/TC21_schnur.pdf

WHO. (2001b). *Tool for the Assessment of Injection Safety*. Geneva, Switzerland: World Health Organization, Department of Vaccines and Biologicals.

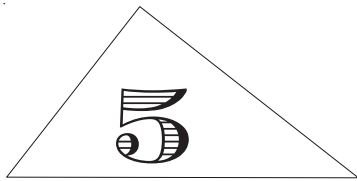
WHO. (2002). *User's Handbook for Vaccine Cold Rooms and Freezer Rooms*. Geneva, Switzerland: World Health Organization. WHO/V&B/02.31.

WHO. (2002a). *The Immunization Data Quality Audit (DQA) Procedure*. Geneva, Switzerland: World Health Organization

WHO. (2002b). *Increasing Immunization Coverage at the Health Facility Level*. Geneva, Switzerland: World Health Organization, Department of Vaccines and Biologicals.

WHO. (2003). *Hepatitis B Vaccine*. Retrieved June 16, 2003, from <http://www.who.int/vaccines/en/hepatitisb.shtml>

WHO. (2003b). *Current Epidemiological Situation of Reported Epidemic Prone Diseases in the Region (Year 2003)*. Retrieved from http://www.afro.who.int/csr/epr/epidemic_prone_diseases/weekly_feedback1-7_2003.pdf



**INTEGRATED
DISEASE
SURVEILLANCE
AND RESPONSE**

Indicators:

- Proportion of health facilities submitting weekly/monthly surveillance reports on time to the district level
- Proportion of districts submitting weekly/monthly surveillance reports on time to the next level
- Proportion of cases of diseases selected for case-based surveillance which were reported to the district using case-based or line listing forms
- Proportion of suspected outbreaks of epidemic-prone diseases notified to the next level within two days of surpassing the epidemic threshold
- Proportion of districts with current trend analysis (line graphs) for selected priority diseases
- Proportion of reports of investigated outbreaks that include case-based data recorded and analyzed
- Proportion of outbreaks of epidemic-prone diseases with laboratory results
- Proportion of confirmed outbreaks with recommended response
- Attack rate
- Case fatality rate for outbreaks of epidemic-prone diseases

CHAPTER 5. INTEGRATED DISEASE SURVEILLANCE AND RESPONSE

Surveillance is the ongoing process of systematic collection, collation, analysis, and interpretation of data with prompt dissemination to those who need to know for relevant action to be taken. A well functioning disease surveillance system is essential for the control of communicable diseases, the most common causes of death and disability in some developing regions of the world, notably Africa. Accurate surveillance data provide continuous information about disease trends over time and may serve to identify outbreaks in the early stages of development. If surveillance data are linked to laboratory results, feedback from these activities can provide public health officials with an understanding of how an outbreak is progressing and facilitate the design of effective disease control strategies. Adequate measles surveillance, for example, permits further evaluation of immunization coverage as well as the implementation of appropriate measures to improve disease control, such as house-to-house immunization for high-risk populations, pre-outbreak acceleration of activities, and mass campaigns to interrupt measles transmission and eliminate the disease.

The core activities for an effective surveillance system are the following:

- Detection (identifying cases and outbreaks)
- Registration
- Confirmation (epidemiological and laboratory confirmation)
- Reporting (early warning and routine)
- Analysis and interpretation (preparing and periodically updating graphs, tables, and charts to describe time, person, and place for reported diseases and conditions; identifying unusual trends or patterns or the exceeding of a threshold value; interpreting results; discussing possible public health action)

- Response
 - Control/response (case management, contact tracing, infection control measures, immunization activities, improvement of preventive and control measures [vector and/or environmental control], community information, and educating or alerting nearby areas and districts)
 - Outbreak investigation (case findings [records, active surveillance], collection and transport of specimens, confirmatory testing, and interpretation of results [epidemiological and laboratory])
 - Program adjustment
 - Changes in policy and planning
- Feedback
- Evaluation and monitoring

These activities are made possible by a number of support functions that lead to better performance of the core surveillance activities:

- Setting standards (e.g., case definitions, standard case management guidelines, standard procedures for investigation)
- Training (surveillance, epidemiology, laboratory)
- Supervision
- Communications systems (e.g., radio, fax, e-mail, phone, health updates)
- Providing resources (human – appropriate number with adequate skills and competencies; material – vehicles, laboratory equipment, supplies, etc.; financial)

An assessment of the capacity to carry out core and support functions of surveillance and response for each priority disease or group of diseases at all

levels of the health system (central, regional/provincial, district or equivalent, health facility) is an integral component of any assessment of national communicable disease surveillance and response. The following facets of the system should also be addressed in order to determine whether the system is meeting its objectives:

- The public health importance of the health event(s) under surveillance
- The objectives and operation of the system
- The system's usefulness
- Attributes of the system
- Cost or resource requirements of the system

As specified by the CDC (2001), important attributes include:

- **Simplicity** – the ease of operation of the system as a whole and each of its components
- **Flexibility** – ability to accommodate changes in operating conditions and information needs
- **Data quality** – completeness and validity of the data collected and recorded
- **Acceptability** – willingness of individuals and organizations to participate in the system
- **Sensitivity** – ability to detect the cases or health events or outbreaks it is intended to detect
- **Predictive Value Positive (PVP)** – mostly affected by the system's specificity, PVP is the proportion of reported cases (or outbreaks) which truly are cases (or outbreaks)
- **Representativeness** – extent to which the system accurately portrays the incidence of health events in a population by time, place, and person
- **Timeliness** – availability of data in time for appropriate action
- **Stability** – reliability and availability of the system (operates properly without failure)

Assuming that all levels of the health system are involved in conducting surveillance activities for detecting and responding to priority diseases and conditions, the information flow in an integrated disease surveillance system is depicted in Figure 5.1 on the following page.

Methodological Challenges

Following are key methodological challenges and issues in monitoring and evaluating the core functions of disease surveillance systems:

Non-standard Case Definitions

A case definition is a standard criteria used to decide if a person has a particular disease or if the case can be considered for reporting and investigation. In investigating an outbreak of a priority disease, the specificity of the case definition needs to be high to have an accurate count of those who have the disease. Components of the case definition may include information about exposure (e.g., time and place), laboratory findings, and clinical symptoms. In routine surveillance as well as outbreak investigations, cases of disease are commonly separated into “*confirmed cases*” and “*probable cases*.” Confirmed cases are generally those that have been confirmed by laboratory results, and probable cases are those that have certain symptoms meeting a clinical case definition but have not been confirmed by laboratory tests. When all health workers use standard case definitions for reporting cases of priority diseases, there is consistency in reporting and it is easier for public health officials to follow trends in disease and to recognize epidemics. In addition, case definitions may have different sensitivity and specificity, limiting meaningful comparative analyses. WHO has provided standardized case definitions for the different priority diseases and it is important to ensure that health workers are encouraged to use them (see Annex 5.1 on page 195).

Figure 5.1. Information flow in an integrated disease surveillance system (IDS).

“An ill person presents to medical attention. Information about the patient is recorded in a register. The register is updated daily to include information for both inpatients and outpatients. At a minimum, the following data are collected: the patient's ID number, date of onset, date of presentation at the facility, date of discharge (inpatient only), village (location), age, gender, diagnosis, treatment, and outcome (inpatient only).

If the clinician suspects a disease or condition that is targeted for elimination or eradication, or if the disease has high epidemic potential, the disease is reported immediately to the designated health staff in the health facility and at the district level. The health facility should begin a response to the suspected outbreak. At the same time, the district takes steps to investigate and confirm the outbreak. The investigation results are used to plan a response action with the health facility.

Periodically, once a month, weekly, quarterly, or annually, the health facility summarizes the number of cases and deaths for each routinely reported IDS condition and reports the totals to the district. The health facility performs some analysis of the data such as keeping trend lines for selected priority diseases or conditions and observing whether certain thresholds are passed to alert staff to take action. One action that is taken if an outbreak is suspected is to obtain laboratory confirmation. Laboratory specimens are obtained and the following data are documented: type of specimen, date obtained, date sent to the lab, condition of specimen when received in the lab (good or poor), and lab results.

At the district level, data are compiled monthly for each of the IDS conditions. The district prepares analyses of time, place, and characteristics of the patients such as age and gender for both outpatients and inpatients. The results are sent to either the regional level or the central level.

The district uses the data to plot graphically the routine surveillance trends and epidemic curves for IDS conditions. In addition, the district maintains a log of suspected outbreaks reported by health facilities. This list documents the nature of the potential outbreak, the number of possible cases, the dates of investigations and actions taken by the district. It also includes any findings of investigations led by the district, regional, or national levels.

The district surveillance focal point provides disease-specific data and information to each disease prevention program.”

(WHO-AFRO and CDC, 2001, 5)

Accuracy, Completeness, and Timeliness of Reporting

In active surveillance systems, the following assumptions are often made:

- (1) Cases are occurring in the community.
- (2) Persons who are cases seek medical attention or otherwise come to the attention of institutions subject to reporting requirements.
- (3) The condition is recognized by the provider or health facility.
- (4) Cases are not reported because filling out reporting forms or notifying to the next higher level is too much trouble.
- (5) If the administrative reporting burden for health facilities is reduced, cases will be reported.

Many of these assumptions are rarely met in developing countries, with implications for the accuracy, completeness, and timeliness of reporting. In areas characterized by poor access to and utilization of health services, if the community does not know how to notify health authorities when priority diseases or unusual health events occur, suspected cases will not be seen at the health facility, and cases will not be reported. It is important, therefore, for community health workers, traditional healers, birth attendants, and community leaders to know how to recognize and report selected priority diseases or conditions to the health facility for treatment. Timely notification is essential so that public health action can be taken to limit the spread of the disease. Methods for dealing with these limitations include distributing simplified case definitions for use in community surveillance (see WHO-AFRO and CDC, 2001, p. 32-33 for an example) and responding effectively to community reports in order to encourage community participation in the disease surveillance system.

Problems of completeness of reporting may also occur if some districts do not send reports when no new cases of reportable diseases are found in a particular reporting period. The reporting of “zero cases” when no cases have been detected by the reporting unit allows the next level of the reporting system to be sure that data sent by participating units have not been lost or that the participating unit has not forgotten to report. If zero-reporting is not accompanied by efforts at case finding, it would be difficult to know whether the absence of reported cases means the absence of disease in the population.

Representation

Another dimension of completeness, which has implications for the validity of surveillance data, relates to the issue of representation (that is, whether the probability of reporting a disease is the same within subgroups of the population or in different populations). Issues of validity can occur if some parts of a country are not covered

by the surveillance system effectively. In addition, the quality of case ascertainment can be affected by the differential reporting of cases in association with different characteristics of the person – in the sense that cases among certain subpopulations may be less likely to be reported than among other groups (Romaguera, German, and Klaucke, 2000). For example, cases in adults or children who are not legal residents of a country or who are refugees are likely to be underreported or inadequately investigated due to a number of factors. Illegal residents may not have access to medical care, may be transient or may avoid contact with authorities if they do not possess proper documentation. Changes in reporting practices over time can also introduce bias into the system, making it difficult to follow long-term trends or establish baseline rates to be used for the recognition of outbreaks.

The ability to detect imported cases is an indirect measure of the quality of case ascertainment at the national level. At the district level, no importations might occur and the absence of reported cases may reflect either the absence of disease or the absence of efforts to identify cases. In nations that border countries where a particular disease is endemic and where there is substantial cross-border movement, failure to detect imported cases of the priority disease may suggest that the national level surveillance system is not sensitive enough to detect individual cases.

Errors in Descriptive Information about a Reported Case

Even if a case of a notifiable disease has been identified and reported, there may be errors in the collection and recording of descriptive information about the case. These errors can be introduced at any stage of the reporting and assessment process. Information commonly collected by surveillance systems includes the demographic characteristics of the affected individual, details about the health event, and the presence or absence of defined potential risk factors. The quality of data is also influenced by the simplicity of the reporting forms, the level of training and supervision of persons

who complete the surveillance forms, and the care exercised in data management (Romaguera, German and Klaucke, 2000).

Lack of Laboratory Support for Outbreak Confirmation or Patient Management

In low-income settings, laboratory services may be unavailable or nonstandardized. Logistics of getting specimens to the laboratory may also be difficult. Strategies used by the polio eradication program to overcome this problem include using the private sector to help transport specimens to the lab and using the laboratory results to ensure that surveillance systems results are supervised and accurate (White and McDonnel, 2000). However, expanding laboratory improvements built from vertical programs associated with polio eradication and neonatal tetanus control within an integrated disease surveillance and response system remains a significant challenge.

Lack of External Standards

The rate of Acute Flaccid Paralysis (AFP) among children less than 15 years of age is a powerful indicator of the adequacy of polio surveillance. Unfortunately, similar external standards do not exist for many other vaccine preventable diseases. For diseases such as Hib, which occurs among children under five years of age as well as adults, it may be necessary for child health programs to monitor the absence of Hib cases in any age groups to assess whether the surveillance system is adequate (Wharton and Ching, 2002).

Infrastructure and Communication Constraints

White and McDonnel (2000) have described in detail infrastructure and communication constraints that may affect the quality of surveillance data in low- and middle-income countries. These constraints may include identifying personnel to conduct surveillance and ensuring transportation and operating expenses for health staff to investigate cases, trace contacts, or transport specimens to laboratories are important constraints. In some situations, health facilities

may not have sufficient reporting forms and health personnel may not be adequately trained to use these forms to report priority diseases within the surveillance system (White and McDonnel, 2000). A limited resource base and the lack of a regular supply of electricity may not permit the creation of a functional computer-based system for reporting. Where there is reliance on a hand-written report system, it may be more difficult to maintain quality control during the collection and tabulation of data or stimulate review and use of information for decision-making. Over time, the increased availability of computers in low-income countries at the national, regional, and district levels has permitted greater electronic reporting.

Selection of Indicators

Over the years, many of these vaccine-preventable disease control programs have developed their own surveillance standards and systems to obtain timely and reliable information for monitoring trends in disease occurrence, predicting or providing early detection of outbreaks, and initiating appropriate public health action and response (see Annex 5.2). Specialized surveillance systems (e.g., AFP, HIV/AIDS) are important, especially when surveillance methods are complex and the systems have specific information needs. However, all surveillance systems involve the same universal functions and common support functions. With the coexistence of various surveillance activities funded and managed by different control programs, which are sometimes based in different institutions, the overall surveillance functions at the national level can become inefficient. In such cases, health personnel participate in multiple systems, use different surveillance methods, terminology, reporting forms and frequency, resulting in extra costs and often work overload for health staff (WHO, 2001). An integrated disease surveillance system allows all surveillance activities, whether for acute flaccid paralysis, measles, neonatal tetanus, or other diseases, to be coordinated and streamlined and takes advantage of similar surveillance functions, skills, resources, and target populations (CDC, 2003).

The World Health Organization (WHO) Regional Office for Africa (AFRO) has adopted an integrated disease surveillance and response (IDSR) strategy linking community, health facility, districts and national levels. The objectives of integrated disease surveillance are to provide a rational basis for decision-making and implementing public health interventions that are efficacious in responding to priority communicable diseases. The IDSR was adopted by member states of the African Region in 1998. WHO suggests 19 communicable diseases and conditions for integrated diseases surveillance in the African region (WHO/CDC, 2001). These include (1) *epidemic-prone diseases* (cholera, diarrhea with blood [shigella], measles, meningitis, plague, viral hemorrhagic fevers, and yellow fever); (2) *diseases targeted for eradication and elimination* (acute flaccid paralysis [AFP]/polio, dracunculiasis, leprosy, neonatal tetanus); (3) *other diseases of public health importance* (pneumonia in children less than five years of age, new AIDS cases, malaria, onchocerciasis, sexually transmitted infections [STIs], trypanosomiasis, and tuberculosis).

In February 2001, the IDSR task force formed a joint WHO and CDC working group to develop and test indicators for monitoring and evaluating IDSR, making it possible to assess the surveillance system as a whole and approach system development and strengthening in a coordinated way (WHO, 2001). The working group proposed a list of core indicators for testing at the IDSR task force meeting in May 2001 (CDC, 2003). From January to June 2002, the working group collaborated with Ministries of Health in Uganda and Mozambique to conduct pre-tests of the indicators at national, provincial, and district levels.

This section of the guide outlines the core indicators developed by WHO-AFRO and CDC for monitoring the implementation of IDSR in the Africa region. The indicators are presented below:

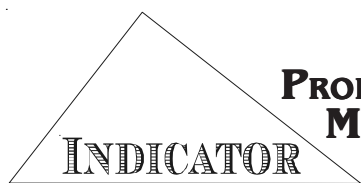
- Proportion of health facilities submitting weekly/monthly surveillance reports on time to the district level

- Proportion of districts submitting weekly/monthly surveillance reports on time to the next level
- Proportion of cases of diseases selected for case-based surveillance which were reported to the district using case-based or line listing forms
- Proportion of suspected outbreaks of epidemic-prone diseases notified to the next level within two days of surpassing the epidemic threshold
- Proportion of districts with current trend analysis (line graphs) for selected priority diseases
- Proportion of reports of investigated outbreaks that include case-based data recorded and analyzed
- Proportion of outbreaks of epidemic-prone diseases with laboratory results
- Proportion of confirmed outbreaks with recommended response
- Attack rate
- Case fatality rate for outbreaks of epidemic-prone diseases

Though initially developed for the Africa region, the IDSR indicators presented in this section can be adapted to national surveillance needs and a country's own disease control priorities, objectives, and strategies. The indicators can help identify gaps and opportunities in performing the core functions of surveillance. They can also help determine country needs as regards strengthening the surveillance system for communicable disease control and prevention, and provide baseline information against which to measure progress in strengthening integrated disease surveillance and response systems.

It must be noted that not all diseases recommended for integrated disease surveillance are under-five priority diseases and not all vaccine-

preventable diseases of the EPI are part of the IDSR strategy. Diphtheria, for example, is a widespread severe infectious disease that has the potential for epidemics and primary prevention of the disease is by ensuring high population immunity through immunization. Recent epidemics have highlighted the need for adequate surveillance and epidemic preparedness (WHO, 1998). Pertussis or whooping cough is also a major cause of childhood morbidity or mortality in the developing world. An estimated 20-40 million cases, 90% of which occur in developing countries, and 200,000 to 300,000 deaths occur annually. Although pertussis may occur at any age, most cases of serious disease and a majority of fatalities occur in early infancy. Case fatality rates in developing countries are estimated to be as high as 4% in infants (WHO, 2001). It is vital, nonetheless, to monitor the implementation of surveillance activities for these diseases within the framework of integration.



PROPORTION OF HEALTH FACILITIES SUBMITTING WEEKLY/ MONTHLY SURVEILLANCE REPORTS ON TIME TO THE DISTRICT LEVEL

Core IDSR Quality Indicator

Definition

Proportion of health facilities submitting weekly/monthly surveillance reports on time to the district during a specified period.

Numerator: Number of health facilities submitting weekly/monthly surveillance reports on time to the district during a specified period.

Denominator: Total number of health facilities expected to submit weekly/monthly surveillance reports to the district in the same period.

“*On time*” means that the forms are received within a specified time from the end of the reporting period. Common reporting periods are “within 7 days after the start of a new month,” “within 14 days of the start of a new quarter,” or other set period. National policy determines whether the data from health facilities and districts are reported immediately, weekly, monthly, or quarterly. For epidemic-prone diseases, notification should be immediate.

Measurement Tools

Administrative records (such as a table for recording timeliness and completeness of monthly reporting from the health facility to the district [see Annex 5.3 on page 199 for a sample form for recording the timeliness and completeness of monthly reporting from the health facility to the district]); computerized HIS/MIS databases

What It Measures

This indicator provides a measure of the extent to which health facilities make disease surveillance data accessible to the district in a timely fashion.

It is an important measure of the quality of the reporting system at the health facility level. The existence of timely information is a precondition for efficient response to any public health problem and should therefore be monitored. The qualifier “*on time*” in the definition of the indicator highlights the need to monitor cases and deaths for each routinely reported IDS condition at a pace consistent with the time frame that district managers have set for planning, monitoring, evaluation, and decision-making.

How to Measure It

Measurement of this indicator requires records indicating exact dates when reports are sent from health facilities and received at the district health office where they are aggregated. Periodically (once a month, quarterly, or annually), the health facility summarizes the number of cases and deaths for each routinely reported IDS condition and reports the totals to the district. At the district level, the dates on which reports are received are routinely recorded and reviewed during the analysis of routine and case-based data. The records of reports that have been received are used to:

- Measure how many reporting units (i.e., health facilities) submitted reports for a given month (completeness of reporting units);
- Identify which reporting units have reported; and
- Measure how many reports were submitted on time.

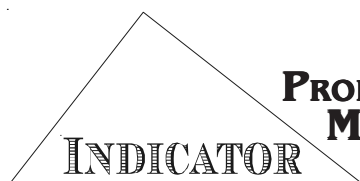
This indicator can be measured every three months by a district supervisor at the health facility level. A rate of timeliness of 80% or more is regarded as highly satisfactory. When the surveillance system is good, the rate of timeliness should approach

100%. Not receiving an adequate performance on this indicator is a trigger for problem solving. Countries may choose to adapt the target and make it incremental as performance problems are addressed.

Strengths and Limitations

Measurement of this indicator serves a number of programmatic purposes. If data indicate that a health facility has not provided a report, or if the report is not on time, the surveillance focus point at the facility should be contacted to work with the designated staff to identify the cause of the problem and develop solutions. These solutions may include providing resources (including a sufficient and reliable supply of forms for reporting the required information, on-the-job training to staff at the facility regarding reporting procedures, etc.). However, deadlines for submitting routine reports must be reasonable given the particular challenges to delivery in many developing country settings.

The indicator assumes that IDS reporting forms are available for reporting at the health facility level. It also assumes that standard case definitions specified by national policy have been widely disseminated and that health facility staff know how to use them to detect priority diseases. It should be noted that this indicator does not assess the quality of the reports themselves or their representativeness. This is crucial for evaluating the reporting system information. Furthermore, the indicator does not look at the accuracy or completeness of reporting. For a surveillance system to be considered good quality, reporting should be not only timely but also complete. Depending on the comprehensiveness of the surveillance system, the indicator may or may not include reporting from private health facilities or nongovernmental organizations.



PROPORTION OF DISTRICTS SUBMITTING WEEKLY/ MONTHLY SURVEILLANCE REPORTS ON TIME TO THE NEXT LEVEL

Core IDSR Quality Indicator

Definition

Proportion of districts submitting weekly/monthly surveillance reports on time to the next level (provincial/regional) during a specified period.

Numerator: Number of districts submitting weekly/monthly surveillance reports on time to the next level (provincial/regional) during a specified period.

Denominator: Total number of districts expected to submit weekly/monthly surveillance reports to the next level (provincial/regional) in the same period.

“*On time*” means that the forms are received within a specified time from the end of the reporting period. Common reporting periods are “within 7 days after the start of a new month,” “within 14 days of the start of a new quarter,” or other set period. National policy determines whether the data from districts and health facilities are reported immediately, weekly, monthly, or quarterly. For epidemic reporting, notification should be immediate.

Measurement Tools

Administrative records (such as a form for recording timeliness and completeness of monthly reporting from the district to the provincial or regional level); computerized HIS/MIS databases

What It Measures

This indicator provides a measure of the extent to which district health offices submit reports/summary data to the next level in a timely fashion. It is an important indicator of the quality of the

reporting system. The existence of timely information is a precondition for the use of information for monitoring and response. The qualifier “*on time*” in the definition of the indicator highlights the need to monitor cases and deaths for each routinely reported IDS condition at a pace consistent with the time frame that provincial/regional managers have set for planning, monitoring, evaluation, and decision-making.

How to Measure It

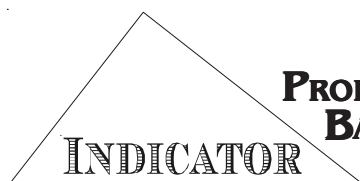
Measurement of this indicator involves monitoring the receipt of reports from district health offices to evaluate the timeliness of reporting to the next level. A monitoring tool such as a record of reports received may be used to monitor timeliness of reporting from districts.

This indicator can be measured every three months by a provincial or regional supervisor at the district level. A proportion of 80% or more is regarded as highly satisfactory in terms of timeliness of reporting from the district to the next level. When the surveillance system is good, the rate for timeliness should approach 100%. Not receiving an adequate performance on this indicator is a trigger for problem solving. Countries may choose to adapt the target and make it incremental as performance problems are addressed.

Strengths and Limitations

Assessment of the timeliness of reporting for each province/region enables the identification of constituent districts that scored low on this indicator. Factors associated with delays in reporting may be determined by a routine supervisory visit to district health offices and concentrated efforts made to strengthen the reporting system through training and careful planning.

It should be noted that this indicator does not provide a measure of the completeness of reporting or the geographic representation of the reports. For a surveillance system to be considered a good quality, reporting should be not only timely but also complete. Furthermore, the indicator does not measure the extent to which provinces/regions process the reported data in a timely manner. The indicator assumes that different IDS reporting forms are available at the district level. It also assumes that standard case definitions specified by national policy have been widely disseminated and that health facility and district-level staff know how to use them to detect priority diseases. Depending on the comprehensiveness of the surveillance system, the indicator may or may not include reporting from private health facilities or nongovernmental organizations



PROPORTION OF CASES OF DISEASES SELECTED FOR CASE-BASED SURVEILLANCE WHICH WERE REPORTED TO THE DISTRICT USING CASE-BASED OR LINE LISTING FORMS

Core IDSR Quality Indicator

Definition

Proportion of cases of diseases selected for case-based surveillance which were reported to the district using case-based or line listing forms.

Numerator: Number of cases of diseases selected for case-based surveillance which were reported to the district using case-based or line listing forms during a specified period.

Denominator: Total number of cases of diseases selected for case-based surveillance that occurred in health facilities in the district in the same period.

“Case:” A person who has the particular disease, health disorder, or condition which meets the case definitions for surveillance and outbreak investigation purposes.

“Diseases selected for case-based surveillance:” WHO-AFRO IDSR has selected the following diseases for case-based surveillance: plague, measles, poliomyelitis, dracunculiasis, leprosy, neonatal tetanus, viral hemorrhagic fever, and yellow fever. The list of priority diseases selected for case-based surveillance could vary from country to country depending on the local epidemiological situation and could include other diseases.

“Case-based (surveillance reporting) form:” WHO recommends a generic case-based reporting form that can be used to report written information about individual cases of priority diseases recommended for case-based surveillance. The top half of the form records information about

the individual case and the bottom half is a laboratory transmittal slip (see Annex 5.4). The case-based surveillance reporting form may be adapted at the country-level. Note that some diseases (e.g., neonatal tetanus and AFP) have their own more detailed case investigation forms.

“Line listing:” Line listing is a tool used during epidemiological investigations to allow investigators to record case information and to review and follow-up case reports or conduct analysis. Line lists are typically used instead of individual case-based forms to report and record cases when several cases occur during a short period (for example if more than 5 to 10 cases occur in a week). They are also used to report summary totals of cases and deaths each week when a large number of cases occur in a single suspected outbreak.

Measurement Tools

Administrative records (case-based reporting forms); computerized HIS/MIS databases; clinic registers or patient charts; line listing forms (see Annex 5.5 on page 202 for a generic line listing form)

What It Measures

This indicator measures the extent to which case-based information is reported for priority diseases, which facilitates more detailed case investigation. The use of case-based information is essential for case investigation in order to identify failure in prevention programs, causal agents, the source of infection, disease transmission patterns, and risk factors related age, sex, time, place, immunization status, and so-forth. Ensuring the use of standard methods for reporting priority diseases throughout the system is important so that program managers, surveillance officers, and other health care staff

can use the information to identify problems and plan appropriate responses, take action in a timely way, and monitor disease trends in an area. The use of standard case-based reporting or line listing forms also allows data to be reported efficiently.

How to Measure It

Measurement of this indicator requires a review of surveillance reports. If the disease is one that requires immediate reporting or if an outbreak of any priority disease is suspected, a case-based reporting or line listing form should be completed at the health facility and sent to the district after the initial verbal report is made. The case-based form should include the following information:

- Patient's name. If neonatal tetanus is reported, also record the name of the mother
- Patient's date of birth, if known, or age of the patient
- Patient's locating information (address, village, neighborhood)
- How to contact the patient or the parents of the patient if more information is needed
- Patient's gender
- The date the patient was seen at the health facility and the date the case was reported to the district
- Date of onset of the disease
- Patient's immunization history for suspected cases of vaccine-preventable diseases (and also for the mother if neonatal tetanus is suspected)
- Patient's status at the time of the report (if an inpatient, report final outcome as living or deceased)
- Date of the report

This indicator can be measured every three months by a district supervisor at the health facility level. If the utilization of standard case-based reporting forms is high, this indicator should approach 100%. Not receiving an adequate performance on

this indicator is a trigger for problem solving. Countries may choose to adapt the target and make it incremental as performance problems are addressed.

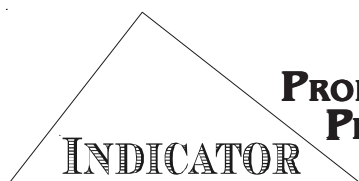
Strengths and Limitations

Precise measurement of this indicator relies on health staff knowing and using the standard case definitions as recommended by national policy. The indicator does not assess whether the recommended minimum data elements for case-based data are present in reports. The usefulness of case-based data depends on whether essential information is recorded on the forms. For example, if data were missing on place of occurrence, it would be difficult to determine where cases are occurring to identify high-risk areas or locations of populations at risk of the disease. The indicator also assumes that recommended case-based surveillance reporting forms are available at the health facility level.

It should be noted that this indicator does not provide a measure of the timeliness of reporting. WHO recommends that a verbal or written notification of immediately reportable diseases or unusual events should reach the district within 24 hours from when the case was first seen by the health facility. Depending on the comprehensiveness of the surveillance system, the indicator may or may not include reporting from private health facilities or nongovernmental organizations.

The indicators can be modified to reflect under-five priority diseases as follows:

- Proportion of cases of AFP which were reported to the district using case-based or line listing forms during a specified period
- Proportion of cases of measles which were reported to the district using case-based or line listing forms during a specified period
- Proportion of cases of neonatal tetanus which were reported to the district using case-based or line listing forms during a specified period



PROPORTION OF SUSPECTED OUTBREAKS OF EPIDEMIC-PRONE DISEASES NOTIFIED TO THE NEXT LEVEL WITHIN TWO DAYS OF SURPASSING THE EPIDEMIC THRESHOLD

Core IDSR Quality Indicator

Definition

Proportion of suspected outbreaks of epidemic-prone diseases notified to the next level (provincial/regional/national) within two days of surpassing the epidemic threshold.

Numerator: Number of suspected outbreaks of epidemic-prone diseases notified to the next level (provincial/regional/national) within two days of surpassing the epidemic threshold.

Denominator: Total number of suspected outbreaks in the district.

“Suspected outbreak:” For epidemic-prone diseases, and for diseases targeted for elimination or eradication, a single case is a suspected outbreak and requires immediate reporting.*

“Epidemic-prone diseases:” These include cholera, diarrhea with blood (*shigella*), measles, meningitis, plague, viral hemorrhagic fever, and yellow fever.

“Epidemic threshold:” An epidemic threshold is the number or density of susceptibles required for an epidemic to occur. For meningitis, for example, the epidemic threshold for the African belt area is an incidence of 15 cases per 100,000 inhabitants per week over a period of two consecutive weeks. Epidemic thresholds recommended by WHO may be adapted to meet national policies, priorities, and capacities to respond. Note that the threshold for some diseases will not change between health facilities or districts because they are thresholds for immediately notifiable diseases and are set by national policy.

*This is not the case for measles in the Africa region.

Epidemic thresholds for notifying the district about other diseases such as shigella, malaria, measles in non-elimination countries, diarrhea with some or severe dehydration in children less than five years and meningitis may be set at the health facility level as described in Figure 5.2 on the following page.

Measurement Tools

Administrative records (e.g., district log of suspected outbreaks and rumors); computerized HIS/MIS databases

What It Measures

This indicator measures the extent to which reported outbreaks or cases are investigated, tracked, and reported to the province within the time frame specified (i.e., within two days of surpassing the epidemic threshold). This is important to ensure that timely decisions are made with regard to the outbreak investigation and response process.

How to Measure It

This indicator is measured by reviewing district logs of suspected outbreaks and rumors by time, place, and person which are used to record verbal or written information from health facilities or communities about suspected outbreaks, rumors, or unexplained events. Two sets of information are required to calculate this indicator: (1) the date the province was notified by the district, and (2) the date the district was notified by health facilities and/or communities about suspected outbreaks, rumors, or unexplained events. The logbook can be easily reviewed during a supervisory visit or when the provincial/regional/national response team wants to have information about how to respond to health events in the district.

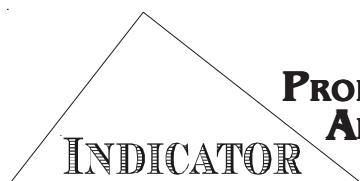
Figure 5.2. Steps for establishing health facility thresholds.

Step 1:	If data from previous years are available, review trends in cases and deaths due to these diseases over the last five years. Determine a baseline number to describe the current extent of the disease in the catchment area.
Step 2:	As appropriate, take into account factors for diseases such as malaria or cholera with seasonal increases.
Step 3:	State the threshold clearly as number of cases per month or week, so that health staff responsible for surveillance activities can readily recognize when the threshold is reached.
Step 4:	Periodically, revise the epidemic threshold and adjust it accordingly depending on past and current trends of the disease. If the extent of the disease's burden is changing (for example, cases are increasing), then adjust the threshold.

This indicator can be measured every three months by a district supervisor at the health facility level. A proportion of 80% or more on this indicator is regarded as highly satisfactory in terms of the timeliness of outbreak reporting. When the surveillance system is good, the indicator should approach 100%.

Strengths and Limitations

Precise measurement of this indicator depends on health facilities having the capacity to detect suspected outbreaks of epidemic-prone diseases in the district accurately (i.e. the denominator). If the total number of suspected outbreaks of epidemic-prone diseases in the district is underestimated, the measurement may overestimate performance no matter how promptly the outbreaks are notified to the provinces. Depending on the comprehensiveness of the surveillance system, the indicator may or may not include reporting from private health facilities or nongovernmental organizations.



PROPORTION OF DISTRICTS WITH CURRENT TREND ANALYSIS (LINE GRAPHS) FOR SELECTED PRIORITY DISEASES

Core IDSR Quality Indicator

Definition

Proportion of districts with current trend analysis (line graphs) for selected priority diseases at a given time (e.g. month).

Numerator: Number of districts with current trend analysis (line graphs) for selected priority diseases at a given time.

Denominator: Total number of districts visited at same point in time.

“*Priority diseases.*” The list of priority diseases could vary from country to country, depending on the local epidemiological situation. WHO recommends the following nineteen priority diseases:

- (1) Epidemic-prone diseases such as cholera, diarrhea with blood (*shigella*), measles, meningitis, plague, viral hemorrhagic fevers, and yellow fever;
- (2) Diseases targeted for eradication and elimination such as acute flaccid paralysis (AFP)/polio, dracunculiasis, leprosy, and neonatal tetanus;
- (3) Other diseases of public health importance such as pneumonia in children less than five years of age, new AIDS cases, malaria, onchocerciasis, sexually transmitted infections (STIs), trypanosomiasis, and tuberculosis (WHO/CDC, 2001).

Measurement Tools

Supervisory visit reports (see Annex 5.6 on page 204 for a sample supervisory checklist for surveillance and response activities at the health facility level)

What It Measures

This indicator measures the extent to which districts are analyzing the surveillance data on a routine basis for each specific priority disease. Trend analysis of disease cases and deaths over time can provide key information during an outbreak to enable the identification of the most appropriate and timely control actions to limit the outbreak and prevent further cases from occurring. Analysis of trend data can also facilitate the detection of abrupt or long-term changes in disease occurrence and provide information to enable improvement in district public health activities that target diseases such as malaria, tuberculosis, HIV/AIDS and vaccine preventable diseases. These diseases can account for up to 80% of the deaths due to priority diseases and conditions, many of which occur in children less than five years of age (WHO-AFRO and CDC, 2001).

How to Measure It

The data for measuring this indicator can be obtained by reviewing an analysis book, if one is maintained at the district level, during a supervisory visit. The availability of a line graph should be assessed for each priority disease specified by national policy. A district is included in the numerator if current trend analysis is available for each priority disease specified by national policy. If the quality of the surveillance system is satisfactory, this indicator should approach 100%. This indicator can be measured every three months by the provincial supervisor through his/her routine supervisory visit reports.

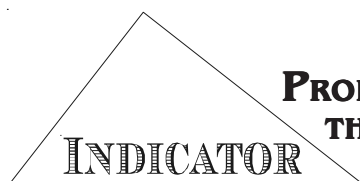
Strengths and Limitations

The strength of this indicator is that it can be measured for a specific priority disease and at the health facility level. It should be noted, however, that while the indicator measures the capacity of

district health offices (or health facilities) to analyze data on priority diseases, it does not provide a measure of the quality of the data collected and used for line graphs. For example, the indicator does not assess whether health workers use standard case definitions to identify and record suspected cases of priority diseases seen in their health facilities (reliability), or whether the condition as reported refer the true condition as it occurs (validity). While calculation of the indicator is straightforward and not labor intensive, the act of collecting data for the numerator and denominator is not without significant costs in terms of travel, materials, time, or installing electronic data management systems at sub-national levels.

Note that health facilities are also expected to do trend analysis. The indicator can be modified to apply to health facilities and data for measuring the indicator collected during routine supervisory visits:

- Proportion of health facilities with current trend analysis (line graphs) for selected priority diseases at a given time.



PROPORTION OF REPORTS OF INVESTIGATED OUTBREAKS THAT INCLUDE CASE-BASED DATA RECORDED AND ANALYZED

Core IDSR Quality Indicator

Definition

Proportion of reports of investigated outbreaks that include case-based data recorded and analyzed.

Numerator: Number of outbreak investigation reports that include case-based data recorded and analyzed (includes two-page IDSR outbreak report, an epi-curve, map, person tables, and line lists or case-based forms attached to the outbreak report) in a given time period (for example, during the last three months).

Denominator: Total number of outbreak investigation reports in the same period.

“Outbreak:” An epidemic limited to localized increase in the incidence of a disease, e.g., in a village, town, or closed institution.

Measurement Tools

Outbreak investigation reports; case reporting forms; line lists; computerized HIS/MIS databases

What It Measures

A primary feature of a surveillance system is to investigate and confirm reported cases and outbreaks of diseases. Recording and analysis of case-based data is important in order to identify thresholds to take action both for routinely reported priority diseases (diseases of public health importance) and case-based diseases (epidemic-prone diseases, and diseases targeted for eradication or elimination). Case-based data are essential for planning outbreak response because

they describe precisely the population at risk for transmission of the disease or condition, the geographic extent of the problem, clusters or patterns of transmission or exposure, and when exposure to the agent that caused the illness occurred. This indicator measures the extent to which outbreak investigation reports include case-based information.

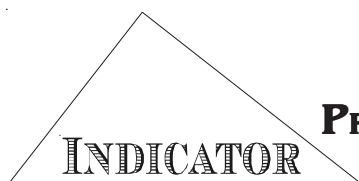
How to Measure It

Measurement of this indicator requires a review of reports of investigated outbreaks to assess whether they contain the following information for suspected and confirmed cases: age group, gender, urban or rural residence, immunization status, inpatient and outpatient status, risk factors, outcome of the episode (for example, whether the patient survived, died, or his/her survival status is unknown), laboratory results, final classification of the case, and other variables relevant to the disease. The outbreak investigation report should not only include this information but also an epi-curve, map, person tables, and line lists or case-based forms in order to be counted in the numerator. These data are derived from register reviews, case reporting forms, and line lists that are used to record information about new cases in health facilities or in searches of the community. In some countries, districts have the overall responsibility for investigating outbreaks. In other countries, large health facilities will undertake some or all aspects of investigating outbreaks for some diseases or conditions. These guidelines assume that the district is responsible for leading the investigation.

This indicator should be measured every three months by a provincial supervisor at the district level.

Strengths and Limitations

This indicator does not provide a measure of the timeliness and completeness of outbreak investigation. CDC/WHO recommends that districts investigate suspected outbreaks within 24 hours of notification. Depending on the comprehensiveness of the surveillance system, the indicator may or may not include reporting from private health facilities or nongovernmental organizations. A lack of change in the indicator would be difficult to interpret due to its composite nature. In this case, disaggregating the indicator into its component parts (a two-page IDSR outbreak report; an epi-curve map; person tables; attachment of line lists or case based forms to the outbreak report) would enable the identification of where problems lie in the recording and analysis of case-based data.



PROPORTION OF OUTBREAKS OF EPIDEMIC-PRONE DISEASES WITH LABORATORY RESULTS

Core IDSR Quality Indicator

Definition

Proportion of outbreaks of epidemic-prone diseases with laboratory results during a specified period.

Numerator: Number of outbreaks of epidemic-prone diseases with laboratory results during a specified period.

Denominator: Total number of outbreaks of epidemic-prone diseases needing laboratory confirmation in the same period.

“Outbreak:” An epidemic limited to localized increase in the incidence of a disease, e.g., in a village, town, or closed institution.

“Epidemic-prone diseases:” These include cholera, diarrhea with blood (*shigella*), measles, meningitis, plague, viral hemorrhagic fever, and yellow fever.

“Specified period:” The time frame may vary depending on the country’s application of the indicator.

Measurement Tools

Administrative records (case-based surveillance reporting forms); supervisory visit reports; laboratory reports/results

What It Measures

This indicator measures the extent to which laboratory testing is used to support or confirm suspected outbreaks. Because there are several diseases or conditions with similar signs and symptoms as other diseases or conditions, having laboratory support for a diagnosis increases the

likelihood that the diagnosis is correct and that public health action will be efficient and appropriate (WHO-AFRO and CDC, 2001). In order to perform this surveillance function, a laboratory network in districts needs to be in place and functional. WHO (2001) has developed a generic laboratory assessment tool that can be used to rapidly assess the functional laboratory capacity for diagnosis of priority diseases for surveillance at all levels of the health system as part of the overall assessment of national surveillance systems. Components of laboratory functioning are highlighted in Figure 5.3 on the following page. Proper specimen collection, storage, handling, and transport are also a critical factor affecting laboratory performance.

How to Measure It

This indicator is measured by reviewing case-based surveillance reporting forms used to record information about individual cases as well as laboratory results and information about the timeliness of laboratory testing. A checklist for supervising surveillance and response activities at the health facility may be used (see Annex 5.6 on page 217). A value of 80% or higher on this indicator is regarded as highly satisfactory in terms of availability of laboratory confirmed results. When the surveillance system is good, the indicator should approach 100%. Countries may choose to adapt the recommended target and make it more incremental as performance problems are addressed.

Strengths and Limitations

This indicator is simple to calculate. The data required for the numerator and denominator can be collected as a part of the routine supervisory visits made by provincial officers. While calculation of the indicator is straightforward and not labor intensive, the act of collecting data for

Figure 5.3. The role of laboratories in a well-functioning surveillance system.

For the laboratory component of a disease surveillance system to function well, the following are required:

- ◆ One good national reference laboratory (NRL) performing biological diagnosis, including the following:
 - Premises are adequate, including adequate electricity, water, and benches.
 - Staff is well trained and motivated.
 - Equipment is present, fully functional, and somebody knows how to maintain and fix it.
 - There is no shortage of small material, consumables, and reagents.
 - It is fully linked to the international public health laboratory and proficiency testing networks.
- ◆ One good NRL performing biological diagnosis, including the following:
 - Premises are adequate, including adequate electricity, water, and benches.
 - Staff is well trained and motivated.
 - Equipment is present, fully functional, and somebody knows how to maintain and fix it.
 - There is no shortage of small material, consumables, and reagents.
 - It is fully linked to the international public health laboratory and proficiency testing networks.
 - Provide some tools to epidemiologists; AST, serotype, virulence factors.
 - Have a good laboratory network that provides samples from remote areas.
 - Provide, if necessary, a mobile intervention team that can be displaced to a critical area.
- ◆ Communication roles of the NRL should be the following:
 - As a disease reporting center, be strongly linked to disease surveillance authorities.
 - Provide data from remote areas.
 - Organize and transmit data and comments to disease surveillance authorities.
 - Drive regular supervision, quality control activities, and training workshops for the laboratory network.

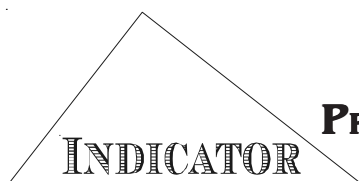
Source: Ministry of Labor, Health and Social Affairs and National Center for Disease Control. 2002. Assessment of Vaccine Preventable Diseases Surveillance Systems in Georgia. Technical Report No. 028. Bethesda, MD: The Partners for Health Reformplus Project, Abt Associates Inc., p. 25.

the numerator and denominator may entail significant costs in terms of travel, materials, time, or installing electronic data management systems at sub-national levels.

The indicator can be measured at the district, provincial/regional, and national level. Precise measurement of this indicator relies on health facilities having the capacity to detect outbreaks of epidemic-prone diseases accurately (i.e., the denominator). If the total number of outbreaks of epidemic-prone diseases in a district is underestimated, the assessment of the extent of laboratory confirmation may be overestimated. Depending on the comprehensiveness of the surveillance system, the indicator may or may not include reporting from private health facilities or nongovernmental organizations.

It should be noted that the numerator does not measure the specificity of the lab results. Many factors can affect the reliability of interpretation of a laboratory test result, including inappropriate serum collection, delay in transportation or refrigeration, and inadequate storage media.

While it is important that surveillance systems are linked to a continuum of laboratories providing the most basic to the most sophisticated services, it is unlikely that resources are sufficient everywhere to provide the entire continuum.



PROPORTION OF CONFIRMED OUTBREAKS WITH RECOMMENDED RESPONSE

Core IDSR Quality Indicator

Definition

Proportion of confirmed outbreaks with recommended response.

Numerator: Number of confirmed outbreaks with recommended response during a specified period.

Denominator: Total number of confirmed outbreaks in same period.

“Confirmed outbreak:” An outbreak in which cases that meet the clinical case definition have been confirmed through laboratory diagnostic testing or through epidemiological linkage to a laboratory confirmed case.

“Recommended response:” For epidemic-prone disease and for diseases targeted for elimination, a confirmed case should trigger a response action such as conducting an immunization activity, enhancing access to safe drinking water, community campaigns, and improving case management. For other priority diseases of public health importance, a confirmed outbreak should prompt an appropriate response such as improving coverage for specified immunizations, strengthening case management for IMCI diseases, providing information, education and communication about preventing and controlling the disease, and so on. Table 5.3 on the following page lists recommended responses to confirmed outbreaks of selected common childhood illnesses and vaccine-preventable diseases. See Section 8 of CDC/WHO (2001) for further details on disease-specific epidemic-response activities.

“Specified period:” The time frame may vary depending on the country.

Measurement Tools

Supervisory visit reports; outbreak investigation; and response reports

What It Measures

When an outbreak is confirmed, or a need for public health action is identified, an appropriate response is required based on outbreak investigation results and data analysis conclusions. This indicator measures whether the health system is functioning effectively to control outbreaks.

How to Measure It

This indicator is measured by the provincial supervisor every three months at the district level through his/her routine supervisory visit reports. Each confirmed outbreak is counted in the numerator if it was responded to according to the disease-specific guidelines. Disease-specific response checklists may be prepared (according to WHO/CDC guidelines) for ease of measurement. A value of 80% or higher on this indicator is regarded as highly satisfactory in terms of appropriate response to confirmed outbreaks. When the surveillance system is good, the indicator should approach 100%.

Strengths and Limitations

One advantage of this indicator is that it can be measured at the national and provincial/regional level. While the calculation of the indicator is straightforward and not labor intensive, the act of collecting data for the numerator and denominator may be costly in terms of travel, materials, time, or installing electronic data management systems at sub-national levels. It is to be noted that the indicator does not measure whether public health actions to treat and control the disease were taken in a timely manner. The indicator also assumes that necessary emergency response funds and resources are available.

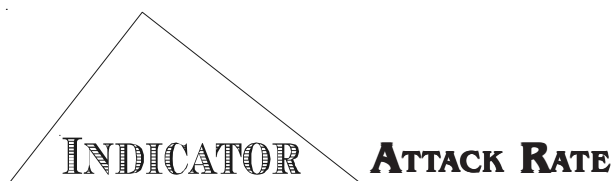
Table 5.3. Recommended responses to confirmed outbreaks for selected diseases that are of relevance to child health programs

Name of Priority Disease	Recommended Response for Confirmed Outbreak
Diarrhea with dehydration in children less than five years of age	<p><i>If the number of cases or deaths increase to two times the number usually seen in a similar period in the past:</i></p> <ul style="list-style-type: none"> • Assess health worker practice of IMCI guidelines for managing cases and improve performance for classifying diarrhea with dehydration in children less than five years of age. • Teach mothers about home treatment with oral rehydration. • Conduct community education about boiling and chlorinating water, and safe water storage and preparation of foods.
Malaria	<p><i>If the number of new cases exceeds the upper limit of cases seen in a previous non-epidemic period in previous years:</i></p> <ul style="list-style-type: none"> • Evaluate and improve, as needed, prevention strategies, such as use of permethrin-impregnated bed nets, especially for young children, pregnant women, and other high-risk populations.
Measles	<p><i>If an outbreak is confirmed:</i></p> <ul style="list-style-type: none"> • Improve routine vaccine coverage through the EPI, and lead supplemental vaccination activities in areas of low vaccine coverage. • Mobilize the community early to enable rapid case detection and treatment.
Meningitis	<p><i>Respond to action threshold:</i></p> <ul style="list-style-type: none"> • Begin mass vaccination campaign. • Distribute treatment supplies to health centers. • Treat according to epidemic protocol. • Inform the public. • Define the age group at highest risk (usually persons age one through 30 years of age) and complete a mass vaccination campaign within 10 days of outbreak detection. • Mobilize the community to permit early case detection and treatment, and improve vaccine coverage during mass vaccination campaigns for outbreak control.
Neonatal tetanus	<p><i>If a case is confirmed through investigation:</i></p> <ul style="list-style-type: none"> • Immunize the mother with at least two doses of tetanus toxoid and other pregnant women in the same locality as the case. • Conduct a supplemental immunization activity for women of childbearing age in the locality. • Improve routine vaccination coverage through EPI and maternal immunization program activities. • Educate birth attendants and women of childbearing age on the need for clean cord cutting and care. Increase the number of trained birth attendants.

Table 5.3. Recommended responses to confirmed outbreaks for selected diseases that are of relevance to child health programs (continued)

Name of Priority Disease	Recommended Response for Confirmed Outbreak
Pneumonia	<p><i>If the number of cases or deaths increases to two times the number usually seen during a similar period in the past:</i></p> <ul style="list-style-type: none"> • Assess health worker practices of IMCI guidelines for assessing, classifying, and treating children with pneumonia and severe pneumonia. • Identify high-risk populations through analysis of person, place, and time. • Conduct community education about when to seek care for pneumonia.
Poliomyelitis (acute flaccid paralysis)	<p><i>If a case is confirmed:</i></p> <ul style="list-style-type: none"> • If wild polio virus is isolated from stool specimen, refer to national polio eradication program guidelines for recommended actions. The national level will decide which actions to take and may include: <ul style="list-style-type: none"> ■ Specify reasons for non-vaccination of each unvaccinated case and address the identified deficiencies. ■ Immediately conduct “mopping-up” vaccination campaign around the vicinity of the case. ■ Conduct surveys to identify areas of low OPV coverage during routine EPI activities, and improve routine vaccine coverage of OPV and other EPI antigens. ■ Lead supplemental vaccination campaigns during National Immunization Days (NIDs) or Sub-National Immunization Days (SNIDs). Focus supplemental vaccination activities in areas of low vaccine coverage during EPI. Consider use of house-to-house vaccination teams in selected areas.
Yellow Fever	<p><i>If a single case is confirmed:</i></p> <ul style="list-style-type: none"> • Mobilize the community early to enable rapid case detection and treatment. • Conduct a mass campaign in the appropriate age group in the area (ages six months and older) and in areas with low vaccine coverage. • Identify high-risk population groups and take steps to reduce exposure to mosquitoes. • Improve routine and mass vaccination campaigns to include yellow fever in high-risk areas.

Source: WHO-AFRO and CDC, 2001.



Priority Indicator for Surveillance

Definition

The number of new cases of a specified disease per 100,000 population at risk of the disease in a given period.

Numerator: Number of new cases of a specified disease during a given period x 100,000.

Denominator: Total population at risk of the disease at the start of the same period.

“*Case:*” A person who has the particular disease, health disorder, or condition which meets the case definitions for surveillance and outbreak investigation purposes.

Measurement Tools

Data from field investigation

What It Measures

The attack rate is a measure of disease frequency applied to a narrowly defined population observed for a limited period of time, such as during an epidemic. An attack rate is used when the occurrence of disease among a population at risk increases dramatically over a short period of time.

How to Measure It

This indicator is a simple ratio that is straightforward and easy to calculate. It can be made age-specific by using the following four steps:

- (1) Calculate the number of persons who are in the age group in the area (e.g., persons aged 0–4 years);
- (2) Divide 100,000 by the number of persons in the age group;
- (3) Tally the number of cases in the age group for the period of time chosen; and
- (4) Multiply the result of Step 2 by the number of cases in the age group.

The result is the age-specific attack rate. The difficulty of calculating the attack rate based on data from field investigations stems from problems related to estimating the size of the total population at risk in a given age group. These are, in turn, the result of inaccurate or outdated census counts, population migrations, and unforeseen changes in birth rates or infant mortality. Where data on the number of persons in a given age group are unavailable, evaluators can estimate these numbers from the total population of the area or district and the typical age distribution for the relevant region of the world. The box on the next page illustrates how to estimate the total population for a given age group using this procedure.

For example:

Calculating the Age-Specific Attack Rate for Yellow Fever for the Age Group 0-4 Years in District A, Sub-Saharan Africa: Example

District population = 50,000

Typical Age Distribution for Sub-Saharan Africa

Age Group (years)	% of Total Population
0-4	17%
5-14	28%
15-29	28%
30-44	15%
45 and older	12%

STEP 1: Calculate the number of persons in the age group 0-4 years in District A

District population = 50,000

17% of total population = 0-4 year olds

$50,000 \times .17 = 8,500$ persons aged 0-4 years old

STEP 2: Divide 100,000 by the number of persons in the age group 0-4 years

$100,000 / 8,500 = 11.8$

STEP 3: Tally the number of cases of yellow fever in the age group 0-4 years for the period of time chosen

15 cases in 0-4 year olds

STEP 4: Multiply the result of Step 2 by the number of cases in the age group 0-4 years

$11.8 \times 15 = 176$

The ASAR for 0-4 year olds is 176 per 100,000

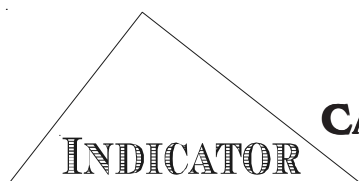
Source: <http://www.cdc.gov/epo/dih/ddm/Downloads/ddm/yellow%20fever/slide>

(Accessed March 18, 2004)

Strengths and Limitations

The attack rate is useful in comparing the risk of disease in groups with different exposures. It can be used to plan disease prevention activities (e.g., a vaccination strategy) and to target prevention activities to the groups with the highest attack rates. As the period of time over which the measurement is based is completely arbitrary, the attack rate is a versatile indicator.

Despite the versatility of an arbitrary time period, the value of the indicator is only as good as the data that are used for its calculation. Thus, data which are incomplete, confounded, or inaccurate, will lead to attack rates that may not be representative of the effectiveness of disease prevention activities.



CASE FATALITY RATE FOR OUTBREAKS OF EPIDEMIC-PRONE DISEASES

Core IDSR Quality Indicator (with adaptations for child health)

Definition

Proportion of persons diagnosed as having a specified epidemic-prone disease who die from that disease within a given period. The case fatality rate is usually expressed as a percentage.

Numerator: The number of deaths of persons diagnosed as having a specified epidemic-prone disease in a given period.

Denominator: Total number of persons diagnosed as having the specified epidemic-prone disease in the same period.

“Epidemic-prone diseases.” These include cholera, diarrhea with blood, measles, meningitis, plague, viral hemorrhagic fever, and yellow fever.

The definition and calculation of the indicator can be adapted to refer to children aged 0-59 months, as follows:

Proportion of children aged 0-59 months diagnosed as having a specified epidemic-prone disease who die from that disease within a given period.

Numerator: The number of deaths of children aged 0-59 months diagnosed as having a specified epidemic-prone disease in a given period.

Denominator: The number of children aged 0-59 months diagnosed as having the specified epidemic-prone disease in the same period.

Measurement Tools

Clinic registers; patient charts; surveillance reporting forms (see Annex 5.7 for an example of a monthly surveillance reporting form for outpatient and inpatient cases and deaths)

What it Measures

The case fatality rate is a measure of severity of illness. The indicator aims at measuring progress towards the reduction of mortality from epidemic-prone diseases at the health facility level. It expresses the likelihood that a person with a specific disease will live after entering the health facility. A case fatality rate helps to indicate whether a case is identified promptly, and any problems with case management once the disease has been diagnosed. It also helps to identify a more virulent, new, or drug-resistant pathogen and indicate poor quality of care or no medical care. Some disease control recommendations for specific diseases include reducing the case fatality rate as a target for measuring whether the outbreak response has been effective.

How to Measure It

The data for calculating this indicator can be derived from a review of clinic registers or patient charts or through periodic reporting of data on suspected cases of the specific disease (cases that meet the clinical case definition) from health facilities to districts, or from districts to the provincial/regional level. The indicator divides the total number of all deaths from a specific disease (for example, ARI, diphtheria, pertussis, measles, neonatal tetanus, etc.) during a specific period by the total number of reported cases of the disease in the same period, and multiplying the answer by 100.

Each epidemic-prone disease has a specific case-fatality rate (CFR) threshold. For example, in the case of cholera, a CFR greater than 1% indicates, among other things, poor case management. In the case of meningitis, a CFR less than or equal to 10% indicates an acceptable level (i.e., the target level), a CFR greater than 25% is considered high, and a CFR lower than 5% is considered very low (i.e., it may be that illness that is not due to meningitis is being classified as meningitis – “over-diagnosis” – or that severely ill patients are not reaching health facilities). In the case of measles, a CFR above 4% is considered high mortality (WHO, 2003b).

Strengths and Limitations

Once data on cases are being collected, this indicator is relatively easy to calculate. It can also respond to changes over a relatively short period, for example, 6-12 months. This indicator mostly helps service management at the level of each facility. This indicator helps to: (1) indicate whether a case is identified promptly; (2) indicate problems with case management once the disease has been diagnosed; (3) identify a more virulent, new, or drug-resistant pathogen; (4) indicate poor quality of care or no medical care; and (5) compare the quality of case management between different catchment areas, health facilities, or districts.

When interpreting this indicator, one should consider that it is sometimes difficult to distinguish deaths from a particular disease from deaths from other causes. Thus, the numerator can be as affected by errors in diagnosis, as by changes in classification. The case fatality rate is also affected by the quality and promptness of medical care provided in the facility, the condition of the child upon arrival, and distance from the health facility. Case-fatality rates may be underestimates because of incomplete reporting of deaths. For example, a CFR under 5% for yellow fever may suggest an epidemic is just beginning, or “over-diagnosis,” or the fact that severely ill cases may not be reaching health facilities.

One way to disentangle the components of the CFR is to gather information on other indicators of the quality of care, such as the admission-to-treatment time interval. Another approach would be to gather information about the condition of the child at the time of admission. This could help disentangle the effect of patients’ condition from that of quality of care.

It may not be valid to compare case fatality rates between facilities, especially between health centers and hospitals, since children with serious illness could be referred to the hospital at the last moment, where they may die. This would lower the CFR at the health center and raise it at the hospital. Thus, interpretation requires comparing the CFR for a particular facility over time and not comparison between facilities. When using this indicator to monitor trends over time in the quality of care, one caveat worth mentioning is that data from a recent year may be incomplete if there is a significant lag time in reporting.

References

- CDC. (1997). *Manual for the Surveillance of Vaccine-Preventable Diseases*. Atlanta: US Department of Health and Human Services. CDC:15.1-10.
- CDC. (2001). *Updated Guidelines for Evaluating Public Health Surveillance Systems: Recommendations from the Guidelines Working Group*. MMWR, 50(No. RR-13):11-24.
- CDC. (2003). *Integrated Disease Surveillance and Response, Vol. 1, Summer 2003*.
- Gordis, L. (2000). *Epidemiology*, 2nd Ed. W.B. Saunders Company: Philadelphia.
- Ministry of Labor, Health and Social Affairs, and National Center for Disease Control. (2002). *Assessment of Vaccine Preventable Diseases Surveillance Systems in Georgia*. Technical Report No. 028. Bethesda, MD: The Partners for Health Reformplus Project, Abt Associates, Inc.
- Romaguera RA, German RR, and Klaucke DN. (2000). Evaluating Public Health Surveillance. In: Teutsch SM, and Churchill RE, eds. *Principles and Practice of Public Health Surveillance*, 2nd Ed. New York: Oxford University Press; 176-193.
- Wharton M, and Ching PL. (2002). Surveillance Indicators. In: *VPD Surveillance Manual*, 3rd ed; 15-1-15-10.
- White ME, and McDonnel SM. Public Health Surveillance in Low- and Middle-Income Countries. In: Teutsch SM, and Churchill RE, eds. *Principles and Practice of Public Health Surveillance*, 2nd Ed. New York: Oxford University Press; 287-315.
- WHO. (1998). *WHO-Recommended Standards for Surveillance of Selected Vaccine-Preventable Diseases*. Geneva, Switzerland: World Health Organization. WHO/EPI/GEN/98.01.
- WHO. (2000). *Maternal and Neonatal Tetanus Elimination by 2005: Strategies for Achieving and Maintaining Elimination*. Geneva, Switzerland: World Health Organization. WHO/V&B/02.09.
- WHO. (2001). *Protocol for the Assessment of National Communicable Disease Surveillance and Response Systems: Guidelines for Assessment Teams*. Geneva, Switzerland: World Health Organization. WHO/CDS/CSR/ISR/2001.2.
- WHO. (2002). *Accelerating Immunization in the African Region*. Retrieved from <http://www.afro.who.int/press/2002/pr20021008-12rc03.html>
- WHO. (2003a). *Communicable Diseases Epidemiological Report*. Retrieved from <http://www.afro.who.int/csr/ids/bullettins/afro/jan2003.pdf>

WHO. (2003b). *Current Epidemiological Situation of Reported Epidemic Prone Diseases in the Region (Year 2003)*. Retrieved from http://www.afro.who.int/csr/epr/epidemic_prone_diseases/weekly_feedback1-7_2003.pdf

WHO-AFRO/CDC. (2001). *Technical Guidance for Integrated Disease Surveillance and Response in the African Region*. Retrieved June 20, 2003, from http://www.cdc.gov/epo/dih/Eng_IDSR_Manual_01.pdf

Annex 5.1. WHO-recommended case definitions for reporting selected suspected priority diseases from the health facility to the district

Epidemic-prone diseases	
Diarrhea with blood (<i>shigella</i>)	Any person with diarrhea and visible blood in the stool.
Measles	Any person with fever and maculopapular (non-vesicular) generalized rash and cough, coryza (i.e. runny nose) or conjunctivitis (red eyes) or any person in whom a clinician suspects measles. A measles death is a death occurring within 30 days of the onset of rash.
Meningitis	Any person with sudden onset of fever ($>38.5^{\circ}\text{C}$ rectal or 38.0°C axillary), and one of the following signs: neck stiffness, altered consciousness or other meningeal signs.
Yellow fever	Any person with sudden onset of high fever ($>39^{\circ}\text{C}$ rectal or 38.0°C axillary), followed by jaundice within two weeks of onset of first symptoms.
Diseases targeted for eradication and elimination	
Acute flaccid paralysis (AFP)/polio	Any child less than 15 years of age with AFP or a person of any age in whom the clinician suspects polio.
Neonatal tetanus	Any newborn with a normal ability to suck or cry during the first two days of life, and who, between 3 and 28 days of age, cannot suck normally and becomes still or has convulsions or both.
Other diseases of public health importance	
Diarrhea in children less than 5 years of age	<p><i>Diarrhea with some dehydration</i> Any child less than 5 years of age with diarrhea and two or more of the following: Restless or irritable Sunken eyes Drinks eagerly, thirsty Skin pinch goes back slowly</p> <p><i>Diarrhea with severe dehydration</i> Any child less than 5 years of age with diarrhea and two or more of the following: Lethargic or unconscious Sunken eyes Not able to drink or drinking poorly Skin pinch goes back very slowly</p>
Pneumonia in children less than 5 years of age	<p><i>Pneumonia</i> Any child aged 2 months up to 5 years of age with cough or difficult breathing and Breathing 50 breaths or more per minute in an infant 2 months up to a year Breathing 40 breaths or more per minute for a child aged 1 to 5 years (Infants less than 2 months with fast breathing, 60 breaths or more per minute, are referred for serious bacterial infection.)</p> <p><i>Severe pneumonia</i> Any child age 2 months up to 5 years with cough or difficult breathing, and with any danger sign, or chest indrawing, or stridor in a calm child. General danger signs are: Unable to drink or breastfeed, vomits everything, convulsions, lethargy or unconsciousness.</p>

Annex 5.1. WHO-recommended case definitions for reporting selected suspected priority diseases from the health facility to the district (continued)

Other diseases of public health importance (continued)	
Malaria	<p><i>Uncomplicated malaria</i> Any person with fever or fever with headache, backpain, chills, sweats, myalgia, nausea, and vomiting diagnosed clinically as malaria</p> <p><i>Confirmed uncomplicated malaria</i> Any person with fever or fever with headache, back pain, chills, sweats, myalgia, nausea, and vomiting and with laboratory confirmation or diagnosis by malaria blood film or other diagnostic test for malaria parasites.</p> <p><i>Malaria with severe anemia</i> Any child 2 months up to 5 years with malaria, and if an outpatient, with severe palm pallor, or if an inpatient, with a laboratory test confirming severe anemia.</p> <p><i>Severe malaria</i> Any person hospitalized with a primary diagnosis of malaria and confirmed by a positive blood smear or other diagnostic test of malaria.</p>

Source: WHO/CDC (2001), Annex 2, 29-31.

Annex 5.2. WHO-recommended types of surveillance for vaccine-preventable diseases

Disease	Recommended Type of Surveillance
Diphtheria	<ul style="list-style-type: none"> Routine monthly reporting of aggregated data of probable or confirmed cases is recommended from peripheral level to intermediate and central levels. Zero reporting should be required at all levels All outbreaks should be investigated immediately and case-based data collected In countries achieving low incidence (usually where coverage is >85-90%) immediate reporting of case-based data of probable or confirmed cases is recommended from peripheral to intermediate and central levels
Acute viral hepatitis	<ul style="list-style-type: none"> Routine monthly reporting of aggregated data of suspected cases, and if available, the number of confirmed cases of each type of hepatitis is recommended from the peripheral level to intermediate and central levels Zero reporting should be required at all levels All outbreaks should be investigated immediately and confirmed serologically
Haemophilus influenza type B (Hib) disease	<ul style="list-style-type: none"> Routine monthly reporting of aggregate data of confirmed cases is recommended from peripheral level to intermediate and central levels Zero reporting should be required at all levels All potential cases should also be reported if laboratory performance indicators are to be monitored (see Note) <p>Note: Since laboratory confirmation is required for all cases, the extent of surveillance will of necessity vary depending on the capabilities of individual countries. Surveillance does not need to be national in scope to fulfill goals. It is more important to have a well-functioning system in some areas than to have a national system that functions poorly.</p>
Measles	<ul style="list-style-type: none"> Control phase: When measles is endemic, routine monthly reporting of aggregated data of clinical measles cases from peripheral to intermediate and central levels. Only outbreaks (not each case) should be investigated. Outbreak prevention phase: When low incidence of measles is achieved with periodic outbreaks due to accumulation of susceptibles, routine monthly reporting of aggregated data of clinical measles cases is recommended from peripheral to intermediate and central level. All suspected outbreaks should be investigated immediately and case-based data collected. Suspected measles epidemics should be confirmed by conducting serology on the first few cases only. Elimination phase: Case-based surveillance should be conducted and every case reported and investigated immediately from peripheral level to intermediate level, and also included in the weekly reporting system. Laboratory specimens should be collected on every case. During all phases: Zero reporting should be required at all levels

Annex 5.2. WHO-recommended types of surveillance for vaccine-preventable diseases (continued)

Disease	Recommended Type of Surveillance
Neonatal tetanus	<ul style="list-style-type: none"> • Number of confirmed neonatal tetanus (NT) cases should be included in routine monthly surveillance reports of all countries and should be reported as a separate item from other (non-neonatal) tetanus. Zero reporting should be required at all levels • Active surveillance for NT should be conducted in major health facilities on a regular basis • A retrospective record review for NT cases should be conducted at least once annually in major hospitals • In “low risk” geographical areas where NT incidence < 1/1000 live births and surveillance is performing well (i.e. surveillance data are reasonably representative of the population and there is good reporting completeness), all suspect cases should be investigated to confirm and identify the cause • Community surveillance is recommended in “silent” areas (i.e. where routine reporting is not functional but, based on other indicators, where neonatal tetanus could be a problem)
Pertussis (whooping cough)	<ul style="list-style-type: none"> • Routine monthly reporting of aggregated data of suspected and confirmed cases from peripheral level to intermediate and central levels. Zero reporting should be required at all levels • All outbreaks should be investigated immediately and laboratory confirmed. During an outbreak, case-based data should be collected • To describe the changing pertussis epidemiology in countries with low pertussis incidence (usually where coverage is >80%), additional information on age group and immunization status should be collected; or, as an alternative case-based surveillance, sentinel surveillance, active surveillance, and/or occasional surveys and laboratory confirmation of suspect cases should be considered
Poliomyelitis	<ul style="list-style-type: none"> • Aggregated data of AFP cases should be included in routine monthly surveillance reports • Zero reporting should be required at all levels • All outbreaks should be investigated immediately • All AFP cases under 15 years of age or with paralytic illness at an age where polio is suspected, should be reported immediately, investigated within 48 hours and two stool specimens collected 24-48 hours apart and within 14 days of paralysis onset • Active surveillance should be implemented in selected hospitals
Yellow fever	<ul style="list-style-type: none"> • Routine weekly/monthly reporting of aggregated data on suspected or confirmed cases from peripheral level to intermediate and central levels. Zero reporting should be required at all levels. • Immediate reporting of suspected cases from peripheral level to intermediate and central levels • All suspected cases and outbreaks should be investigated immediately and laboratory confirmed. • Case-based surveillance should be implemented in countries identified by WHO as high risk for yellow fever. Specimens should be collected to confirm an epidemic as rapidly as possible. Then priority should be placed on collecting specimens from new or neighboring areas (other than the area where the epidemic is already confirmed).

Source: WHO. 1998. WHO-Recommended Standards for Surveillance of Selected Vaccine-Preventable Diseases. WHO/EPI/GEN/98.01. Geneva: World Health Organization.

Annex 5.3. Sample form for recording timeliness and completeness of monthly reporting from the health facility to the district

Nota bene: legend

T = arrived on time

L = arrived late

W = report not received

District: _____

Year: _____

Name of health facility	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total number of reports expected (N)												
Total reports sent on time (T)												
Total reports sent late (L)												
Total number of reports not received												
Timeliness of the reports = $100 * T / N$												
Completeness of reporting = $100 * (N - W) / N$												

Please note that timeliness and completeness are expressed as percents (%). When the surveillance system is good, the rates for timeliness and completeness should approach 100%. This table allows for monitoring the progress of these two indicators in the district so that action can be taken to improve timeliness for each health facility in the district.

Source: WHO and CDC (2001), Annex 29, p. 185.

Annex 5.4. Generic case-based reporting form – from health facility/worker to district health team

Reporting Health Facility					Reporting District				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AFP	Cholera	Diarrhea with blood /Shigella	Dracuncu- liasis	Neonatal Tetanus	Measles	Plague	Viral Hemorrhagic Fever	Yellow Fever	Other
<div style="display: flex; justify-content: flex-end; align-items: center;"> <div style="border-bottom: 1px solid black; width: 100px; margin-right: 5px;"></div> <div style="margin-right: 5px;">/</div> <div style="border-bottom: 1px solid black; width: 100px; margin-right: 5px;"></div> <div style="margin-right: 5px;">/</div> <div style="border-bottom: 1px solid black; width: 100px;"></div> </div> Received form at national level									
Name(s) of Patient: _____			Date of Birth: ____/____/____			Age: ____ <small>(if DOB Unknown)</small> Years ____ Months ____ Days ____ <small>(If <12 months) (NNT Only)</small>			
Patient's Residence: Village/Neighborhood _____						SEX: <input type="checkbox"/> M=Male F=Female			
Town/City: _____			District of Residence: _____			<input type="checkbox"/> U=Urban R=Rural Urban/Rural			
Locating Information: _____ <small>If applicable, name of mother and father if neonate or child</small>									
Date Seen at Health Facility: ____/____/____ Date Health Facility Notified District: ____/____/____ Dates of Onset: ____/____/____					For cases of Measles, NT (TT in mother), Yellow Fever, and Meningitis: Number of vaccine doses received <input type="checkbox"/> 9=unknown <small>For Measles, TT, YF -documented by card. For Meningitis, by history.</small> Date of last vaccination: ____/____/____ <small>(Measles, Neonatal Tetanus (TT in mother), Yellow Fever, and Meningitis only)</small>				
Blank Variable #1 _____ Blank Variable #2 _____			In/Out patient: <input type="checkbox"/> 1= In patient 2= Out-patient		Outcome <input type="checkbox"/> 1= Alive 2= Dead 9= unknown				
Final Classification : <input type="checkbox"/>					1= Confirmed 2= Probable/Compatible 3= Discarded 4= Suspected				
Person Completing Form Name: _____ Signature: _____ Date Sent Form to District: ____/____/____									

Annex 5.4. Generic case-based reporting form – from health facility/worker to district health team (continued)

If Lab Specimen Collected

<i>For Health Facility: If lab specimen is collected, complete the following information, and send a copy of this form to the lab with the specimen.</i>							
Date of specimen collection: ____/____/____			Specimen source: Stool Blood CSF _____ Other				
Date specimen sent to lab: ____/____/____							
For the lab: Complete this section and return the form to the district team and clinician							
Date Lab Specimen: ____/____/____			Specimen Condition: Adequate Not adequate				
Disease/ Condition	Type of test	Results (P=pending)	Disease/ Condition	Type of test	Results		
Cholera	Culture	+ - P	Yellow Fever	IgM	+ - P		
	Direct exam	+ - P	Measles	IgM	+ - P		
Meningitis		Method used for Direct Exam	Rubella	IgM	+ - P	Virus Detection	
N. meningitidis	Culture	+ - P	RVF	IgM	+ - P	+ - P	
S. pneumonia	Culture	+ - P	Ebola	IgM	+ - P	+ - P	
H. influenza	Culture	+ - P	CCHF	IgM	+ - P	+ - P	
N. meningitidis	Latex	+ - P	Lassa	IgM	+ - P	+ - P	
S. pneumonia	Latex	+ - P	Marburg	IgM	+ - P	+ - P	
H. influenza	Latex	+ - P					
ShigellaDysenteriae	Culture	SD type 1 Other shig					
Plague	Culture	No shig					
	IFA>1: 64	+ - P + - P					
Date lab sent results to district: ____/____/____ Name of lab sending results: _____			Other lab results: _____ _____ _____ Other pending tests: _____				
Date district received lab results: ____/____/____			Date lab results sent to clinician by district: ____/____/____				
Note: District is responsible for ensuring lab results get to clinicians. Failure to do so will undermine cooperation with clinicians on reporting of cases in the future							

Source: WHO and CDC (2001), Annex 8, pp. 57-58.

Annex 5.5. Generic line list – for reporting from health facility to district and for use during outbreaks

Health Facility: _____

Date received at District: _____

District: _____

Disease/Condition: _____

	<i>ID Number</i> (Assigned at the district level only) 001,002, etc.	(O)ut/ (I)n Patient	Name	Village or Town and Neighborhood	Sex	Age **	Date Seen at Health Facility	Date of Onset of Disease
(1)								
(2)								
(3)								
(4)								
(5)								
(6)								
(7)								

- If district sends specimen to the lab, use ID number as well (PPP-DDD-YY-oox format) to identify lab specimen.
- If health facility sends lab specimen to lab without passing through the district, then the name (only) will be the lab specimen identifier.

NOTE: If more than 100 cases occur in a week (e.g. for measles, cholera, etc.) at a health facility, line listing of cases is not required; record just the total number of cases.

- If previously reported cases die, update the status by completing a new row with “died” in the status column and “update record” in the Comments column.

** Age in years if more than 12 months, otherwise write age in months (e.g. 9m).

Annex 5.5. Generic line list – for reporting from health facility to district and for use during outbreaks (continued)

	Number of doses of vaccine (Exclude doses given within 14d of onset)	Blank variable	Blank variable	Lab Tests		Outcome (A)live (D)ead	Comments
				Specimen taken (Yes/No) If yes, date collected	Lab results		
(1)							
(2)							
(3)							
(4)							
(5)							
(6)							
(7)							

Source: WHO and CDC (2001), Annex 9, pp. 62-63.

Annex 5.6. Sample supervisory checklist for surveillance and response activities at the health facility

Health Facility: _____ Date of Supervisory Visit: _____

ACTIVITY	SUPERVISORY QUESTION	ANSWER	COMMENT (What Caused Problem)
Identify Suspected Case	1. How often do you collect information from the community about reports of suspected cases or deaths due to a priority disease or condition?	G-----	
Register Case	1. Are diagnoses of cases of priority diseases recorded in the clinic register according to the standard case definition?	G Yes G NO	
Report	1. Do health staffs use a standard case definition to report the suspected cases and outbreak? 2. Do you record information about immediately notifiable diseases on a case form or line list?	G Yes G NO G Yes G NO	
Analyze and Interpret	1. Do you plot the numbers of cases and deaths for each priority disease on a graph? (Ask to see the health facility's analysis book. Look to see if the trend lines are up-to date.) 2. Do you plot the distribution of cases on a map?	G Yes G NO G Yes G NO	
Investigate and Confirm Reported Cases and Outbreaks	1. If an epidemic-prone disease was suspected, was it reported immediately to the district office? 2. For the cases of priority diseases needing laboratory tests seen since the last supervisory visit, how many had laboratory results? 3. Are appropriate supplies available or set aside for collecting laboratory specimens during an urgent situation and show me the supply?	G Yes G NO Number of results obtained:----- Number of expected cases seen:----- G Yes G NO	
Respond	1. Are appropriate supplies available for responding to a confirmed case or outbreak (for example, <i>immunization supplies and vaccine, ORS, antibiotics, and so on</i>)? 2. Please show me the supplies for carrying out a recommended response. 3. Who is the outbreak coordinator for this facility? 4. How often do you provide information and training in outbreak response to the staff of this facility?	G Yes G No G Yes G No Name:----- Designation:----- Training is done -----	
Provide Feedback	1. How often do you report information to the community? 2. Do you receive the latest bulletin from the (<i>central, subnational</i>) level?	Report it----- G Yes G No	
Evaluate and Improve the System	1. Were the last 3 routine monthly reports sent to the district office? 2. Were the last 3 routine monthly reports sent on time?	G Yes G No G Yes G No	

Annex 5.6. Sample supervisory checklist for surveillance and response activities at the health facility (continued)

ACTIVITY	SUPERVISORY QUESTION	ANSWER	COMMENT (What Caused Problem)
Epidemic Preparedness	1. What precaution do health staff (including laboratory staff) take routinely with all patients regardless of patients' infection status? 2. How do you estimate the number of supplies to set aside for use during an emergency situation?	Minimum level of standard precautions: _____ How supplies are estimated: _____	

Source: WHO and CDC (2001), Annex 31, pp. 188-189.

Annex 5.7. Monthly surveillance summary report form for out-patient cases and in-patient cases and deaths (district to next level)

Year _____ Month _____ District _____ Province _____

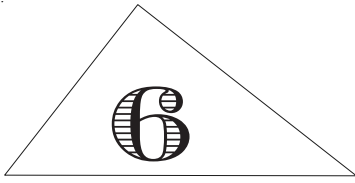
Record below the total number of cases and deaths for each disease/condition. Report these totals to the next level. Complete the column for the current month for all diseases/conditions.

		Out-Patient	In-Patient	
		Cases	Cases	Deaths
Malaria <5 years	Uncomplicated			
	Severe			
Malaria >5 years	Uncomplicated			
	Severe			
In-Patient Malaria with severe anemia (<5 years)				
Uncomplicated Malaria < 5 years, lab-confirmed				
Uncomplicated Malaria 5+ years lab-confirmed				
Pneumonia (<5 years)				
Severe Pneumonia (< 5 years)				
Diarrhea with some dehydration (<5 years)				
Diarrhea with severe dehydration (<5 years)				
New AIDS cases				
Male Urethral Discharge				
Male Non-vesicular Genital Ulcer				
Female Non-vesicular Genital Ulcer				
Diarrhea with blood				

Number of sites that reported on time _____

Number of outpatient sites that are supposed to report _____

Number of sites that are reported late _____



**INTEGRATED
MANAGEMENT OF
CHILDHOOD ILLNESS
(IMCI): IMPROVED
HEALTH WORKER
SKILLS**

Indicators:

- Child checked for three danger signs
- Child checked for the presence of cough, diarrhea, and fever
- Child's weight checked against a growth chart
- Child's vaccination status checked
- Index of integrated assessment of sick child
- Child under two years of age assessed for feeding practices
- Child needing an oral antibiotic and/or antimalarial is prescribed the drug(s) correctly
- Sick child not needing antibiotic leaves the facility without antibiotic
- Caretaker of sick child is advised to give extra fluids and continue feeding
- Child needing vaccinations leaves facility with all needed vaccinations
- Caretaker of child who is prescribed ORS and/or oral antibiotic and/or antimalarial knows how to give the treatment
- Sick child needing referral is referred

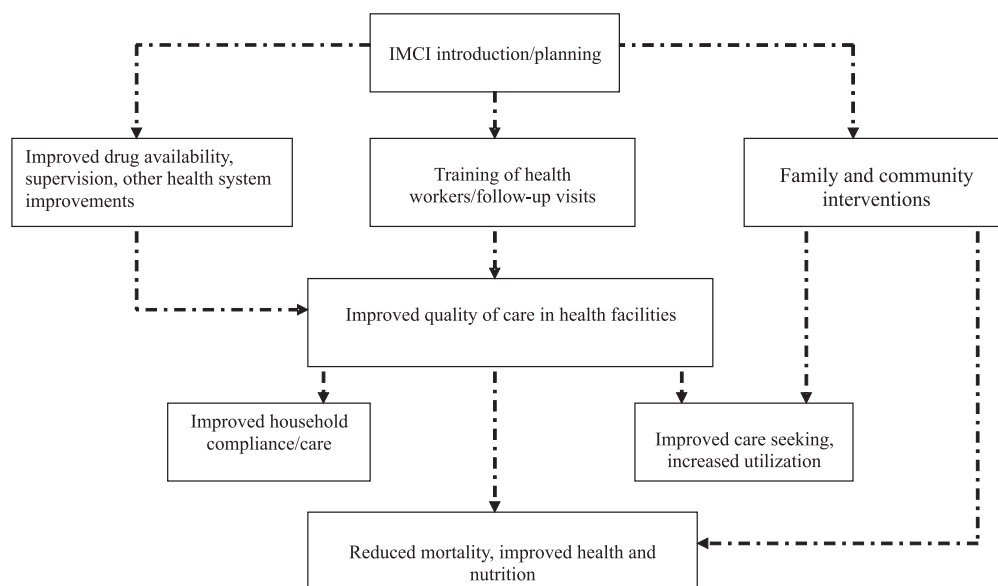
CHAPTER 6. INTEGRATED MANAGEMENT OF CHILDHOOD ILLNESS (IMCI): IMPROVED HEALTH WORKER SKILLS

IMCI is an integrated programmatic approach for reducing infant and childhood morbidity and mortality and improving nutritional status, through the provision of timely appropriate care for illnesses most prevalent among children under five. Instead of having vertical approaches for every major childhood disease, as was the case with previous efforts, IMCI focuses on dealing with common childhood illnesses in a more efficient and cost effective manner. IMCI has three major components, each of which is adapted in countries on the basis of local epidemiology, health system characteristics, and culture. These components include: (a) improving the skills of health workers through training and reinforcement of correct performance; (b) improving health system support for the delivery of child health services, including the availability of drugs, effective supervision and the use of monitoring and health information system data; and (c) improving family practices

that are important for children's health and development. The latter component also encourages the development and implementation for community and household-based interventions to increase the proportion of children who are exposed to these practices.

Figure 6.1 shows a simplified model that outlines the pathways through which the different IMCI interventions are expected to lead to changes in child mortality, health, and nutrition (Bryce et al., 2004). The model does not directly address contextual factors that could affect the outcomes and impact of IMCI interventions. However, the role of these factors in modifying the effects of IMCI activities on child mortality, health, and nutrition outcomes or producing effects that are independent of or simultaneous with IMCI interventions is recognized.

Figure 6.1. Outline of the integrated management of childhood illness (IMCI) impact model.



Source: Bryce et al. (2004).

This chapter focuses on indicators for monitoring and evaluating health facility-based interventions intended to improve health worker skills. These training interventions are based on a set of guidelines for assessing signs and symptoms; classifying illness and identifying needed treatment; providing appropriate treatment, referral, and counseling of the child's caretaker, depending on the classification identified; and providing follow-up care. The guidelines also cover the assessment of nutrition and immunization status and potential feeding problems, and effective communication with the child's caretaker.

Table 6.1 presents illustrative processes and outputs related to interventions to improve health worker skills. We do not address efforts to improve the skills of community health workers but focus on the training of first-level public health providers in IMCI case management. IMCI training interventions are expected to lead to improved health worker skills and competence as well as reduced missed opportunities for vaccination and treatment of childhood illness, which should lead to increased patient satisfaction and improved home care. Effective counseling of caretakers by IMCI-trained health workers is expected to lead to improvements in early case management,

Table 6.1. Illustrative processes, outputs, and outcomes associated with improving health worker skills

Processes	Outputs	Outcomes	Impact
<ul style="list-style-type: none"> • Training first-level health workers and district-level supervisors 	<p><i>Functional Outputs</i></p> <ul style="list-style-type: none"> • Health workers trained in IMCI • District supervisors trained in IMCI <p><i>Service Outputs</i></p> <ul style="list-style-type: none"> • Improved health worker skills • Improved health worker competence • Reduced missed opportunities for vaccination and treatment of childhood illness • Increased patient satisfaction 	<ul style="list-style-type: none"> • Improved caretaker knowledge and practices <ul style="list-style-type: none"> ◦ Early case management ◦ Appropriate care seeking ◦ Compliance with treatment 	<ul style="list-style-type: none"> • Reduced mortality • Improved child health and nutrition

appropriate home treatment, and compliance with treatment recommendations. These outcomes should lead, in turn, to reductions in the case fatality rates of diarrhea, pneumonia, measles, malaria, and other severe bacterial infections, as well as to reductions in malnutrition.

Service Provision Assessment

The Service Provision Assessment (SPA) is the most comprehensive tool for measuring the quality of care at the health facility level. The SPA is a national survey of a representative sample of public and/or private facilities that provide maternal, child, and reproductive health services. The SPA measures not only the quality of care but also the overall functioning of a health facility, as reflected in the set of questions it addresses:

- (1) To what extent are the surveyed facilities prepared to provide the priority services?
- (2) To what extent does the service delivery process follow generally accepted standards?
- (3) To what extent do support systems for maintaining or improving the existing services exist, and how well are they functioning?
- (4) What are the issues the clients and service providers consider relevant to their satisfaction with the service delivery environment?

The SPA uses four different data collection methods. The first is an inventory of resources and support services, which provides information on the preparedness of a facility to provide priority services at an acceptable standard of quality. As part of the inventory (also known as a facility audit), interviewers ask staff about their qualifications, training, perceptions of the service delivery environment, and related issues. The second is a provider interview, during which interviewers ask health service providers for information on their qualifications (training, experience, and continuing education), supervision they have received, and perceptions of the service delivery environment. The third is observation of services provided. The observation assesses the extent to which service providers adhere to service

delivery standards. The fourth is exit interviews with clients who have received services. The exit interview assesses the client's understanding and perceptions of the consultation/examination, as well as recall of instructions regarding treatment or preventive behaviors. Recall of key messages increases the likelihood that the client (caretaker) will successfully follow treatment or will perform the preventive behaviors that optimize healthy outcomes.

The SPA provides the following information on child health:

- Preparedness to provide good quality services (specifically, immunization services and basic diagnosis and outpatient treatment of sick children)
- Adherence to standards for provision of services
- Client understanding of consultation

The following components of the SPA are of direct relevance to an evaluation of health worker skills and competence:

Staff: What is the qualification of staff who provide the service? Have the health workers received periodic continuing education on relevant topics, and how recently has training occurred? Have the health workers received a minimal level of supervision?

Process: Do protocols and standards of practice for each service meet generally accepted quality standards for basic as well as advance level services at referral facilities? Do providers adhere to the standards of practice for service delivery? The process assessed includes procedures followed, components of physical examinations, as well as the information exchanged between the health worker and client (caretaker in the case of child health). The SPA assesses if the process during service delivery meets the standards; it does not assess if providers correctly diagnose the problem.

Client understanding: What information regarding the consultation, instructions, or follow-up can the client recall?

Other components related to the ability of health facilities to deliver quality services are:

Facility resources, equipment, and supplies: What specific equipment and supplies are available at the various levels of service delivery? Do the elements that are required to provide the services meet minimum standards? Are these elements present, functioning, and in the appropriate location for use during service provision? Are there systems for maintaining adequate availability of supplies (inventories; appropriate storage; equipment maintenance and repair/replacement systems), and is there evidence of effectiveness?

Systems for evaluating and monitoring services: Are routine information systems up-to-date and able to provide basic client and service provision data? Are there systems for monitoring community coverage if that is expected of the facility?

Facility management: Does the facility have basic management systems in place, and do they include community representation? Does the facility participate in any financing mechanism that affects the cost to the community or client?

Service provision environment: Does the facility collect very basic information about problems the staff thinks should be addressed to improve their working situation and services? Does the facility collect data revealing the opinion of clients regarding issues related to satisfaction with their consultation and the service delivery environment? The appendix presents a summary of the information available from the SPA on child health.

The SPA identifies the strengths and weaknesses of a set of clinical facilities at a given point in time, and if repeated, the data can demonstrate changes over time. If a program is not achieving its desired outcome, the SPA may reveal service-related reasons for this shortcoming. Data from the SPA data can be linked to household-level data from the DHS to demonstrate that changes (improvements) in the service delivery environment improve outcomes at the population level.

Challenges of Monitoring and Evaluating Health Worker Skills

Observation and courtesy bias

Most of the indicators for monitoring and evaluating health worker skills are measured through observations of sick child consultations or exit interviews. In observations of sick child consultation, it is often not possible to keep the provider ignorant of actual observation. Therefore, it is likely that a health worker may abide by the guidelines more strictly when he or she is conscious of being monitored. Such observation bias may be reduced if observation teams spend a longer period in the health facility, by the end of which provider behaviors may become more normative.

An indicator may also be affected by "courtesy bias" if the information required to measure it is collected through an exit interview. The caretaker may respond positively about procedures that the health worker was supposed to carry out, even though they may not have been performed. Courtesy bias is likely to occur if the caretaker has doubts about the confidentiality of the exit interview or if the caretaker has developed a positive interpersonal relationship with the health worker. The bias can be reduced if interviewers stress that the responses will remain confidential and that no identifying information will be put on the questionnaires.

Complexity of Indicator Measurement

Some of the indicators recommended for monitoring and evaluating health worker skills are

composite indicators that combine several elements. Thus, the indicators are not always straightforward to measure. For example, correct treatment of a particular condition requires correct questions to be asked, correct assessments to be conducted, and correct treatment to be provided. All these steps need to be carefully monitored through observation and compiled into an aggregate index. Explaining a lack of change over time in a composite indicator poses a major challenge as improvements in some components may be masked by deterioration in others.

Prioritizing Indicators

Because the quality of care is a complex, multi-faceted issue, there could literally be hundreds of indicators to measure it. As collecting data on all these indicators would be time-consuming, costly, and overwhelming, the question of prioritizing indicators to measure the quality of care is an important one. From the point of view of practicality, WHO (2001) has developed a set of core and supplemental indicators for IMCI at first-level facilities. If time and budget permit, evaluators may want to augment these indicators with the supplemental indicators listed in Annex 6.1 on page 239.

Maximizing the Use of Available Data

The challenge remains as to how best to use the available data to inform decisions about the provision of high quality child health services or improvements in the quality of care. Overburdening the system with a great deal of information may prove to be counter-productive in the absence of clear guidance on how program managers can use the data for decision-making.

Selection of Indicators

This chapter presents WHO priority indicators for the assessment of health worker skills at the health facility level. These indicators were selected by the Interagency Working Group on IMCI Monitoring and Evaluation on the basis of their

validity, reliability, and feasibility. The indicators are the following:

Assessment

- Child checked for three danger signs
- Child checked for the presence of cough, diarrhea, and fever
- Child's weight checked against a growth chart
- Child's vaccination status checked
- Index of integrated assessment of sick child
- Child under two years of age assessed for feeding practices

Correct Treatment and Counseling

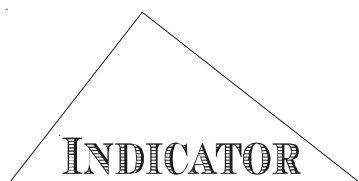
- Child needing an oral antibiotic and/or antimalarial is prescribed the drug(s) correctly
- Sick child not needing antibiotic leaves the facility without antibiotic
- Caretaker of sick child is advised to give extra fluids and continue feeding
- Child needing vaccinations leaves facility with all needed vaccinations
- Caretaker of child who is prescribed ORS and/or oral antibiotic and/or antimalarial knows how to give the treatment

Correct Management of Severely Ill Children

- Sick child needing referral is referred

Although the scope of this chapter is limited to only one of the components of the IMCI strategy (i.e., improving health worker skills), for a complete evaluation of the outcomes and impact of IMCI, all three components must be monitored and evaluated. If health workers are competent in case management but do not have the equipment, supplies, or drugs needed to manage cases correctly, desired child health outcomes cannot be achieved. This implies that activities aimed at improving the ability of the health system

to deliver IMCI need to be monitored and evaluated alongside activities to improve health worker skills. For example, increased availability of equipment, drugs, and supplies and improved service organization at health facilities are expected to lead to reduced waiting times for clients and a more complete assessment of child health care needs. Readers are referred to Annex 6.1 for a list of indicators for monitoring and evaluating improved health system support for the delivery of child health services.



CHILD CHECKED FOR THREE DANGER SIGNS

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of sick children checked for the three general danger signs.

Numerator: Number of sick children aged 2-59 months seen who are checked for three danger signs (is the child able to drink or breastfeed; does the child vomit everything; has the child had convulsions).

Denominator: Number of sick children aged 2-59 months seen.

Measurement Tools

Service Provision Assessment (SPA); Health Facility Assessment (HFA); supervision checklist

What It Measures

This indicator measures the performance of one of the tasks associated with the routine assessment of sick children aged two months to five years: checking for general danger signs. The indicator presupposes that the health worker has been trained in IMCI. Given this assumption, the indicator measures both the adequacy of IMCI training to impart these skills and the ability of the trainees to assimilate and retain the information and skills over time.

How to Measure It

Measurement of this indicator requires direct observation of sick child consultations to determine whether the health worker asked about or the caretaker reported each of the following danger signs: the child is unable to drink or breastfeed, the child vomits everything, and the

child has had convulsions during the present illness. It is recommended that health workers not rely completely on the caretaker's report of whether the child is able to drink or breastfeed but observe the mother while she tries to breastfeed or to give the child something to drink.

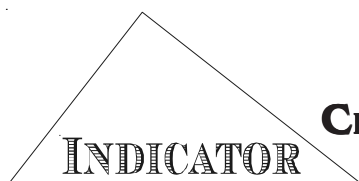
Strengths and Limitations

Measuring this indicator is straightforward and can be done in a routine basis during supervisory visits. Immediate feedback can be given to the health worker to improve future practice. The indicator can help identify if health workers of a particular health facility need refresher training. If no improvement in this indicator is seen over time, program managers may wish to monitor health workers' assessment of the presence of each danger sign separately to identify whether a particular danger sign is not routinely checked.

Sample Questions

Sample instructions from a checklist completed by an observer during a SPA are the following:

- o Record whether a provider asked about or whether the caretaker mentioned any of the following:
 - (1) Whether the child is unable to drink or breastfeed at all;
 - (2) Whether the child vomits everything; and
 - (3) Whether the child has had convulsions with this sickness



CHILD CHECKED FOR THE PRESENCE OF COUGH, DIARRHEA, AND FEVER

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of sick children aged 2-59 months checked for the presence of cough, diarrhea, and fever.

Numerator: Number of sick children aged 2-59 months seen whose caretakers were asked about the presence of cough, diarrhea, and fever.

Denominator: Number of sick children aged 2-59 months seen.

Measurement Tools

SPA; HFA; supervision checklist

What It Measures

This indicator measures health worker compliance with IMCI clinical guidelines requiring the routine check of all sick children for the three main symptoms that often result in death: cough or difficult breathing, diarrhea, and fever. This enables the health worker to exclude or identify cases of ARI or diarrhea or measles or malaria. The indicator presupposes that health workers have been trained in IMCI. If this assumption is met, the indicator not only reflects the retention of skills acquired during IMCI training, but also measures the adequacy of the training to impart these skills and the ability of the trainees to assimilate and retain the information and skills over time.

How to Measure It

The data sources for this indicator are checklists and notes from an expert observation of sick child consultation. The data required for calculating this indicator can also be collected during routine supervisory visits. A child is counted in the numerator if the health worker asked the caretaker about each of the three symptoms. All sick children seen at the health facility constitute the denominator.

Strengths and Limitations

The data required to calculate the indicator are simple to collect and can easily be incorporated into checklists used for the routine supervision of health workers. This indicator can be collected after a specific interval post-training (e.g., six months or 12 months) among health workers who attended an IMCI training course.

Sample Questions

Sample questions from the March 2004 version of the SPA are as follows:

- o *Assessment task:* Record whether a provider asked about or whether the caretaker mentioned that the child had any of the following major symptoms:
 - (a) Has cough or difficult breathing;
 - (b) Diarrhea; and
 - (c) Fever or body hotness.



INDICATOR

CHILD'S WEIGHT CHECKED AGAINST A GROWTH CHART

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of sick children aged 2-59 months who are weighed the day they are seen and whose weights are checked against a recommended growth chart.

Numerator: Number of sick children aged 2-59 months who are weighed the day they are seen and whose weights are checked against a recommended growth chart.

Denominator: Total number of sick children aged 2-59 months seen.

Measurement Tools

SPA; HFA; supervision checklist

What It Measures

This indicator measures health worker compliance with IMCI guidelines for the routine assessment of the nutritional status in sick children. There are two main reasons for this assessment. The first is to identify children with severe malnutrition who are at increased risk of mortality and need urgent referral. Second, the assessment of the nutritional status of sick children helps to identify children with growth faltering who may benefit from nutritional counseling. All sick children should be assessed for malnutrition.

How to Measure It

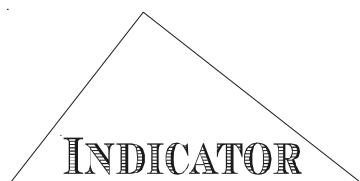
The data are gathered by direct observation of sick child consultations. The observer records whether the health worker weighed the child and plotted the child's weight on a recommended growth chart (usually a standard WHO or national growth chart).

Strengths and Limitations

Data for this indicator are easy to collect during sick child observation or routine supervisory visits. They give a good indication of health worker compliance with IMCI guidelines regarding the nutritional assessment of all sick children. The indicator can be applied at a specific interval post-training to those who attended IMCI training to evaluate the retention of this particular component of clinical assessment skills. This may help identify health workers who need refresher training or health centers in which weighing of sick children and recording the weight on a growth chart are not enforced.

Limitations to the use of observation for measuring quality of sick child assessment have already been discussed. These include "observation bias," in that a health worker may abide to the guidelines more strictly when he or she is conscious of being monitored. Another limitation of the indicator pertains to variability between observers in measurement. This is hard to measure but can be assessed by having two independent observers rate a sick child consultation and then comparing the degree of agreement or disagreement in their ratings.

Note that the indicator does NOT reflect the correct measurement of the child's weight, whether the child's weight was accurately plotted on a growth chart, how effectively health workers interpreted the information on the growth chart, or whether the health worker took an appropriate course of action based on insights from the growth chart. It is also difficult to tell from the indicator whether health workers are weighing/not weighing the children at all, or whether children are weighed but their weights are not plotted on a growth chart.



CHILD'S VACCINATION STATUS CHECKED

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of sick children who have their vaccination status checked.

Numerator: Number of sick children seen who have their vaccination card or history checked.

Denominator: Number of sick children seen.

Measurement Tools

SPA; supervision checklist

What It Measures

This indicator is a measure of missed opportunities for vaccinating sick children who are brought to the health facility.

How to Measure It

The data requirements for calculating this indicator are the number of sick children who have their vaccination card or history checked and the number of sick children seen. The data are collected by observation of sick child consultations. The indicator can also be collected through checklists used for routine supervision. The observer/supervisor records on a checklist whether the health worker checked the child's vaccination status by reviewing the child's vaccination card or asking the caretaker questions about the child's vaccination history.

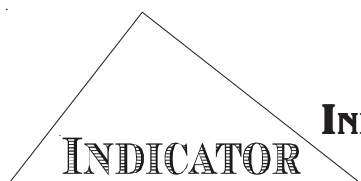
Strengths and Limitations

The strength of this indicator lies in its scope for assessing missed opportunities for vaccinating sick children who present to the health facility. The immunization status of every sick child brought to a health facility should be checked. The indicator only measures whether health workers are screening the vaccination status of sick infants and children, not whether they act on this information appropriately by vaccinating children in need of a vaccination on the same day or referring them to the next vaccination session.

Sample Questions

The MEASURE DHS+ SPA (version dated March 2004) observation checklist for sick child consultation at health facilities includes the following instructions:

- o Record whether a provider asked about or performed other assessments of the child's health by doing the following:
 - Look at the child's immunization card or ask the caretaker about the child's vaccination history?



INDEX OF INTEGRATED ASSESSMENT OF SICK CHILDREN

Priority Indicator for IMCI at Health-Facility Level

Definition

Arithmetic mean of assessment tasks performed per sick child assessed.

The index is made up of the following 10 assessment tasks that must be taken by the health provider to check for general danger signs, main symptoms, nutritional status, and immunization status:

- Sick child checked for ability to drink or breastfeed (1 point)
- Sick child checked on whether he/she vomits everything (1 point)
- Sick child checked for presence of convulsions during present illness (1 point)
- Sick child checked for presence of cough and fast/difficult breathing (1 point)
- Sick child checked for presence of diarrhea (1 point)
- Sick child checked for presence of fever (1 point)
- Sick child weighed on the day of the visit to the health facility (1 point)
- Sick child's weight plotted against a recommended growth chart on the day of the visit to the health facility (1 point)
- Sick child checked for palmar pallor (1 point)
- Sick child's vaccination status checked (card or history) (1 point)

Measurement Tools

SPA; HFA

What It Measures

Correct assessment is required in order to classify and treat children appropriately. This indicator is an aggregate measure of the quality of assessment of sick children at the facility level. It reflects the extent to which health providers perform the steps required to correctly assess sick children. These steps include: (1) checking for general danger signs; (2) checking main symptoms; (3) checking nutritional status; and (4) checking immunization status.

How to Measure It

The data for calculating this indicator are derived from a questionnaire completed by an expert observer to evaluate health worker performance during sick child consultations. Each routine task mentioned in the definition is assigned "1" point. To calculate this indicator, the following data are needed for each health provider that manages sick children:

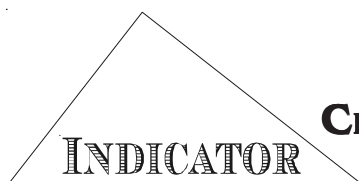
- The number of assessment tasks completed for each sick child seen by a health provider
- The total number of sick children seen by that health provider
- The sum of assessment tasks completed by that health provider for all sick children seen

The numerator is the sum of assessment tasks completed by a health provider for all sick children seen. The denominator is the total number of sick children seen by the health provider. The index ranges from zero (indicating no routine assessment tasks were completed for any sick child seen) to 10, signifying that all routine assessment tasks were completed for all sick children seen by a health worker. The index may be converted into a grade. Grades could range from weak through moderate and strong, depending on the index's range.

Strengths and Limitations

This summary indicator may be useful for demonstrating change in health workers' performance of assessment tasks over time, since health workers may progressively increase the number of essential tasks that are completed. The index can be aggregated across health workers in a facility to produce an average sick child assessment score for health facilities. The index can also be aggregated across facilities in a district to produce an index of integrated assessment at the district-level. If the index is used to compare the quality of sick child assessment across health facilities or districts, the following two indicators could be used: (1) the average number of assessment tasks per sick child and (2) the percentage of health workers performing a minimum number of assessment tasks. The comparison of the performance of health workers among different health facilities in a particular district, or among different districts, can help identify health facilities or districts that are performing below standards.

Questions have been raised about the utility of a composite score, as it could mask deterioration in the performance of some assessment tasks and improvements in others. For program planning and monitoring, it may be useful to simply track each assessment task comprising the index separately. This would enable the identification of which tasks are not usually performed. Individual screening tasks can then be targeted through routine supervision or refresher training.



CHILD UNDER TWO YEARS OF AGE ASSESSED FOR FEEDING PRACTICES

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of sick children under two years of age whose caretakers are asked about breastfeeding, complementary foods, and feeding practices during this episode of illness.

Numerator: Number of sick children under two years of age whose caretakers are asked if they breastfeed this child, whether the child takes any other food or fluids other than breast milk, and if during this illness the child's feeding has changed.

Denominator: Number of sick children under two years of age seen.

Measurement Tools

SPA; HFA; supervision checklist

What It Measures

This indicator is a composite of the steps a health worker must undertake in order to correctly assess a sick child's feeding and counsel the mother to solve any feeding problems that exist. Thus, it measures the correct assessment of a sick child's feeding. The IMCI guidelines require that all sick children under two years have a feeding assessment even if they have a normal Z-score (WHO, 1998).

The standard deviation unit or Z-score is the simplest way of making comparisons to the reference population. The Z-score is defined as the difference between the value for an individual and the median value of the reference population in the same age or weight, divided by the standard

deviation of the reference population. The median is the value at exactly the mid-point between the largest and smallest.

How to Measure It

The measurement of this indicator is based on observations of the performance of health workers with regard to the assessment of feeding practices for sick children who are brought to a health facility. The observer records on a questionnaire or checklist whether the health worker asked about or the care taker reported on whether the child is breastfed, whether the child is taking any other foods or fluids, and whether feeding practices had changed during the illness. Routine supervisory visits can also yield data for measuring this indicator.

Exit interviews are a second option for collecting data to measure this indicator. The caretaker is asked whether the health worker had asked him/her questions about breastfeeding, complementary feeding, and changes in the child's feeding during the current illness.

Only a sick child less than two years old who has a "yes" answer on all three aspects of the assessment of feeding practices is included in the numerator. The denominator is the total number of sick children under the age of two years who were seen by the health worker.

Strengths and Limitations

Methodologically, this indicator is relatively easy to construct. The indicator could be aggregated across all health workers in a facility to calculate an average child feeding assessment score for a given health facility. This is useful for identifying facilities that are performing below standards with

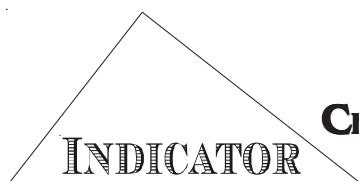
regard to the assessment of feeding practices. A low score on the indicator is a fairly sound indication of the need for refresher training or targeted supervision.

There are, however, difficulties in interpreting changes in this indicator. Lack of change in the indicator could mean deterioration in one or more aspects of child feeding assessment counteracted by improvements in other aspects, or could merely indicate a general lack of performance improvement in this component of sick child assessment. For purposes of planning and monitoring, it may be useful to monitor changes in the individual components of the indicator that are of most interest to program managers. Thus, programs may want to calculate a separate indicator for each task associated with the assessment of child feeding in order to identify which tasks are not routinely performed.

Sample Questions

The following are sample questions from the SPA (dated March 2004):

- o Record whether a provider asked about or performed other assessments of the child's health by doing any of the following:
 - (1) Offer the child something to drink or ask the mother to put the child to the breast (to find out whether the child can drink);
 - (2) Ask about normal breastfeeding practices when the child is not ill; and
 - (3) Ask about feeding or breastfeeding practices for the child during this illness.



CHILD NEEDING AN ORAL ANTIBIOTIC AND/OR ANTIMALARIAL IS PRESCRIBED THE DRUG(S) CORRECTLY

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of sick children who do not need urgent referral, who need an oral antibiotic and/or an antimalarial who are prescribed the drug(s) correctly.

Numerator: Number of sick children with validated classifications, who do not need urgent referral, who need an oral antibiotic and/or an antimalarial (pneumonia, and/or dysentery, and/or malaria, and/or acute ear infection, and/or anemia in high malaria risk areas) who are prescribed the drug(s) correctly, including dose, number of times per day, and number of days.

Denominator: Number of sick children with validated classifications who do not need urgent referral and who need an oral antibiotic and/or an antimalarial.

Validated Classifications: The validator classification using the IMCI standard protocol is considered to be the gold standard and as close to the actual diagnosis as is possible to get in the outpatient setting.

Measurement Tools

Health Facility Assessment (HFA); supervision checklists

What It Measures

This indicator assesses the ability of the health worker to provide correct treatment, given correct identification of common childhood diseases.

How to Measure It

The indicator is a composite measure and is restricted to children with validated classifications. The data are collected through direct observation of sick child consultations during a health facility survey or routine supervisory visits. The following pieces of information are needed to calculate the denominator:

- (1) Whether or not a child needs urgent referral.
 - Children who need urgent referral are excluded from the both the numerator and the denominator of this indicator.
- (2) Whether or not a child needs an oral antibiotic and/or an antimalarial.
 - Oral antibiotics and/or antimalarials should be given for pneumonia, and/or dysentery, and/or malaria, and/or acute ear infection, and/or anemia in high malaria risk areas.

Children are included in the numerator if each of the following elements is prescribed correctly by the health worker:

- (i) How many tablets or capsules or spoonfuls to take each time
- (ii) How many times a day to give the medication
- (iii) How many days to continue treatment

If a child needs both an antibiotic and an antimalarial, the health worker must prescribe each drug correctly for the child to be included in the numerator. The IMCI chart shows how many days and how many times each day to give antibiotics and antimalarials depending on the child's weight or age. Note that oral antimalarials vary by country. In high malaria risk areas, the health worker should prescribe an appropriate antimalarial. This should be the antimalarial chosen by the National Drug Policy Program, which assesses the rate of resistance to

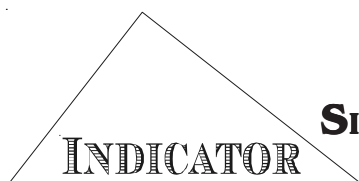
different anti-microbials and decides on the drugs most appropriate for the treatment of uncomplicated malaria.

Strengths and Limitations

One of the limitations of this indicator is that it is not straightforward to calculate. It addresses multiple dimensions of the quality of sick child assessment and has many components. First, the health worker must prescribe each drug correctly in terms of all three of the following elements: how many tablets or capsules or spoonfuls to take each time; how many times a day to give the medication; and how many days to continue treatment. The age or weight of the child should also be considered in determining the correct dose of antibiotic or antimalarial. If a child has multiple classifications, each classification and prescribed treatment should be considered in the calculations.

Note that this indicator cannot be calculated from the March 2004 version of the SPA instruments. Although the SPA questionnaire for the observation of sick child consultation requires that the observer notes the diagnosis and treatment prescribed for the illness, the observer is not required to record the dose, number of times per day, or number of days for any medication that is prescribed. Earlier questions only noted whether the provider explained how to administer oral treatments, asked the caretaker to repeat the instructions for the medications, and gave the first dose of the oral treatment. While these questions permit an assessment of whether one component of counseling (i.e. teaching the mother or caretaker how to give oral drugs at home) is performed, they do not enable a determination of whether antibiotics and/or antimalarials were prescribed correctly.

Given the number of components that are included in the calculations, it would be difficult to interpret change in the indicator. The indicator requires that all required screening and assessment tasks have been performed correctly and, therefore, may not demonstrate change until these other preliminary tasks have been mastered. Second, correct classification may not be possible if the health worker does not have some item of essential equipment, such as a timing device for counting respiratory rate or a scale for measuring weight.



SICK CHILD NOT NEEDING ANTIBIOTIC LEAVES THE FACILITY WITHOUT ANTIBIOTIC

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of children who do not need urgent referral and who do not need an antibiotic for one or more IMCI classifications who leave the facility without having received or having been prescribed antibiotics.

Numerator: Number of children with validated classification who do not need urgent referral and do not need an antibiotic for one or more IMCI classifications (no-pneumonia cough or cold; diarrhea with or without dehydration; persistent diarrhea; malaria; fever that is not likely to be due to malaria; measles; chronic ear infection; anemia or very low weight-for-age; no anemia and not very low weight) who leave the facility without receiving antibiotics or a prescription for antibiotics for those validated classifications.

Denominator: Number of sick children with validated classifications who do not need urgent referral and who do not need an antibiotic for one or more IMCI classifications.

Measurement Tools

HFA; SPA; supervision checklist

What It Measures

This indicator measures the ability of health workers to correctly differentiate between conditions needing antibiotics and those that do not. Unnecessary treatment with antibiotics is not only ineffective, but it presents an unnecessary risk to the child through possible side effects and

allergic reactions. Furthermore, the widespread unnecessary use of antibiotics encourages the development of bacteria that are resistant to the drugs.

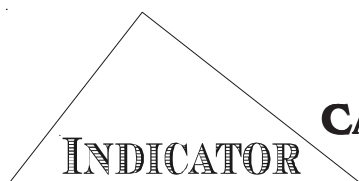
How to Measure It

The measurement of this indicator relies on observations of sick child consultations and a comparison of the classification and treatment of sick children with the IMCI “gold standard.” A validator reexamines each sick child, or a sample of cases seen by the health worker in order to determine whether the correct diagnosis and treatment were given.

The denominator consists of children with validated classifications who do not need urgent referral and do not need an antibiotic for one or more IMCI classifications. The IMCI classifications for which antibiotics are not needed are the following: no pneumonia cough or cold; diarrhea, with or without dehydration; persistent diarrhea; malaria; fever that is not likely to be due to malaria; measles; chronic ear infection; anemia or very low weight-for-age; no anemia and not very low weight. The numerator is the number of children meeting these criteria who leave the facility without receiving or being prescribed an antibiotic.

Strengths and Limitations

This indicator can be used to assess patterns of over-treatment with antibiotic. As with all composite indicators a lack of change in the indicator could signify that improvements in some areas may mask deteriorations in others. Program managers may want to see scores reported separately by type of classification in order to identify areas of weakness and improve training programs.



CARETAKER OF SICK CHILD IS ADVISED TO GIVE EXTRA FLUIDS AND CONTINUE FEEDING

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of sick children with validated classifications who do not need urgent referral whose caretakers are advised to give extra fluid and continue feeding.

Numerator: Number of sick children with validated classifications, who do not need urgent referral, whose caretakers are advised to give extra fluid and continue feeding.

Denominator: Number of sick children with validated classifications, who do not need urgent referral.

Validated classification: All sick children need to be classified correctly by the health worker. The validation of the health worker's classification needs to be done at the health center by an authorized person (basically a doctor or clinical supervisor) who reexamines a sample of cases seen by the health worker to see if a correct classification was made.

Measurement Tools

SPA; supervisory checklist

What It Measures

This indicator measures the extent to which health workers are complying with standards for counseling a mother or caretaker of a sick child on the need to continue feeding and increase the child's fluid intake at home. Sick children need to increase their fluid intake during and after illness to avoid dehydration. This is especially important for diarrheal illness but is also true for

other illnesses that may make children less likely to drink. Continued feeding (including breastfeeding) during illness shortens the duration of the illness episode and reduces the risks of dehydration and growth faltering.

How to Measure It

The information required for this indicator can be obtained during a health facility survey through direct observations of sick child consultations or exit interviews of caretakers. A health worker is included in the numerator if he or she scores positively on both advice about the need to continue feeding during illness and advice about the need to increase the sick child's fluid intake. The denominator comprises sick children with validated classifications who do not need urgent referral.

There are two groups of interest: (1) sick children aged zero through five months and (2) sick children aged six to 23 months. The former should be counseled for continued and increased on-demand breastfeeding during illness (no foods or liquids). The latter should be counseled for continued and increased breastfeeding on-demand (greater frequency and longer), age-appropriate feeding recommendations, and general increase of fluids (breastfeeding and other).

Strengths and Limitations

The indicator does not measure whether the mother or caretaker complies with the advice or whether the advice on continued feeding specifies the types of food and frequency of feeding recommended for the child's age. As with many other indicators in this chapter, observation bias is of concern if the data are collected through direct observations of sick child consultations. Although exit interviews of caretakers may be a more cost-

effective method of data collection, some degree of misreporting of the content of counseling could occur. If no changes are observed in this indicator over time, it may be useful to report separately the two elements of this indicator: continued feeding and increased fluid intake during illness.

Sample Questions

Sample questions from the SPA (dated March 2004) are the following:

Option 1: Observation of sick child consultation

- o Record whether a provider did any of the following when counseling the caretaker:
 - (1) Provide general information about feeding or breastfeeding the child even when not sick
 - Yes/No/Don't know/NA
 - (2) Tell the caretaker to give extra fluids to the child during this sickness
 - Yes/No/Don't know/NA
 - (3) Tell the caretaker to continue feeding the child during this sickness
 - Yes/No/Don't know/NA

Option 2: Exit interview

- o What did the provider tell you about feeding [NAME] during this illness?
 - Give less than usual
 - Give same as usual
 - Give more than usual
 - Give nothing/not feed
 - Didn't discuss
 - Don't know
- o What did the provider tell you about giving fluids (or breastmilk, if the child is breastfed) to [NAME] during this illness?
 - Give less than usual
 - Give same as usual
 - Give more than usual
 - Give nothing/not feed
 - Didn't discuss
 - Don't know



INDICATOR

CHILD NEEDING VACCINATIONS LEAVES FACILITY WITH ALL NEEDED VACCINATIONS

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of children needing vaccinations (based on vaccination card or history) who leave the health facility with all needed vaccinations (according to national immunization schedule).

Numerator: Number of children needing vaccinations (based on vaccination card or history) who leave the health facility with all needed vaccinations.

Denominator: Number of children seen who need vaccinations (based on vaccination card or history).

This indicator refers to children aged two months up to five years of age unless otherwise defined in a given country's national immunization policy.

Measurement Tools

SPA; HFA

What It Measures

This indicator helps to assess the performance of a health worker in incorporating immunization services into the management of sick children and the extent to which "missed opportunity" for vaccination is reduced at a particular health facility. All infants and children should have their vaccination status checked at every facility visit. Children who are due a vaccination should receive it on the same day (or be referred to the next vaccination session). Thus, the indicator captures not only a health worker's assessment of a child's vaccination status and the administration of needed vaccines, but also the ability of a health facility to maintain an adequate stock of vaccines.

How to Measure It

The data requirements for measuring this indicator are: (1) the number of children due at least one vaccination that received all vaccinations due and (2) the number of children due at least one vaccination. In health facility surveys, the data are collected through observations of sick consultations and caretaker exit interviews and are limited, therefore, to sick children under five. During routine supervisory visits, both sick consultations and well baby visits can be observed when collecting data to measure this indicator. Doses of vaccines given will be entered in the health facility record for the child, which can also be used to verify whether the child left the facility with needed vaccinations.

The child's vaccination status is determined by either the vaccination card or history. In countries where different vaccinations are given to children in different locations (for example, DTP in the thigh, measles in the arm), health providers may use this information to help the caretaker recall which vaccines have been given to the child. The observer notes on the questionnaire or checklist whether the child was due for immunization and if so, whether the provider immunized the child, referred the child for an immunization, or took no action.

During an exit interview, the interviewer asks the caretaker to see the child's vaccination card and notes whether the child has ever received any vaccinations (Polio-0; BCG; Polio-1; Polio-2; Polio-3; DTP-1; DTP-2; DTP-3; Measles) and the date on which each vaccination was received. The interviewer also notes whether the child's vaccination record shows that the child was vaccinated on the day of the health facility visit. It must be noted that the March 2004 version of the SPA questionnaire does not collect data on

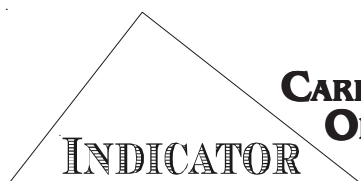
the type of vaccinations received for children whose caretakers could not produce a vaccination card during the exit interview. Therefore, data derived from the SPA exit interview are restricted to children whose vaccination cards were seen by the interviewer.

If health facilities are sufficiently equipped with vaccines, and health care providers trained to perform vaccination according to the national immunization schedule, the percentage should approach 100%.

Strengths and Limitations

This indicator permits an assessment of the extent to which policies regarding the immunization of sick children are observed. Although the indicator focuses on children under age five years, it can be calculated separately for infants under age 12 months – the most important age group that needs timely protection. Measuring this indicator for individual health facilities permits the identification of facilities where sick children are not routinely immunized.

For program purposes, it might be important to know whether children in need of vaccination do not receive all vaccinations due on the day of the health facility visit because of poor health worker assessment of a child's vaccination status or because vaccines are unavailable at the health facility on the day of the sick child visit or because health workers believe erroneously that illness and malnutrition are a contraindication to immunization. It is recommended, therefore, that the indicator be interpreted in the light of the availability of the four recommended antigens (BCG, polio, DTP, and measles) at the facility on the day of the visit and that qualitative research be conducted to determine the reason(s) for low performance on this indicator. It must be recognized that some lower level health facilities may not vaccinate on a daily basis as this would lead to huge amounts of wastage in the case of freeze-dried vaccines like BCG, which comes only in 20-dose vials and must be discarded six hours after opening.



CARETAKER OF CHILD WHO IS PRESCRIBED ORS AND/OR ORAL ANTIBIOTIC AND/OR ANTIMALARIAL KNOWS HOW TO GIVE THE TREATMENT

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of sick children prescribed oral rehydration salt (ORS), and/or an oral antibiotic and/or an antimalarial whose caretakers can describe correctly how to give the treatment.

Numerator: Number of sick children prescribed ORS, and/or an oral antibiotic, and/or an oral antimalarial whose caretakers can describe how to give the correct treatment, including the amount, number of times per day, and number of days.

Denominator: Number of sick children prescribed ORS and/or an antibiotic and/or an antimalarial.

Measurement Tools

HFA

What It Measures

This indicator measures caretaker knowledge of how to give treatment correctly, which is an essential requirement for correct home treatment. The indicator reflects the success of a health worker's efforts to counsel the caretaker of a sick child on how to give oral drugs at home and serves as a proxy measure for correct treatment at home.

How to Measure It

The data required for measuring this indicator are collected through exit interviews. The interviewer asks the caretaker of a sick child to see the medicines/prescriptions received that day from the health center. For each medicine given or prescribed, the caretaker is asked how to give the

treatment. The questionnaire typically includes a table with the names of all the medications (antibiotics, antimalarials, ORS) that are being given at that particular health center and spaces for recording the caretaker's responses on how much medicine to give to the child each time (number of spoonfuls/tablet), how many times per day, for how many days, and the need to complete the entire course of medication. To help caretakers/mothers recall the dosing, the interviewer may show them samples of the tablets or capsules that they have been prescribed and ask them to demonstrate how they will give the medication at home.

To be classified as "describing correctly how to give the treatment" the child's mother or caretaker must describe each element correctly (how much medicine to give the child each time, how many times per day, how many days). If a child received more than one medication or prescription, the caretaker is included in the numerator only if he or she can describe correctly how to administer each medication. Note that this indicator cannot be obtained from the March 2004 version of the SPA questionnaire.

Strengths and Limitations

The data required for this indicator are simple to collect and useful where systematic efforts are made at a health facility to counsel all caretakers on how to administer oral treatments correctly. Teaching a mother or caretaker how to give oral drugs requires a series of simple steps including: (1) telling the mother and caretaker what the treatment is and why it should be given; (2) demonstrating how to measure a dose; (3) describing the treatment steps; (4) watching the mother or caretaker practice measuring a dose; (5) asking the mother or caretaker to give the dose to the child; (6) explaining carefully how and how

often to do the treatment at home; (7) explaining that ALL oral drug tablets or syrups must be used to finish the course of treatment, even if the child gets better; and (8) checking the mother's or caretaker's understanding. If a mother or caretaker does not accurately describe how to administer an oral drug at home, it is difficult to tell from the indicator which steps of the counseling process were not adequately performed.



INDICATOR

SICK CHILD NEEDING REFERRAL IS REFERRED

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of sick children needing referral who are referred by the health workers.

Numerator: Number of sick children with a validated classification of severe disease needing referral (one or more danger signs, severe pneumonia or very severe disease, and/or severe dehydration with any other severe classification, and/or severe persistent diarrhea, and/or very severe febrile disease, and/or severe complicated measles, and/or mastoiditis, and/or severe malnutrition or severe anemia) who were referred by the health workers.

Denominator: Number of sick children with a validated classification of severe disease needing referral.

Measurement Tools

SPA; HFA

What It Measures

This indicator measures both the health worker's ability to appropriately assess clinical conditions needing referral and appropriately refer.

How to Measure It

Data for calculating this indicator are collected through direct observation of sick child consultations. For a child to enter the denominator, he or she should have signs and symptoms of severe illness which may include one or more of the following: (1) one or more danger signs; (2) severe pneumonia or very severe disease; (3) severe dehydration with any other severe

classification; (4) severe persistent diarrhea; (5) very severe febrile disease; (6) severe complicated measles; (7) mastoiditis; (8) severe malnutrition; and (9) severe anemia.

In order to have a valid appraisal of the health worker's ability to appropriately refer, all children need to be re-assessed by a gold standard examiner in order to validate severe classification. This entails a re-examination of the sick child performed separately by a nurse or physician (or other health worker trained in validation examinations) in another room without prior knowledge of the results of the health worker's examination. The classification is considered validated if the nurse or physician or validator makes a determination that the child needs to be referred based on IMCI guidelines.

Strengths and Limitations

This indicator may be difficult to obtain if the proportion of sick children with severe disease classification is low. Additionally, the indicator does not measure completion of the referral process. Successful referral of severely ill children depends on a number of factors including effective counseling of the caretaker and the availability of transportation.

References

Bryce J, Victora CG, Habicht JP, Vaughn JP, and Black RE. (2004). The Multi-Country Evaluation of the Integrated Management of Childhood Illness Strategy: Lessons for the Evaluation of Public Health Interventions. *American Journal of Public Health*, 94(3):406-415.

UNICEF. (1999). *The Household and Community Component of IMCI: A Resource Manual on Strategies and Implementation Steps*. Nairobi, Kenya: UNICEF, ESARO. Retrieved June 9, 2005, from http://www.unicef.org/health/files/health_imcimanual.pdf.

WHO. (1999). *IMCI Indicators, Monitoring and Evaluation*. Geneva, Switzerland: World Health Organization. WHO/CHS/AH/98.1K. Retrieved June 9, 2005, from http://www.who.int/child-adolescent-health/New_Publications/IMCI/WHO_CHS_CAH_98.1/Rev99.K.pdf.

WHO. (2001). *Model Chapter for Textbooks: IMCI*. Geneva, Switzerland: World Health Organization.

WHO. (2001). *Indicators for IMCI at First-level Facilities and Households*. Geneva, Switzerland: World Health Organization. Retrieved June 9, 2005, from http://www.who.int/child-adolescent-health/New_Publications/CHILD_HEALTH/indicators_for_IMCI.htm

Annex 6.1. Additional Indicators for IMCI at the Health Facility Level

PRIORITY INDICATORS

Health System Support

Supervision

- Health facility received at least one supervisory visit that included observation of case management during the previous six months

Drugs, equipment and supplies

- Index of availability of essential oral treatments
- Index of availability of injectable drugs for pre-referral treatment
- Health facility has the equipment and supplies to provide full vaccination services
- Index of availability of four vaccines

IMCI training coverage

- Health facilities with at least 60% of health workers who manage children trained in IMCI

SUPPLEMENTAL INDICATORS

Health Worker Skills

Correct assessment, classification, and treatment

- Child checked for other problems
- All child symptoms identified
- Child with very low weight assessed for feeding problems
- Child with very low weight is correctly classified
- Child is correctly classified
- Child with pneumonia is correctly treated
- Child with dehydration is correctly treated
- Child with malaria is correctly treated
- Child with anemia is correctly treated
- Child receives first dose of treatment at the facility

Correct management of severely-ill children

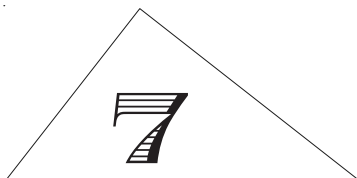
- Child checked for lethargy
- Child with severe illness is correctly treated

Communication between health workers and caretakers

- Child prescribed oral medication whose caretaker received counseling on how to administer the treatment
- Sick child whose caretaker is advised on when to return immediately
- Child with very low weight whose caretaker received correct counseling
- Child leaving the facility whose caretaker was given or shown a mother's card

Health System Support

- Health facility has essential equipment and materials
- Health facility has IMCI chart booklet(s) and mothers' counseling cards



**DIARRHEA, ACUTE
RESPIRATORY
INFECTION, AND
FEVER**

Indicators:

- Proportion of households with access to an improved source of drinking water
- Proportion of households using an improved toilet facility
- Proportion of households with access to essential handwashing supplies
- Proportion of households storing drinking water safely
- Proportion of households treating drinking water effectively
- Proportion of households where drinking water has sufficient levels of residual chlorine
- Proportion of households where the caretaker of the youngest child under five reported appropriate handwashing behavior
- Proportion of households that disposed of the youngest child's feces safely the last time s/he passed stool
- Period prevalence of diarrhea
- Child with non-bloody diarrhea treated with antibiotics
- Oral rehydration therapy (ORT) use rate
- Proportion of children aged 2-59 months with diarrhea in the last two weeks who were treated with zinc supplements
- Proportion of children aged 0-59 months with diarrhea in the last two weeks who received increased fluids and continued feeding
- Period prevalence of acute respiratory infection needing assessment
- Care seeking for ARI in children 0-59 months of age
- Period prevalence of history of fever
- Child sleeps under an insecticide-treated net
- Child with fever receives appropriate antimalarial treatment
- Caretaker knows at least two signs for seeking care immediately
- Number of malaria cases among under-fives
- Malaria death rate among under-fives

CHAPTER 7. DIARRHEA, ACUTE RESPIRATORY INFECTION, AND FEVER

Diarrhea, acute respiratory infections (ARI), and malaria account for about 40% of all childhood deaths worldwide. Most childhood deaths due to these three diseases can be easily prevented and treated at home or in health facilities. For example, diarrhea can be prevented by good hygiene and sanitary practices. When a child with diarrhea becomes dehydrated, rapid and appropriate treatment is necessary both at home and in the health facility. Malaria can be prevented by the use of insecticide-treated nets. Once the child has malaria, rapid and appropriate care is essential. Much less is known about how to prevent respiratory illnesses in children but once a child has a serious respiratory illness, s/he needs appropriate care by a trained health provider.

WHO has developed frameworks along with indicators for monitoring the progress and evaluating the outcomes and impacts of interventions that address these three common childhood conditions. Beginning in the mid-1980s, vertical programs for the control of diarrheal diseases (CDD) and ARI established indicators for measuring their success with specific interventions such as the use of oral rehydration salt (ORS) and for evaluating mortality impact. With the movement towards a more holistic approach to child health, diarrhea, and pneumonia morbidity and mortality (as well as other key health concerns in children, including malnutrition and malaria) came to be addressed within the IMCI framework. The framework combines improvements in the case management skills of health workers and in the health systems required to deliver quality care, with improvements in household and community practices for child survival, growth, and development.

The household and community component of IMCI aims to prevent common childhood

illnesses; improve the household and community response to childhood illness and the quality of care provided at home; improve appropriate and timely care seeking behavior when children need additional assistance outside the home; increase compliance to recommended treatment and advice from trained care providers; and promote a supportive and enabling environment at the household and community level for children's survival, growth, and development. The household practices identified and agreed upon by UNICEF/ESAR, WHO/AFRO, and other partners fall into four main categories: growth promotion and development; disease prevention; home management; and care seeking and compliance to treatment and advice (UNICEF, 1999). As depicted in Table 7.1, the list of proposed indicators for the household and community component of IMCI include some that are of direct relevance to diarrhea, ARI, and fever.

Three hygiene interventions – handwashing with soap; point-of-use (household, health facility, school, etc.) water treatment and safe storage and handling; and safe disposal of human feces – have been shown consistently to reduce diarrheal disease morbidity. These hygiene interventions are central to the Hygiene Improvement Framework (HIF) adopted by USAID, UNICEF, The World Bank, and the Water Supply and Sanitation Collaborative Council (WSSCC), and have recently received favorable attention at the World Summit on Sustainable Development, the 2003 G8 meeting in Evian, and the launching of the Healthy Environments for Children Alliance. “Halving, by 2015, the proportion of people without sustainable access to safe water and basic sanitation” are two important MDG targets and a high priority area for sustainable development. This section draws on water and sanitation

Table 7.1. List of indicators for the household and community component of IMCI

I. PRIORITY INDICATORS	
Nutrition	<ul style="list-style-type: none"> ◆ Child under 4 months of age is exclusively breastfed ◆ Child aged 6–9 months receives breastmilk and complementary feeding ◆ Child under 2 years of age is low weight for age
Prevention	<ul style="list-style-type: none"> ◆ Child 12–23 months of age is vaccinated against measles before 12 months of age ◆ Child sleeps under an insecticide-treated net (in malaria risk areas) ◆ Child has feces disposed safely (key family practice under community IMCI [C-IMCI]) ◆ Child whose caretaker has appropriate handwashing behavior (key family practice under C-IMCI)
Home case management	<ul style="list-style-type: none"> ◆ Sick child is offered increased fluids and continued feeding ◆ Child with fever receives appropriate antimalarial treatment (in malaria-risk areas)
Care seeking	<ul style="list-style-type: none"> ◆ Caretaker knows at least two signs for seeking care immediately
II. SUPPLEMENTAL INDICATORS	
Nutrition	<ul style="list-style-type: none"> ◆ Continued breastfeeding rate of children aged 12–15 months ◆ Complementary feeding frequency ◆ Stunting prevalence ◆ Wasting prevalence ◆ Mean weight-for-age z-score ◆ Mean height-for-age z-score ◆ Mean weight-for-height z-score
Prevention	<ul style="list-style-type: none"> ◆ DPT vaccine coverage ◆ Polio vaccine coverage ◆ Tuberculosis vaccine coverage ◆ Vitamin A supplementation
Home case management	<ul style="list-style-type: none"> ◆ Ownership of mother's card for children under two years
Morbidity	<ul style="list-style-type: none"> ◆ Prevalence of night-blindness ◆ Period prevalence of history of fever ◆ Prevalence of malaria parasitemia ◆ Period prevalence of diarrhea ◆ Period prevalence of acute respiratory infections needing assessment

Source: WHO (1999).

measures that have been proposed in the *Global Water Supply and Sanitation Assessment 2000 Report* (WHO and UNICEF, 2000) by the United Nations Commission on Sustainable Development, in the *Water and Sanitation Indicators Measurement Guide* developed by the Food and Nutrition Technical Assistance (FANTA) Project (Billig, Bendahmane, and Swindale, 1999), and in *Assessing Hygiene Improvement: Guidelines for Household and Community Levels* by the Environmental Health Project (EHP, 2004). The water supply, sanitation, and hygiene-related indicators presented in this guide are based on the hygiene improvement framework (HIF). Hygiene improvement is a comprehensive approach to prevent childhood diarrhea through a combination of improving access to water and sanitation hardware and household technologies, promoting proper hygiene, and strengthening the enabling environment to ensure the sustainability of hygiene improvement activities.

Regarding the monitoring and evaluation of interventions that address fever, the RBM initiative has proposed a framework and set of indicators for monitoring the principal malaria interventions and related efforts to reinforce the health sector. The initiative was launched in 1998 and has as its main objective to halve the malaria burden by the year 2010. The framework identifies five critical areas for monitoring the impact and outcomes of RBM. These areas include: (1) the impact on malaria burden (i.e., mortality, morbidity, and economic losses); (2) malaria prevention and disease management including the prevention and control of epidemics; (3) health sector development; (4) intersectoral linkages; and (5) support and partnerships (Remme, Binka, and Nabarro, 2001). A list of proposed indicators for monitoring and evaluating RBM is given for each of these critical areas in Table 7.2.

Drawing on existing frameworks and guidelines, this section of the guide presents five categories of indicators for monitoring and evaluating

diarrheal diseases (DD), ARI, and malaria prevention programs at the population level: (1) prevention; (2) home case management; (3) care seeking; (4) morbidity; and (5) impact. The indicators are the following:

Prevention

- Proportion of households with access to an improved source of drinking water
- Proportion of households using an improved toilet facility
- Proportion of households with access to essential handwashing supplies
- Proportion of households storing drinking water safely
- Proportion of households treating drinking water effectively
- Proportion of households where drinking water has sufficient levels of residual chlorine
- Proportion of households where the caretaker of the youngest child under five reported appropriate handwashing behavior
- Proportion of households that disposed of the youngest child's feces safely the last time s/he passed stool
- Child sleeps under an insecticide treated net

Home case management

- Child with non-bloody diarrhea treated with antibiotics
- Oral rehydration therapy (ORT) use rate
- Proportion of children aged 2-59 months with diarrhea in the last two weeks who were treated with zinc supplements
- Proportion of children aged 0-59 months with diarrhea in the last two weeks who received increased fluids and continued feeding
- Child with fever receives appropriate antimalarial treatment

Table 7.2. RBM core indicators

<p style="text-align: center;">I. IMPACT</p> <ul style="list-style-type: none"> ◆ Crude death rate among target groups ◆ Malaria death rate (probable and confirmed cases) among target groups ◆ % of probable and confirmed malaria deaths among patients with severe malaria admitted to a health facility ◆ Number of cases of severe malaria (probable and confirmed) among target groups ◆ Annual Parasite Incidence (API) among target groups (by region/according to the epidemiological situation)
<p style="text-align: center;">II. MALARIA PREVENTION AND DISEASE MANAGEMENT</p> <p>Prevention</p> <ul style="list-style-type: none"> ◆ % of countries having introduced pyrethroids for public health use and insecticide-treated materials in the list of essential drugs and materials ◆ % of service providers (health personnel, community health worker [CHW]) trained in techniques of treatment of nets and/or indoor spraying according to national policy ◆ % of households having at least one treated bednet ◆ % of pregnant women who have taken chemoprophylaxis or intermittent drug treatment, according to the national drug policy ◆ % of antenatal clinic staff trained in intermittent preventive antimalarial treatment for pregnant women <p>Prevention and control of epidemics</p> <ul style="list-style-type: none"> ◆ % of countries with epidemic-prone areas/situation having a national preparedness plan of action for early detection and control of epidemics ◆ % of epidemics detected within two weeks of onset and properly controlled <p>Early diagnosis and prompt treatment</p> <ul style="list-style-type: none"> ◆ % of health personnel involved in patient care trained in malaria case management and IMCI ◆ % of health facilities able to confirm malaria diagnosis according to national policy (microscopy, rapid test, etc.) ◆ % of patients hospitalized with a diagnosis of severe malaria and receiving correct antimalarial and supportive treatment according to national guidelines ◆ % of patients with uncomplicated malaria getting correct treatment at health facility and community levels according to national guidelines within four hours of onset of symptoms
<p style="text-align: center;">III. HEALTH SECTOR DEVELOPMENT</p> <p>Health policy</p> <ul style="list-style-type: none"> ◆ % of districts with plans of action reflecting national health policy ◆ % of districts using health information for planning ◆ % of countries having a policy of universal coverage for all with a basic package including relevant malaria control activities <p>Service delivery</p> <ul style="list-style-type: none"> ◆ % of health facilities reporting no disruption of stock of antimalarial drugs, as specified in the national drug policy, for more than one week during the previous three months <p>Community action</p> <ul style="list-style-type: none"> ◆ % of countries having national guidelines for malaria prevention and treatment including training of all the informal health providers and recommendations for home treatment of febrile illness/suspected malaria, recognition of the most frequent signs of danger for children, prevention of malaria during pregnancy, and use of insecticide-treated nets ◆ % of villages/communities with at least one CHW trained in management of fever and recognition of severe febrile illness ◆ % of mothers/caretakers able to recognize signs and symptoms of danger of febrile illness in a child < five years

Table 7.2. RBM core indicators (continued)

IV. INTERSECTORAL LINKAGES	
◆	% of countries with multisectoral and inter-agency partnerships established
◆	% of countries having established official linkages, including the elaboration of research agenda of public health interest, between research institutions and the Ministry of Health
V. SUPPORT/PARTNERSHIP	
◆	% of countries with agreed national RBM budget met by donor funding
◆	% of countries with functional sentinel sites for surveillance efficacy of 1st and 2nd line antimalarial drugs
◆	Number of antimalarial drugs which have progressed to the level of phase II trials

Source: WHO and UNICEF (2000).

Care seeking

- Caretaker knows at least two signs for seeking care immediately
- Care seeking for ARI in children 0-59 months of age

Morbidity

- Period prevalence of diarrhea
- Period prevalence of acute respiratory infection needing assessment
- Period prevalence of history of fever

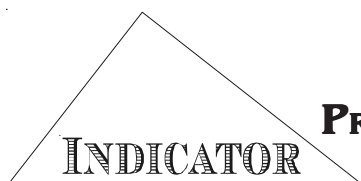
Impact

- Number of malaria cases among under-fives
- Malaria death rate among under-fives

The indicators presented above are not meant to represent the full universe of measures that have been proposed for monitoring and evaluating the outcomes and impact of programs and initiatives designed to reduce DD, ARI, and malaria. They are, rather, a small number of population-based measures that have been developed through broad consensus among many partners and disciplines. For some preventive measures, two separate indicators are proposed to maintain comparability with standard indicators that are included in major

household surveys such as the DHS, MICS, and the WHO World Health Survey (WHS), and to obtain information that is programmatically more relevant. The DHS, MICS, and WHS are general purpose surveys that can only contain a limited number of survey questions and are mainly used for national and international comparisons. Programs usually need more detailed information about specific interventions, which is represented in the additional indicator.

The impact indicators presented here are malaria-specific. Other impact indicators pertaining to infant and child mortality are presented in Chapter nine. We also do not also present indicators for monitoring some of the cross-cutting elements from other components of child health programs that make significant contributions to the reduction in DD, ARI, and malaria morbidity and mortality. These elements include breastfeeding, immunization, and nutrition, which are directly addressed in Chapters four and eight.



PROPORTION OF HOUSEHOLDS WITH ACCESS TO AN IMPROVED SOURCE OF DRINKING WATER

MDG Indicator and Core Hygiene Improvement Indicator

Definition

Proportion of households with access to an improved source of drinking water.

Numerator: Number of households with access to an improved source of drinking water.

Denominator: Total number of households surveyed.

The term “*water source*” is used as a synonym for water distribution or supply point.

An “*improved water source*” is defined as any of the following types of drinking water supply:

- Piped water into dwelling
- Piped into yard, plot, or apartment building
- Public tap/standpipe
- Tubewell/borehole
- Protected dug well
- Protected spring
- Rainwater
- Bottled water where combined with piped water into dwelling or other improved source

An “*unimproved water source*” includes:

- Unprotected dug well
- Unprotected spring
- Surface water (river, dam, lake, pond, stream, canal, and irrigation channels)
- Cart with small tank/drum

- Tanker-truck
- Bottled water where combined with an unimproved source
- Any other type of supply

Distinguishing between protected water sources, which are “improved,” and those that are unprotected, which are “not improved,” is a major challenge facing household survey participants. As defined in this guide, a protected water source is constructed in a manner that prevents water from being contaminated, particularly by surface runoff (i.e., water from rain, snow melt, or irrigation that flows over the ground). Protected dug wells have raised well linings or casings and platforms for diverting spilled water and are covered. Protected springs have spring boxes which are built to protect the spring from runoff and other contamination.

Measurement Tools

Population-based surveys (e.g., DHS, KPC, and MICS)

What It Measures

This indicator measures access to an improved drinking water source, which is used as an approximation of safe water. To classify water as truly “safe” would require testing for bacteriological and chemical contaminants. This is rarely done in household surveys due to cost considerations. To protect a household against frequent episodes of diarrhea, the water source must be both within easy reach as well as of good quality. An estimated 1.1 billion (18%) of the world’s population did not have access to an improved source for drinking water in 2002, according to a WHO/UNICEF Joint Monitoring Programme (JMP) update published in 2004. Access to a water source is also an indirect indicator of water use. The average

liters per capita use per day (lcd) can range from several hundred liters with a pipe connection to less than 10 liters when the source is more than a kilometer away. Thus, the closer a water source is to a family, the more water it tends to utilize.

How to Measure It

The caretaker of the child or the head of household is interviewed about the household's main source of drinking water. Interviewers should be familiar with different water supply types: whether piped (into dwelling, into yard/plot, or public); open well (in yard/plot or public); covered well (in yard/plot or public); tubewell or borehole (in yard/plot or public); surface (spring, river, stream, pond, lake, or dam); rain water; tanker-truck; bottled water; gravity flow stream; and so forth. When bottled water is mentioned as the main source for drinking water, a second water source for cooking and hygiene needs to be identified by asking a follow-up question. The second water source must be improved for bottled water to be counted as an improved source of drinking water; or else bottled water is counted as unimproved. If the household obtains drinking water from several sources, the interviewer is required to probe to determine the source from which the household obtains the majority of its drinking water.

There is a possibility that the water source may differ according to season. If a household's normal, wet-season source becomes unusable in the dry season and the household is forced to travel longer distances to fetch water, the time to reach the dry season drinking water source must be recorded. The proportion of households with access to an improved water source is calculated by dividing the numerator by the total number of households surveyed. This indicator is a standard DHS/MICS indicator.

This indicator should be measured every three to five years. Target 10 of the U.N. (2000) MDG is to “halve, by 2015, the proportion of people without sustainable access to safe drinking water.” As water use varies seasonally, baseline and follow-

up surveys must be conducted during the same season if the results are to be comparable and trend analysis meaningful.

Strengths and Limitations

Access to an improved drinking water source is a useful and practical approximation of water quality and availability. However, definitions of access vary, limiting the usefulness of this indicator for cross-national comparisons. For example, the *Global Water Supply and Assessment Report 2000* defines “reasonable access” as “the availability of 20 liters per capita per day at a distance no longer than 1000 meters” of the dwelling. Some surveys record the main source of water used at the time of interview if the source of water varies seasonally. In other surveys (other than DHS and MICS), data on time to get water may not include the time it takes to get to the source, wait to get water (if necessary), and return to the dwelling.

As access and volume are concepts that are difficult to measure, sources of water that are thought to provide safe water are used mostly as a proxy for this indicator. To improve the comparability of data on safe water coverage (Indicator 1), WHO, UNICEF, and USAID under the JMP have agreed on a standard approach to its measurement for all major household surveys (i.e., the DHS, MICS and World Health Survey [WHS]). It is recommended that evaluators note the definitions that are used when examining trends in this indicator.

One limitation of this indicator is that it does not directly address issues of water quality. It also does not reliably measure the quantity of water used. However, it has been shown that the amount of time to a water source is a surrogate measure for the quantity of water used. When using this indicator as a proxy for water use, it is important to recognize that water use varies seasonally and that a single interview may not be reliable because water needs may vary from day to day, depending on household activities (e.g., brewing or laundry). Care should be exercised in interpreting trends in

the indicator as they could be influenced by the time of the year in which the surveys are conducted, as well by the definitions used for access.

As mentioned previously, this indicator informs only about the type of water source, yet even if it is improved, access may be limited because of excessive time spent to collect water or intermittent water availability. For this reason, it is recommended that the proportion of households with access to an improved water source be supplemented by the indicator below. This would ensure comparability with international targets as well as enable programs to obtain more relevant information.

Supplemental Indicator

Definition: Proportion of households with an improved source of drinking water within acceptable reach and available daily.

Numerator: Number of households with access to an improved water source, water collection time of 30 minutes or less, and no interruption for an entire day or longer within the last two weeks.

Denominator: Total number of households surveyed.

In this formulation, “access” is defined by two qualities: (1) time to fetch water; and (2) continuity of water supply. “Acceptable reach” means 30 minutes or less for the entire process of fetching water, which includes going to the water supply point, waiting time, filling containers, and returning to the household. Distance is a less common and less useful measure, because it does not adequately represent the effort of bringing water to the household. The cut-off value of 30 minutes is based on research findings. No separate values have been established for rural and urban areas as of this writing. Acceptable access also requires that an improved water source is available daily, without interruption for an entire day or longer during the last two weeks.

This supplemental indicator is measured using the DHS Environmental Health Module. In addition to asking the caretaker of the child or the head of household about the household’s main source of drinking water, the time required to reach the water source or the distance from the source is estimated. This is by whatever means of transportation the household generally uses, whether the members walk or ride bicycles or motor vehicles. If access is expressed in terms of time to the source of water, a round trip, in addition to time for queuing and filling containers, is included in the calculations. To be counted in the numerator of the supplemental indicator, a household must have access to at least one of the improved types of water sources, water collection time must be within 30 minutes, and the source must not have been interrupted for an entire day or longer within the last two weeks (that is, 14 days).

This supplemental indicator can be disaggregated into levels of access based on time for water collection as follows: no access (more than 30 minutes total collection time); basic access (between five to 30 minutes total collection time); intermediate access (on-plot, e.g., single tap in house or yard); and optimal access (water is piped into the home through multiple taps). These levels of access can be interpreted in terms of household water security (Howard and Bartram, 2003). The percentage of households at each level of access is then calculated by dividing the number of households at that level by the total number of households in the sample.

A major concern surrounding this supplemental indicator is its composite nature. The supplemental indicator measures three things: whether a household has access to an improved source of water for drinking; whether the time to collect water from this improved source is 30 minutes or less; and whether there was any interruption of water supply from the said source for an entire day or longer in the last two weeks. Thus, when examining trends in the supplemental indicator, improvements in some areas of access

may be masked by deterioration in other areas. For monitoring purposes, it may be more useful to track the components of Indicator 2 separately to identify specific deficiencies and areas for improvement.

Because water collection can pose a significant burden on household members, it is important to know which family members usually perform the task of collecting water. Knowing the particular family member or members that collect water gives a sense of whether gender and generational disparities exist with respect to water collection responsibilities.

Sample Questions

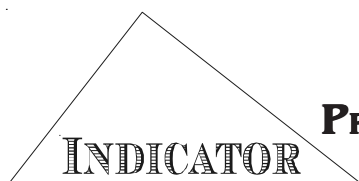
Priority questions:*

- o What is the main source of drinking water for members of your household?
- o If bottled water is the main source, what is the main source of water used by your household for other purposes such as cooking or handwashing?
- o How long does it take you to go to your principal water source, get water, and come back?
- o Who usually goes to this source to fetch the water for this household?
- o In the last two weeks has the water from this source been unavailable for at least one whole day?

Optional supplemental questions:*

- o When this source is not available at any time, what other source of drinking water do you use for members of this household?

* Priority questions are needed for estimating the indicator(s) described. Supplemental questions are optional and may be useful for calculating additional indicators. Not all questions are available from the DHS.



PROPORTION OF HOUSEHOLDS USING AN IMPROVED TOILET FACILITY

MDG Indicator and Core Hygiene Improvement Indicator

Definition

Proportion of households using an improved toilet facility.

Numerator: Number of households that use an improved toilet facility.

Denominator: Total number of households surveyed.

“Use” implies that the household must have access to a toilet facility at any time for any member and that a toilet facility should also be located within a convenient distance from the user’s dwelling, bearing in mind night use and use by children and the elderly. This can be ascertained through observation of the accessibility and use of the toilet facility.

“Improved” toilet facilities include:

- Flush/pour-flush toilet connected to piped sewer system
- Flush/pour-flush toilet connected to a septic tank
- Flush/pour-flush latrine connected to a pit
- Ventilated improved pit (VIP) latrine
- Simple pit latrine with slab (slab that can be cleaned)
- Composting toilet

Note: A slab must have a smooth surface to be cleaned. This can be made of concrete, plastic, clay spread over sticks, or tightly fitting wooden

planks with a smooth upper surface. A slab of exposed sticks without a smooth surface would not be considered improved.

“Unimproved” toilet facilities include:

- Flush/pour-flush latrine that empties elsewhere without connection to a piped sewage system, septic tank, or pit
- Flush/pour-flush latrine with unknown drainage
- Pit latrine without slab/open pit
- Bucket latrine (where excreta are manually removed)
- Hanging toilet/latrine
- Shared facility of the improved type
- Open defecation in field or bush, into plastic bags (‘flying toilets’)
- Any other type of defecation

Measurement Tools

Population-based surveys such as DHS, KPC, and MICS

What It Measures

Having easy access to functioning and improved toilet facilities is essential for the improvement of the hygienic situation of a household. This indicator measures access to an improved toilet facility. Note that all shared facilities are classified as unimproved according to the definition adopted by WHO and UNICEF in 2000. However, this seems biased against urban areas where shared facilities may be the only feasible sanitation solution.

How to Measure It

The child's caretaker or household head is interviewed about the type of toilet facility used by the household. Households that have a toilet facility which is not in working order or is not used for other reasons are classified as not using a facility. After the interview, an observation should be carried out to determine if the sanitation facility is accessible and shows sign of use (e.g., well-worn path, unobstructed, etc.). For a household to be counted in the numerator, only use of an improved toilet facility is required. Note that all shared facilities must be classified as unimproved. Target 10 of the MDGs is to "halve, by 2015, the proportion of people without sustainable access to basic sanitation.

Strengths and Limitations

This indicator can be monitored separately for urban and rural areas. However, unless this indicator is measured in a standard way, it would be of limited use for regional or cross-national comparisons. In some countries, data for calculating this indicator are routinely collected at the national and sub-national levels using population and housing censuses. Administrative or infrastructure data may also be used. However, administrative data generally refer to existing sanitation facilities, whether or not they are used. Just having a sanitation facility is not sufficient. There must be signs of consistent use by all family members if health impact is to be achieved. Household ownership of improved sanitation facilities is sometimes used as a proxy for this indicator. Evaluators must note, therefore, the definitions that are used when examining trends in the indicator. To improve the comparability of data on sanitation coverage, WHO, UNICEF, and USAID under the JMP have agreed on a standard approach to the measurement of this indicator for all major household surveys, such as the DHS, MICS, and WHS.

Sanitation may be a sensitive topic in many cultures. Thus, interviewers must be well trained and as unobtrusive and sensitive as possible. For

good program design, qualitative research on knowledge of, attitudes towards, and practices of excreta disposal is critical. A study should be sure to detail the types of sanitation facilities that are locally available and not assess the household against types not usually found in the community being examined. However, any locally defined types must be classified under one of the improved or unimproved categories listed earlier; otherwise, findings between different surveys cannot be compared.

While use of an improved toilet facility may represent a necessary condition for "*sanitary excreta disposal*," the toilet facility may not be hygienic. Thus, it is recommended that this indicator be measured in conjunction with a supplemental indicator measuring the proportion of households using an improved, accessible, and hygienic toilet facility. This would ensure comparability with international targets and enable programs to obtain more relevant information.

The definition and metrics of the supplemental indicator are as follows:

Supplemental Indicator

Definition: Proportion of households using an improved, accessible, and hygienic toilet facility.

Numerator: Number of households that use an improved, accessible, and hygienic toilet facility.

Denominator: Total number of households surveyed.

"Accessibility:" Components of access include the following:

- Whether the facility is shared;
- Proximity to the dwelling; and
- Physical access to the toilet facility.

Specifically, in order for the toilet facility to be classified as accessible, the following two criteria must be met:

- Toilet facility must be in or attached to the dwelling or inside the yard; and
- Observed signs of use and absence of signs discouraging use.

The distance to the toilet facility is approximated by its location in relation to the dwelling or yard.

A “*hygienic*” facility means the absence of visible fecal matter on exposed surfaces such as the door, floor, seat, walls, etc.

This supplemental indicator, which is measured using the DHS/Environmental Health Module, takes four conditions into account: (1) the toilet facility must be one of the improved types; (2) the facility must be in the dwelling or yard; (3) the facility must be accessible and show signs of use; and (4) the facility must be hygienic – there must be no feces on the floor, seat, or walls. Based on prior research, these seem to be the most critical conditions. Additional criteria could further strengthen the programmatic relevance of information collected about sanitation, for example, whether there is a place for hand washing with water and soap within or next to the facility, the actual distance between the dwelling and toilet, whether the facility has a basic superstructure that ensures privacy, or whether the toilet is functioning.

After the interview, an observation should be carried out to determine if the sanitation facility is accessible and shows sign of use (e.g., well-worn path, unobstructed, etc.), and whether it is hygienic, which is defined as being without visible feces on interior toilet surfaces. The primary limitation of the supplemental indicator is that it is composite in nature. It combines measures of use, access, and hygiene conditions and may be difficult to measure in practice. Disaggregating the supplemental indicator into its constituent

parts may facilitate the identification of areas of improvement, particularly if trends show little or no change in the indicator over time.

Sample Questions

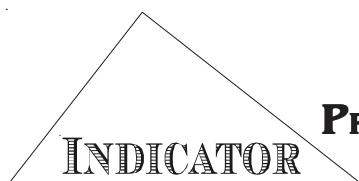
Priority questions:*

- o What kind of toilet facility do members of your household usually use?
- o Do you share this toilet facility with other households?
- o How many households use this toilet facility?
- o Where is the toilet facility located?
- o If flush/pour-flush: is the toilet facility in working condition?
- o Where does this toilet facility drain?
- o Toilet facility observation: observe access to the facility. Are there obstacles in the path? Are there signs of regular use?
- o Toilet facility observation: is there human or animal fecal matter present inside the facility on the floor, seat, or walls?

Supplemental questions:*

- o Is the drop hole covered by a lid?
- o Do you have a place where you usually wash your hands, and if so, where is it?

* Priority questions are needed for estimating the indicator(s) described. Supplemental questions are optional and may be useful for calculating additional indicators. Not all questions are available from the DHS.



PROPORTION OF HOUSEHOLDS WITH ACCESS TO ESSENTIAL HANDWASHING SUPPLIES

Core Hygiene Improvement Indicator

Definition

Proportion of households with access to essential handwashing supplies.

Numerator: Number of households that have access to essential handwashing supplies.

Denominator: Total number of households surveyed.

“Access” means that all essential items for handwashing are either present (visible at the time of survey) or can be produced within one minute. A special place for hand-washing may not be always feasible, but ideally one should be located in or near the toilet facility or kitchen.

“Essential handwashing supplies” include all of the following:

- (1) Water (stored in separate container than in the washing device);
- (2) Soap (or locally available cleansing agent); and
- (3) Washing device allowing for unassisted hand-washing (tap, basin, bucket, sink, or tippy tap).

Clean drying materials, such as towels, are not essential because air drying is an acceptable alternative.

Disposal of wastewater after handwashing does not require specific measures, unlike wastewater from cleaning up children’s stool. However, letting wastewater from hand washing accumulate in puddles should be avoided to keep surroundings dry and to prevent mosquitoes from breeding.

Measurement Tools

Population-based surveys such as KPC and DHS/ Environmental Health (EH) Module

What It Measures

Basic handwashing is an important element of the control of diarrheal diseases (DD). Handwashing behavior is strongly influenced by the presence and access to water as well as access to essential handwashing supplies. To be optimally effective, the handwashing place should be located in close proximity to the toilet facility so that household members can conveniently wash their hands after defecation, or to the place where cooking takes place so that food preparers can wash their hands easily before preparing food. At a minimum, the handwashing place should be inside the yard.

How to Measure It

Data for calculating this indicator are collected during a household interview. A question is asked to find out where household members usually wash their hands. The interviewer then asks to examine the site and notes whether the site contains a water supply (it is desirable but not essential that this is of the improved type, because even handwashing with water unsafe for drinking can be effective), a device for containing water and rinsing hands, and a cleansing agent such as soap. These items can either be displayed or brought out within one minute for the household to qualify as having access to essential handwashing supplies. To calculate the indicator, divide the number of households with access to all essential handwashing supplies by the total number of households in the sample.

Strengths and Limitations

The indicator does not measure the use of hand-washing supplies at appropriate times or knowledge of appropriate hand-washing techniques. Ideally, actual hand-washing practices should be observed, but this is often not practical during household surveys. Some surveys do not collect data on all criteria required in the definition of essential hand-washing supplies. The current version of the core questionnaire of the DHS, for example, does not ask about a handwashing place and supplies; however the DHS/EH module does assess all essential criteria plus whether there is clean material for hand-drying, which can be used where relevant to calculate an additional indicator. It is important, therefore, that baseline and follow-up surveys use exactly the same methodology to calculate the indicator so that any measurement biases would be systematic.

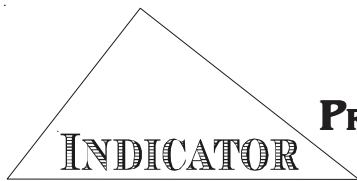
Sample Questions

Priority questions:*

- o Observation only: Is there a towel or cloth to dry hands? Note if present or brought in one minute or less.
 - o Observation only: Does the towel or cloth appear to be clean?
- * Priority questions are needed for estimating the indicator described. Supplemental questions are optional and may be useful for calculating additional indicators.
- o Can you show me where you usually wash your hands and what you use to wash hands?
 - o Observation only: Is there water? Interviewer: turn on tap and/or check container and note if water is present or brought in one minute or less.
 - o Observation only: Is there soap or detergent or locally used cleansing agent? Note if present or brought in one minute or less.
 - o Observation only: Is there a hand-washing device such as a tap, basin, bucket, sink, or tippy tap present or brought in one minute or less?

Optional supplemental questions:*

- o Observation only: Does the washing device allow unassisted washing and rinsing of both hands, for example, a tap, basin, bucket, sink, or tippy tap?



PROPORTION OF HOUSEHOLDS STORING DRINKING WATER SAFELY

Core Hygiene Improvement Indicator

Definition

Proportion of households storing drinking water safely.

Numerator: Number of households storing drinking water safely.

Denominator: Total number of households surveyed that store drinking water.

“Storing drinking water safely:” To store drinking water safely, households should:

- Cover the container (containers should have a screw-on top/lid or a plate-like cover that completely covers the water storage container and fits tightly); and
- Use a narrow neck container (containers should have a neck of 3cm or less in diameter); or
- Store water in cisterns and/or roof tanks.

Measurement Tools

Population-based survey such as KPC and DHS/EH Module

What It Measures

While access to safe water is important, it is also necessary for a household to store its water properly so that it remains safe. That means that the water should not be contaminated by exposure to dirt or dust (hence containers should have a narrow neck and be covered).

How to Measure It

Data for this indicator are collected through a household interview. The interviewer asks how the household stores its water and then examines the container to ascertain if it is narrow-necked and covered. A household is counted in the numerator if it meets all criteria for proper water storage: that is, use of a covered and narrow-neck container, which limits access, especially by children, to drinking water. Cisterns and roof tanks are considered safe because they generally do not allow individual household members to serve themselves directly and no direct observations of these storage facilities are included that could ascertain whether they are safe. Only households that store drinking water are included in the denominator.

Setting a target of 50% of the households storing water properly is realistic and attainable, but the proportion reached may be lower or higher depending on where a community is at the beginning of a safe water storage intervention (i.e. baseline) and the time available to change knowledge and practices.

Strengths and Limitations

The data required to calculate the indicator are simple to collect. As in the case of other hygiene improvement behaviors, practicing safe water storage is predicated on knowledge.

Additional criteria are not considered in the calculation of the indicator, but could be included in an indicator that measures safe water management comprehensively:

- Container with tap or spigot
- Limited access of children to the drinking water (a narrow neck of 3cm or less)

- Use one different clean vessel to transfer water or pour it out
- Regular cleaning of the storage container

It is useful to distinguish between water storage containers from which water is removed by dipping and those from which it is removed by pouring through a spigot (tap) or a spout. Dipping introduces objects (ladle, cup, dipper, etc.) and often the hands that hold these objects into stored water, and can easily negate the benefits of a cover. The importance of a narrow-neck is that if sufficiently narrow, it will effectively preclude dipping as a way of removing water, and will require the user to pour water from the container or remove it through a spigot (tap) at the bottom. Even if a household has easy access to safe water, the members could be at risk if the water storage container is not proper or properly maintained.

Sample Questions

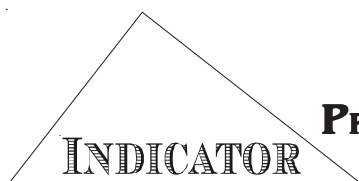
Priority questions:*

- o How do you store drinking water?
- o If in containers: may I see the containers, please?
- o What type of containers are these? (observe)
- o Are the containers covered? (observe)

Optional supplemental questions:*

- o Observe: where are the water containers placed?
- o Who takes water from these containers?
- o How do you remove water from the drinking water container?
- o What do you use to remove water?
- o Are the water containers cleaned?
- o When last were they cleaned?

* Priority questions are needed for estimating the indicator(s) described. Supplemental questions are optional and may be useful for calculating additional indicators. Not all questions are available from the DHS.



PROPORTION OF HOUSEHOLDS TREATING DRINKING WATER EFFECTIVELY

Core Hygiene Improvement Indicator

Definition

Proportion of households treating drinking water effectively.

Numerator: Number of households treating drinking water effectively.

Denominator: Total number of households surveyed.

“Treating drinking water effectively:” Effective treatment requires a methodology that removes fecal pathogens from drinking water and the regular (daily) application of the treatment method to minimize the risk of recontamination. Although some methods such as chlorination and filtration can protect water for longer than 24 hours, it is assumed that most poor households will not store large quantities of water, but will collect water daily. Where cisterns or roof tanks are common and treated chemically, questions may need to be adapted to take into account the less frequent treatment of large quantities of water. Where water chlorination is promoted (and where it is feasible), household water should be tested for residual chlorine (free and total) using inexpensive test strips.

Effective treatment methods are:

- Boil for at least one minute
- Add bleach/chlorine
- Water filter (ceramic, sand, composite)
- Solar disinfection

Note: these methods may be used in combination with sedimentation or straining through cloth to

remove solid matter and to increase the effectiveness of physical or chemical methods.

Ineffective methods of treating drinking water, if not used in combination with one of the aforementioned effective treatment methods, are the following:

- Let water stand and settle/sedimentation
- Strain water through cloth
- Any other method

Measurement Tools

Population-based surveys such as DHS, KPC, and MICS

What It Measures

While access to a safe source for drinking water is important, many households have no such access. In addition, water from many sources that meet the criteria for “safe improved water sources” may in fact be contaminated and unsafe to drink. This may be due to breaks in water distribution pipes, failures of chlorination systems, cracks in borehole well casings, contamination of “protected” springs or dug wells, or unsafe rainwater collection methods (i.e. from contaminated roofs). When properly practiced, point-of-use or household treatment of drinking water is an effective means of improving water quality and reducing waterborne disease. Generally, water is treated after it is collected and before it is stored (see indicator on storing drinking water safely on page 257).

How to Measure It

Data for this indicator are collected through a household interview, and may be supplemented by direct observation. In priority questions, the interviewer asks how the household usually treats

its drinking water. A household is counted in the numerator if it meets the criteria for effective water treatment: that is, habitual use of an approved method. This indicator is a standard DHS/MICS indicator.

Optional criteria for an additional indicator include observation of the tools or materials used for treatment (i.e., presence of a filter, a bottle of hypochlorite solution, containers for solar disinfection of water, or a pot used routinely to boil drink water). A simple test of stored water for the presence of chlorine can provide useful objective data for households that practice point-of-use treatment with sodium hypochlorite-based solutions. Microbiologic evidence of water treatment would be ideal, where water quality can be tested, but because of time and cost this may only be feasible in special surveys.

In a controlled setting, it may be realistic and attainable to set a target of 75% of households without access to an improved drinking water source treating water effectively. However, the proportion reached may be much lower for programs operating at a large scale. Realistic targets also depend on where a community is at the beginning of a point-of-use water treatment intervention (i.e. baseline) and the time available to change knowledge and practices. Targets will vary from place to place according to the quality and integrity of the water sources. Setting a target for point-of-use treatment for households with access to an improved water source is of a lesser public health priority, because for a proportion of these households water is safe, and treatment will not be needed. Water quality tests may be useful to establish targets, if they are feasible and affordable; in most situations, knowledge of whether community sources are of the improved or unimproved type will be adequate.

An additional indicator could be calculated by including only households at highest risk from water contamination. In this case, households with piped water connections that store water because the supply may be irregular would be included in

the denominator. Households with piped water connections that do not store water would be excluded from the denominator.

Strengths and Limitations

The data required to calculate this indicator are simple to collect. As in the case of other hygiene improvement behaviors, practicing point-of-use water treatment is predicated on knowledge. This indicator is also a composite of the necessary steps that a household must take in order to treat drinking water effectively. For program planning and monitoring, it may be more useful to ask directed and detailed questions relevant to the recommended method of household (also called point-of-use) water treatment. It is useful to calculate proportions independently for households that have access to an improved water source (as defined in the water source indicator) and for those that do not. In addition, programs may monitor (1) the proportion of households that treat drinking water effectively according to their primary type of water source; and (2) the proportion of households that possess the appropriate tools and materials for point-of-use drinking water treatment according to their primary type of water source.

This indicator usually significantly overestimates the proportion of households that drink safe water because it measures only whether households “usually” treat their drinking water. The effectiveness of water treatment can be measured more accurately by including information about the timing of water treatment. A supplemental indicator measuring the percent of households treating drinking water effectively in the past 24 hours can be calculated, as shown on page 261. It is proposed that effective household water treatment should be measured with both indicators (the proportion of households treating drinking water effectively and the proportion of households treating drinking water effectively in the past 24 hours) to ensure comparability with national surveys and to obtain programmatically more relevant information.

Supplemental Indicator

Definition: Proportion of households treating drinking water effectively in the past 24 hours.

Numerator: Number of households treating drinking water effectively in the past 24 hours.

Denominator: Total number of households surveyed.

The supplemental indicator is also collected through a household interview and by direct observation. The interviewer asks how the household usually treats its drinking water and when the last treatment was applied. The past 24 hours is approximated by the responses “yesterday” or “today.”

Sample Questions

Priority questions:*

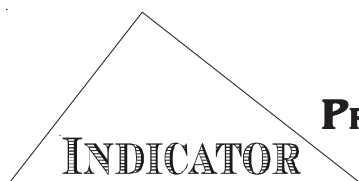
- o Do you treat your water in any way to make it safer to drink?
- o If yes: What do you usually do to the water to make it safer to drink?
- o When did you treat your drinking water the last time using this method?

Optional supplemental questions:*

- o How often does the household treat its drinking water?
- o If water is treated by a method other than boiling: May I see the product or device? Ask the respondent to show you the tools or materials used for treating drinking water and note whether they are adequate (i.e., is the filter broken? Is the container of hypochlorite solution empty? Is the pot for boiling available and of adequate size? Are there a sufficient number of containers for solar disinfection to meet household drinking water needs?).
- o How often do you clean your filter?
- o How often do you repurchase hypochlorite solution?

- o How long do you leave your water in solar disinfection bottles in the sunlight?

* Priority questions are needed for estimating the indicator(s) described. Supplemental questions are optional and may be useful for calculating additional indicators. Not all questions are available from the DHS.



PROPORTION OF HOUSEHOLDS WHERE DRINKING WATER HAS SUFFICIENT LEVELS OF RESIDUAL CHLORINE

Core Hygiene Improvement Indicator

Definition

Proportion of households where drinking water has sufficient levels of residual chlorine.

Numerator: Number of households where drinking water has levels of residual chlorine between 0.2 and 0.5mg/l or greater.

Denominator: Total number of households surveyed.

“Sufficient levels of residual chlorine” is usually measured as free chlorine. Residual chlorine in treated water should be between 0.2-0.5mg/l according to WHO water quality guidelines. Higher concentrations are unnecessary and lead to a noticeable chlorine taste at 3mg/l or greater. This indicator should only be measured where household water chlorination is used or where water is treated at the source or in the supply systems such as piped water networks.

Measurement Tools

Population-based survey

What It Measures

This is a direct measure of water quality, based on the evidence that chlorine in concentrations of 0.2mg/l over several hours effectively eliminates common diarrhea-causing pathogens. However, it does not remove chemical contaminants and does not kill some common protozoa.

How to Measure It

Free and total chlorine concentrations are measured with inexpensive test strips such as those used to test swimming pool water or some finer

graduations. Different shades of a color, often purple, correspond to different chlorine concentrations. The lowest positive reading often corresponds to a concentration of 0.2 mg/l or more, which simplifies the test as only positive and negative readings can be recorded.

Strengths and Weaknesses

Measurable levels of chlorine depend on a variety of factors besides water treatment. Turbid water and the presence of sediments tend to bind chlorine, thereby lowering the free level, which may become undetectable. The time since the last treatment, exposure to sunlight, temperature, and potential of hydrogen (pH) all influence the concentration of free chlorine and its ability to disinfect water.

Sample Questions

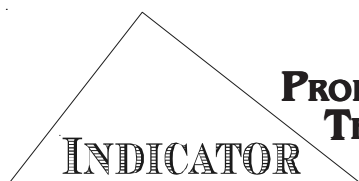
Priority questions:*

- o Do you treat your water in any way to make it safer to drink?

If households respond positively to the preceding water treatment question and mention chlorination, or if water chlorination within the water supply system is standard practice, perform chlorine dipstick tests.

- If bleach, chlorine, or tap water, test water for free chlorine
- If bleach, chlorine, or tap water, test water for total chlorine

* Not all questions are available from the DHS.



PROPORTION OF HOUSEHOLDS WHERE THE CARETAKER OF THE YOUNGEST CHILD UNDER FIVE REPORTED APPROPRIATE HANDWASHING BEHAVIOR

Core Hygiene Improvement Indicator

Definition

Proportion of households where the caretaker of the youngest child under five years reported using soap for washing hands within the past 24 hours at two or more critical times (after defecation and one of the following four: after changing a young child; before preparing food; before eating; and before feeding a child).

Numerator: Number of households where the caretaker of the youngest child under five years reported using soap for washing hands within the past 24 hours at two or more critical times (after defecation and one of the following four: after changing a young child; before preparing food; before eating; and before feeding a child).

Denominator: Total number of households with children under five years surveyed.

The above indicator is based on the assumption that in each household only one caretaker (i.e., the caretaker of the youngest child) will be interviewed. Where programs decide to interview more than one caretaker and assess reported handwashing behavior by caretakers of all children under five, the indicator should be calculated separately for children 0-23 months and children 24-59 months. In addition, the indicator definition, numerator and denominator should be modified as follows:

Definition: Proportion of caretakers of children aged 0-23 months (or some appropriate age range under five years) who report using soap for washing hands within the past 24 hours at two or more critical times (after defecation and one of

the following four: after changing a young child; before preparing food; before eating; and before feeding a child).

Numerator: Number of caretakers of children aged 0-23 months (or some appropriate age range under five years) who report using soap for washing hands within the past 24 hours at two or more critical times (after defecation and one of the following four: after changing a young child; before preparing food; before eating; and before feeding a child)

Denominator: Total number of caretakers of children aged 0-23 months (or some appropriate age range under five years) surveyed

“*Appropriate handwashing behavior*” includes two dimensions: use of soap and critical times for handwashing.

Critical times for handwashing listed by WHO are:

- After defecation
- After handling a child’s feces/cleaning babies’ bottoms/changing a young child
- Before food preparation
- Before eating
- Before feeding a child

Measurement Tools

Population-based surveys (KPC and DHS/ Environmental Health Module)

What It Measures

Evidence from trials and observational studies show that handwashing with soap reduces the risk of diarrheal disease by 30-50% (Curtis and

Cairncross, 2003). This indicator inquires about actual behavior, and not knowledge. In many instances, the behavior of the actual caretaker of the child (which could be the mother, a sibling, other family, or other help with whom the child spends most of his/her time) and that of the household member who prepares food would be most important. Handwashing with soap at two critical times, “after defecation” plus another critical time, is suggested as a minimum but programs may choose to set higher targets if more frequent handwashing seems achievable. Although ash, sand, and mud are mentioned in the literature as local alternatives, neither their acceptability as a cleansing agent nor their actual use on a significant scale has been established. The use of soap is commonly promoted for hand washing through, for example, public-private partnerships.

How to Measure It

In a household survey, this indicator is measured by self-reporting of critical times for handwashing; rarely by demonstration of handwashing technique. Data on handwashing techniques are collected by asking whether the caretaker has soap, has used it in the past 24 hours for hand washing, and the occasions during which soap was used for this purpose. The 24 hour recall period can be approximated by respondents mentioning “today” or “yesterday.” If only one caretaker is interviewed per household, all households with children under five years old surveyed are counted in the denominator, whether or not they have soap. Where other locally appropriate cleansing materials are common (see indicator about handwashing supplies), this indicator can be calculated only for households that have soap. If more than one caretaker is interviewed per household, all caretakers of children under five are counted in the denominator.

In past household surveys, caretakers were frequently asked to name the critical times for washing hands. The question had multiple answers and measured knowledge. Interviewers

were instructed not to read the answers out loud, but to record only those mentioned spontaneously by the caretaker. Unfortunately, these knowledge questions had little discriminatory power. Therefore, the soap use questions mentioned above are now recommended.

Social marketing and health extension/education programs have shown that considerable improvement in handwashing behavior can be achieved over time (Bateman et al., 1995; Whiteford et al., 1996). Targets aimed at increasing appropriate hand washing by 50% over the baseline are realistic and attainable.

Strengths and Weaknesses

Appropriate handwashing behavior includes three dimensions: critical times, frequency, and technique. However, handwashing frequency and technique are difficult and time-consuming to assess. Requesting a handwashing demonstration and direct observation of the handwashing technique would be desirable, but may be unfeasible in most surveys because it requires extensive training of the observers and is intrusive, time-consuming, and expensive.

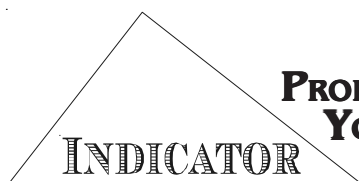
Handwashing behavior is strongly influenced by the presence or absence of a convenient source of water. Where water is scarce, people may resort increasingly to using recycled water for hand washing. Where possible, the use of recycled water for handwashing should be assessed during the interview. Since different methods can be used to collect data on hand washing, it is important that baseline and follow-up surveys use exactly the same methodology to calculate the indicator so that any measurement biases would be systematic.

It is also important to recognize that this indicator is based partly on self-reported behavior in the past 24 hours and does not indicate whether appropriate hand washing at critical times is practiced routinely. Note that some large-scale surveys, such as the ICHS, do not collect data on hand washing.

Sample Questions*

- o Do you have soap?
- o Have you used soap today or did you use soap yesterday?
- o When you used soap today or yesterday, what did you use it for? If “for washing my or my children’s hands is mentioned,” probe what was the occasion, but do not read the answers.

* Note that these questions are not available in the DHS.



PROPORTION OF HOUSEHOLDS THAT DISPOSED OF THE YOUNGEST CHILD'S FECES SAFELY THE LAST TIME S/HE PASSED STOOL

Core Hygiene Improvement Indicator

Definition

Proportion of households that disposed of the youngest child's feces safely the last time s/he passed stool.

Numerator: Number of households that disposed of the youngest child's feces safely the last time s/he passed stool.

Denominator: Total number of households surveyed.

Some programs may decide to interview more than one caretaker per household or assess safe feces disposal for more than one child under five years old. Assessing feces disposal for more than one child makes programmatic sense because these behaviors may be different for younger and older children.

If feces disposal is assessed for more than one child under five years old, the indicator 1 should be reported for children aged 0-23 months and 24-59 months separately and the definition, numerator, and denominator modified as follows:

Definition: Proportion of children aged 0-23 months (or some appropriate age range under five years) whose feces were safely disposed of the last time they passed stool.

Numerator: Number of children aged 0-23 months (or some appropriate age range under five years) whose feces were safely disposed of the last time they passed stool.

Denominator: Total number of children aged 0-23 months (or some appropriate age range under five years) surveyed.

"Safe feces disposal:" Passing stool directly into a toilet facility, or throwing it into a toilet facility when a potty is used or defecation occurs in the open are the safest disposal methods. If feces are rinsed from clothing, bedding, or washable diapers, the water should be discarded in a toilet facility, sewer or septic system, or in a covered grey-water pit. If households use composting or dry latrine, only the feces can be disposed into such a facility. Urine and wastewater from rinsing must not enter the composting compartment. Disposable diapers should not be discarded in a toilet facility because they will clog drain pipes and do not decompose fully if they contain plastic materials, which could make it impossible to empty the pit. Disposal of these diapers in the trash that is collected at least once per week could be a relatively safe option, but it may not be available in many developing countries. Therefore, the latter option is not included in the calculation of this indicator. Burial of feces seems an unlikely choice for most households, because it is difficult to remove feces routinely from the environment in this manner. All other options expose the environment to fecal contamination. This includes open grey water pits or garbage pits.

The following feces disposal methods are "safe:"

- Dropped into toilet facility
- Rinsed/washed away
 - Water discarded into toilet facility (except composting toilet)
 - Water discarded into sink or tub connected to drainage system (sewer, septic tank, or pit)

The following feces disposal methods are "unsafe:"

- Rinsed/washed away

- Water discarded into composting toilet
- Water discarded outside (includes open grey water pits)
- Disposed
 - Into solid waste/trash but no weekly trash collection
 - Somewhere in yard (includes garbage pits)
 - Outside premises
- Buried
- Did nothing/left it there

Measurement Tools

Population-based surveys (e.g., DHS, ICHS, KPC, MICS)

What It Measures

This indicator approximates safe feces disposal practices by all household members. Feces of young children pose a particular challenge, because young children are the most likely to contaminate the immediate household environment and the least likely to use a sanitation facility. The child is the unit of observation instead of the caretaker when surveys include more than one child under five years old per household.

How to Measure It

The survey questions for this indicator are adapted from a question included in the current household/woman questionnaires of the DHS and MICS. Thus, the indicator is a DHS/MICS standard indicator. Previous DHS questionnaires worded the question slightly differently by asking caretakers how they “usually” dispose of the child’s feces. In the most recent version of the DHS questionnaire, the question refers to the “last time” the youngest child passed stools. This question formulation may reduce recall bias.

Strengths and Weaknesses

The age range for the children surveyed can be adapted to meet local needs without impairing comparability as long as the child’s age is measured

in such a way as to allow analysis for different age groups. Children rather than caretakers are used as a unit of measurement if safe disposal is assessed for more than one child in the age range targeted. If only one child per caretaker is assessed, the results based on children or caretakers as the unit of analysis will be the same.

Harmonizing indicator definitions is a challenge. It is recommended, therefore, that feces disposal be measured with two indicators to ensure comparability with national surveys and to obtain programmatically more relevant information. The second proposed indicator is the following:

Supplemental Indicator

Definition: Proportion of households that disposed of the youngest child’s feces appropriately the last time s/he passed stool

Numerator: Number of households that disposed of the youngest child’s feces appropriately the last time s/he passed stool

Denominator: Total number of households surveyed

The difference between “safe” feces disposal and “appropriate” feces disposal is the specific inclusion of the use and disposal of disposable diapers in the latter. Disposable diapers are becoming an increasing waste problem in developing countries and an increasing environmental hazard without proper means of disposal.

The following feces disposal methods are considered “appropriate:”

- Dropped into toilet facility
- Rinsed/washed away
 - Water discarded into toilet facility (except composting toilet)
 - Water discarded into sink or tub connected to drainage system (sewer, septic tank, or pit)

- Disposed
 - Into solid waste/trash with weekly collection (except composting toilet)

Unsafe feces disposal methods are considered “inappropriate.”

Where programs assess appropriate feces disposal for more than one child under five years old, the definition, numerator, and denominator of the supplemental indicator should be modified as follows:

Definition: Proportion of children aged 0–23 months (or some appropriate age range under five years) whose feces were appropriately disposed of the last time they passed stool.

Numerator: Number of children aged 0–23 months (or some appropriate age range under five years) whose feces were appropriately disposed of the last time they passed stool.

Denominator: Total number of children aged 0–23 months (or some appropriate age range under five years) surveyed.

Sample Questions

- Where did [NAME OF CHILD] defecate the last time?
- The last time [NAME OF YOUNGEST CHILD] passed stools, what was done to dispose of the stools? (Child used toilet or latrine; put/rinsed into toilet or latrine; put/rinsed into drain or ditch; thrown into garbage; buried; left in the open; other; don’t know.)

The disposal of feces into a toilet facility should be cross-checked with the question inquiring about the household’s use of such a facility.

Supplemental IMCI Indicator at the Household Level**Definition**

Proportion of children aged 0-59 months who had diarrhea at any time in the two-week period prior to the survey.

Numerator: Number of children aged 0-59 months who had diarrhea at any time in the two-week period prior to the survey.

Denominator: Total number of children aged 0-59 months surveyed.

“*Diarrhea*” is commonly defined as three or more loose or watery stools in a 24-hour period, a loose stool being one that would take the shape of the container. Diarrhea that is of 14 or more days in duration is defined as “persistent diarrhea.”

Programs may focus on a different age range, for example, 0-35 or 0-23 months, and the indicator definition, numerator, and denominator adjusted according to the age range of interest.

Measurement Tools

Population-based surveys such as DHS, KPC, and MICS

What It Measures

This indicator measures the prevalence of diarrhea among children under age five years and gives some indication of the importance of diarrhea as a public health problem. Diarrhea is one of the principal causes of morbidity and mortality among children in developing countries, accounting for 15-20% of all deaths of children under age five years (Kosek, Bern, and Guerrant, 2003). Diarrhea-related deaths are most commonly

caused by dehydration produced by acute watery diarrhea and acute dehydration. Death can also be caused by infection, particularly in children who have persistent diarrhea (of 14 or more days in duration) and malnutrition, in those who have other infections at the same time (such as pneumonia), or in those who have bloody diarrhea.

How to Measure It

In a population-based survey, mothers of children under five years of age are asked if their children had diarrhea at any time in the two weeks preceding the survey, and whether they still had diarrhea in the last 24 hours. In some surveys, the duration of that particular episode of diarrhea is also collected. A child is said to have persistent diarrhea if s/he had diarrhea in the last 24 hours and if s/he had diarrhea in the last two weeks that lasted for at least 14 days. Some surveys also include a question on blood in the stool to provide an approximation of the percentage of children who had dysentery. The caretaker may also be asked how many times the child had bowel movements on the worst day of the diarrhea in order to get an idea of the severity of the diarrhea.

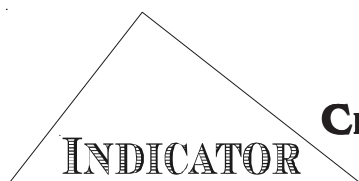
Strengths and Limitations

The indicator is useful for evaluating the effectiveness of specific public health interventions aimed at reducing the frequency of childhood diarrheal disease. It is simple to calculate and can be used to examine trends in diarrheal disease over time. Because diarrheal disease prevalence is influenced by season, surveys must occur in the same season if the data are to be comparable over time.

While it is extremely useful for measuring the importance of diarrhea as a public health problem, the indicator is a reflection of both old and new cases of diarrhea in the population. It does not

give any indication of how long the diarrhea has lasted and excludes children who may have died with symptoms of diarrhea.

Programs may be interested in calculating the period prevalence of persistent diarrhea. Although persistent diarrhea (diarrhea that occurs for 14 or more days) accounts for less than 10% of all diarrhea cases, it is associated with 30-50% of diarrhea deaths (Black, 1993). The indicator can be modified to calculate the prevalence of persistent diarrhea by restricting the numerator to the number of children aged 0-59 months who had diarrhea lasting for 14 days or more in the two-week period prior to the survey.



CHILD WITH NON-BLOODY DIARRHEA TREATED WITH ANTIBIOTICS

Definition

Proportion of children aged 0-59 months with non-bloody diarrhea in the last two weeks who were treated with antibiotics.

Numerator: Number of children aged 0-59 months with non-bloody diarrhea in the last two weeks who were treated with antibiotics.

Denominator: Total number of children aged 0-59 months with non-bloody diarrhea in the last two weeks.

Measurement Tools

Population-based surveys such as DHS, KPC, and MICS

What It Measures

This indicator is a measure of inappropriate treatment of childhood diarrhea. Inappropriate treatment of childhood diarrhea with antibiotics is widespread and a major public health concern. Non-bloody watery diarrhea is often caused by viruses and does not require antibiotics. Using an antibiotic to treat viral diarrhea may contribute to preventable deaths and waste scarce resources on drugs that may even aggravate diarrhea episodes. Widespread unnecessary use of antibiotics could also lead to antibiotic resistance.

How to Measure It

In a population-based survey, data for calculating this indicator are collected for each child born in the past five years. The mother/caregiver is asked whether the child had diarrhea in the two weeks preceding the survey, and if so, whether there was blood in the stool. Respondents are then asked whether the child received anything to treat this episode of diarrhea, and if so, what type of treatment was given. Subsequent questions ask

whether advice was sought from someone else on how to treat this episode of diarrhea and note all types of facility and all persons seen. A child enters the numerator if s/he had non-bloody diarrhea and was treated with antibiotics. The denominator consists of all children under five years old who had non-bloody diarrhea in the last two weeks.

Strengths and Limitations

This indicator has major programmatic implications. If a high percentage of children with non-bloody diarrhea are found to be treated with antibiotics, it can be assumed that IEC programs targeting improvements in home management of diarrhea have not succeeded. Widespread use of antibiotics for the treatment of non-bloody diarrhea also indicates that health care providers are either advocating the treatment and/or are lacking relevant technical knowledge. This indicator does not capture, however, who specifically is providing inappropriate treatment of childhood diarrhea. Care providers delivering inappropriate treatment could be doctors, nurses, clinical staff, pharmacists, or village health workers. This issue is better examined through observations of sick child consultations.

Sample Questions

- o Has [NAME] had diarrhea in the last two weeks?
- o If yes: was there any blood in the stools?
- o Was anything given to treat the diarrhea?
- o What was given to treat the diarrhea?
 - Fluid from ORS packet
 - Recommended home fluid
 - Antibiotic pill or syrup
 - Injection
 - IV (intravenous)
 - Herbal remedies/herbal medicines
 - Other

Definition

Proportion of children aged 0-59 months with diarrhea in the last two weeks who were treated with oral rehydration salts and/or recommended home fluids.

Numerator: Number of children aged 0-59 months with diarrhea in the last two weeks who were treated with oral rehydration salts and/or recommended home fluids.

Denominator: Number of children aged 0-59 months surveyed who had diarrhea in the last two weeks.

The commonly accepted definition of “*diarrhea*” is three or more loose or watery stools during a 24-hour period.

“*Oral Rehydration Salts*” (ORS) refer to a balanced mixture of glucose and electrolytes for use in treating and preventing dehydration, potassium depletion, and base deficit due to diarrhea. When ORS is dissolved in water, the mixture is called ORS solution.

A “*government-recommended homemade fluid*” (RHF) may be a cereal-based mixture or it may be made from sugar, salt, and water, or it may include soups, or plain water (if nothing else is available). Note that a homemade sugar-and-salt solution is not recommended in some settings due to the difficulty of getting the quantities right.

Measurement Tools

Population-based surveys such as DHS, KPC, MICS

What It Measures

This indicator measures program performance in countries where ORS and/or RHF are/is an accepted part of the diarrheal disease control program. Diarrhea is a principal cause of morbidity and mortality among children in developing countries. Diarrhea-related deaths are most commonly caused by dehydration produced by acute watery diarrhea and acute dehydration. The basic principle of home management of diarrhea is to prevent dehydration by increasing fluid intake with oral rehydration fluid (including ORS and plain water) or some other government-recommended fluid as soon as the episode of diarrhea starts. Increases in the use of ORT have been associated with marked falls in the annual number of deaths attributable to diarrhea among children under five years in some developing countries (Victora, Bryce, Fontaine, and Monasch, 2000).

How to Measure It

In household surveys, caretakers of children under five years old with an episode of diarrhea in the last two weeks are asked whether the child received fluid made from the contents of an ORS or a fluid made from ingredients available in the home and recommended for use as ORT by the national diarrheal disease control program. The instructions for which ingredients to use in the recommended home fluid may vary from country to country.

Strengths and Limitations

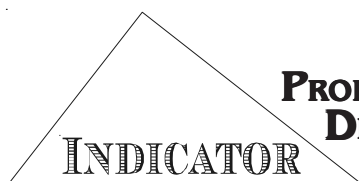
This indicator is easy to measure. It assumes caretaker and community awareness of ORT. The use of a two-week reference period to ascertain the occurrence and treatment of diarrhea decreases problems of recall. However, the indicator does not capture timely treatment of diarrhea, that is,

whether ORT was provided as soon as the episode of diarrhea started. The indicator does not also measure whether ORT was prepared appropriately (electrolyte concentration in the case of ORS) or whether it was administered correctly (in sufficient volume) to prevent dehydration. It also does not take into account the severity of illness.

The study of time trends in ORT use has been limited by the use of four different definitions of ORT in the 1990s. In the early 1980s, the indicator of choice was the proportion of children under five years old with diarrhea in the last two weeks who were treated with ORS. By 1988, this definition was expanded to include the proportion treated with ORS and/or RHF. By 1991, ORT was redefined as increased fluid intake and by 1993, continued feeding was included as part of the indicator. As demonstrated by Victora et al. (2000), these definitional changes led to fluctuations in ORT coverage over time. When interpreting trends in ORT use, the successive changes in its definition must be taken into account.

Sample Questions

- o Has [NAME] had diarrhea in the last two weeks?
- o Was there any blood in the stools?
- o Did you seek advice or treatment for the diarrhea from any source? If yes: where did you seek advice or treatment?
- o How many days after the diarrhea began did you first seek advice or treatment for [NAME]?
- o Does [NAME] still have diarrhea?
- o Was s/he given any of the following to drink at any time since s/he started having the diarrhea?
 - (a) A fluid made from a special packet called [LOCAL NAME FOR ORS PACKET]?
 - (b) A pre-packaged ORS liquid?
 - (c) A government-recommended homemade fluid?



PROPORTION OF CHILDREN AGED 2-59 MONTHS WITH DIARRHEA IN THE LAST TWO WEEKS WHO WERE TREATED WITH ZINC SUPPLEMENTS

Definition

Proportion of children aged 2-59 months with diarrhea in the last two weeks who were treated with zinc supplements.

Numerator: Number of children aged 2-59 months with diarrhea in the last two weeks who were treated with zinc supplements.

Denominator: Total number of children aged 2-59 months surveyed with diarrhea in the last two weeks.

The commonly accepted definition of “*diarrhea*” is three or more loose or watery stools during a 24-hour period.

Measurement Tools

Population-based surveys such as DHS, KPC, and MICS

What It Measures

This indicator measures the extent to which home and health facility treatment practices for childhood diarrhea reflect the recent WHO/UNICEF (2004) joint recommendations that children receive zinc supplements for treatment of diarrhea. A meta-analysis of acute and persistent diarrhea showed a 15% reduction in the duration of acute diarrhea and a 24% reduction in the duration of persistent diarrhea, as well as a reduction in the severity of diarrhea episodes, among children receiving zinc supplementation compared with children receiving a placebo. Children receiving zinc supplementation for 10-14 days also showed greater resistance to new episodes of diarrhea in the two to three months following the full treatment and enhanced overall immune function (Zinc Investigators' Collaborative Group, 1999; 2000). Widespread

use of ORS and zinc supplementation for diarrhea treatment is estimated to prevent 88% of diarrhea deaths (Jones, Steketee, Black et al., 2003).

How to Measure It

In household surveys, caretakers of children under five years old are asked whether the child experienced an episode of diarrhea in the last two weeks and if so, what was given to treat the diarrhea. If zinc supplementation is not spontaneously mentioned, the caretaker is asked specifically whether the child received zinc supplements. The caretaker may be shown a sample of zinc tablets or syrup and asked to report whether this treatment was given to the child.

All children aged 2-59 months with diarrhea in the last two weeks are counted in the denominator. A child is counted in the numerator only if s/he is aged 2-59 months, had diarrhea in the last two weeks, and was treated with zinc supplements. Children who received multivitamins with zinc in their formulation should not be included in the numerator if they did not receive the recommended zinc supplements. Although multivitamins with zinc in their formulation may enhance the overall zinc content of the diet, such multivitamins have not been assessed for their impact on diarrhea.

Strengths and Limitations

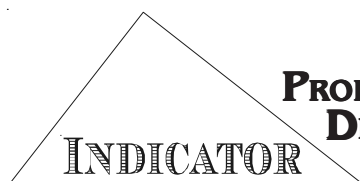
This indicator is easy to measure. It assumes family and community understanding of the revised recommendations for managing childhood diarrhea and that existing zinc formulations are available, cost-effective, and easily administered to infants and children. The use of a two-week reference period to find the occurrence and treatment of diarrhea decreases problems of recall.

However, the indicator does not capture the recommended dosage and duration of zinc supplementation for treatment of childhood diarrhea. WHO and UNICEF (2004) recommend daily 20mg zinc supplements for 10-14 days for children aged 6-59 months and 10mg per day for infants under six months old with acute diarrhea (i.e., a diarrhea episode lasting less than 14 days). In a household survey, the majority of children with diarrhea in the last two weeks would have had the illness less than 10 days ago. Thus, it would not be useful to ask the number of days they were given zinc supplements, especially since the course of zinc would probably not have started on the day that the diarrhea began. Additionally, mothers are unlikely to know the number of milligrams present in the zinc tablets or syrup used to treat the child. To assess whether household practices for the treatment of childhood diarrhea include the recommended dosage and duration of zinc supplementation, a more in-depth study would be required. Note also that where zinc supplements are promoted in syrup form, the indicator cannot capture the quality of the product, that is, whether the amount of zinc indicated on the label is present.

This indicator should be monitored in conjunction with ORT use, increased fluid intake, and increased fluid and continued feeding. A child with acute diarrhea should be treated with both zinc supplements and ORS/RHF (that is, fluid made from the contents of an ORS packet or fluid made from ingredients available in the home and recommended for use as ORT by the national diarrhea control program). Program managers may want to use a composite indicator measuring the use of both zinc supplementation and ORS/RHF to treat diarrhea among children in the last two weeks. However, if no change is observed in this composite indicator over time, it would be difficult to determine whether this is due to lack of change in both ORT use and zinc supplementation, or whether an improvement in one component of the composite indicator is offset by deterioration in the other component.

Sample Questions

- o Has [NAME] had diarrhea in the last two weeks?
- o Was s/he given any of the following to drink at any time since he/she started having diarrhea: a fluid from a special packet called [LOCAL NAME FOR ORS PACKET]; a pre-packed ORS liquid; a government-recommended homemade fluid?
- o Was anything (else) given to treat the diarrhea?
- o What (else) was given to treat the diarrhea?
If zinc is mentioned: How many times was [NAME] given zinc?



PROPORTION OF CHILDREN AGED 0-59 MONTHS WITH DIARRHEA IN THE LAST TWO WEEKS WHO RECEIVED INCREASED FLUIDS AND CONTINUED FEEDING

Priority Indicator for IMCI at the Household Level

Definition

Proportion of children aged 0-59 months with diarrhea in the last two weeks who received increased fluids and continued feeding during the illness.

Numerator: Number of children aged 0-59 months with diarrhea in the last two weeks who received increased fluids and continued feeding during the illness.

Denominator: Total number of children aged 0-59 months surveyed with diarrhea in the last two weeks.

“*Fluids*” include oral rehydration salts (ORS), recommended home fluids, and water. Locally recommended home fluids may include soups, cereal gruels, yogurt-based drinks, unsweetened fruit juice, green coconut water, weak tea, plain clean water, or homemade sugar-and-salt solutions. Note that homemade sugar-and-salt solution is not recommended in some settings due to the difficulty of getting the quantities right.

Measurement Tools

Population-based surveys such as DHS, ICHS, KPC, and MICS

What It Measures

This indicator measures the performance of programs aimed at improving home case management of diarrhea. Any illness in children is likely to reduce caloric intake and increase children’s susceptibility to malnutrition following each illness episode. Both increased fluid intake and continued feeding during illness are important to reduce this nutritional impact.

How to Measure It

Data requirements for calculating this indicator are: (1) the number of children age 0-59 months with diarrhea in the past two weeks who received increased fluids and continued feeding; and (2) the total number of children age 0-59 months surveyed with diarrhea in the past two weeks.

In the DHS and MICS3 questionnaires, data on increased fluids and continued feeding during illness are collected only if the child had diarrhea in the past two weeks. Caretakers of children who had diarrhea in the past two weeks are asked whether the child was given less than usual to drink, about the same amount, or more than usual to drink during the diarrhea. Similarly, questions about feeding practices during illness ask whether the child was offered less than usual to eat, about the same amount, or more than usual to eat during the diarrhea episode, and if less, how much less.

In the ICHS conducted by the BASICS II project, fluid intake during illness refers to liquids other than breastmilk, and separate questions are asked to find out about breastfeeding practices during illness. The distinction between breastfeeding and non-breastfeeding children was made in an attempt to capture feeding practices during illness among children who are exclusively breastfed. If the child is currently breastfeeding, the mother is asked whether she changed the frequency of breastfeeding while the child was sick. If yes, the respondent is asked whether the frequency of breastfeeding was increased, decreased (somewhat less or much less), or if she stopped breastfeeding completely during the illness episode. Note that if ICHS-type questions are used to collect the data, information for both breastfeeding and non-breastfeeding children should be combined when calculating the numerator.

Goal 23 of the World Summit for Children is to reduce by 50% the deaths due to diarrhea in children under the age of five years and to reduce the diarrhea incidence rate in this age group by 25%.

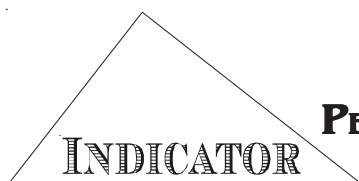
Strengths and Limitations

The “increased fluids” component of the indicator does not capture how soon after the start of the illness episode children are offered increased fluids. The timing of the administration of increased fluids is especially important in diarrhea cases as early increased fluid intake can prevent many children from becoming dehydrated and facilitate continued feeding by restoring appetite. Also, the indicator does not measure the nutritional value of food given to child during illness.

The indicator can be disaggregated into an indicator of increased fluid intake during illness and an indicator of continued feeding during illness. These separate indicators can be used for the purpose of tracking the individual components of feeding practices during illness, especially if a low value is obtained on the indicator.

Sample Questions

- o Has [NAME] had diarrhea in the last two weeks?
- o Now I would like to know how much [NAME] was given to drink during the diarrhea. Was s/he given less than usual to drink, about the same amount, or more than usual to drink?
- o IF LESS, PROBE: Was s/he given much less than usual to drink or somewhat less?
- o When [NAME] had diarrhea, was s/he given less than usual to eat, about the same amount, more than usual, or nothing to eat?
IF LESS, PROBE: Was s/he given much less than usual to eat or somewhat less?



PERIOD PREVALENCE OF ACUTE RESPIRATORY INFECTION NEEDING ASSESSMENT

Supplemental Indicator for IMCI at the Household Level

Definition

Proportion of children aged 0-59 months reported to have had a cough and fast and/or difficult breathing due to a problem in the chest in the last two weeks.

Numerator: Number of children aged 0-59 months reported to have had a cough and fast and/or difficult breathing due to a problem in the chest in the last two weeks.

Denominator: Total number of children aged 0-59 months surveyed.

Measurement Tools

Population-based surveys such as DHS, KPC, and MICS

What It Measures

This indicator measures the frequency of existing childhood cases of acute respiratory infections (ARI) needing assessment in the population and gives some indication of the importance of ARI as a public health problem. Acute lower tract respiratory infection, primarily pneumonia, is a common cause of morbidity and death among children under five years of age in developing countries. Pneumonia is characterized by difficult or rapid breathing and chest-indrawing.

How to Measure It

In household surveys, the identification of ARI is based on the caretaker's perceptions of the respiratory symptoms suffered by the child. Mothers are asked whether their children under age five had been ill with a cough in the two weeks

prior to the survey, and if so, whether the cough had been accompanied by short, rapid breaths and/or a problem in the chest and/or a blocked or runny nose. Children are counted in the numerator if they meet each of the following three conditions: (1) they had a cough in the last two weeks; (2) the cough was accompanied by fast and/or difficult breathing; and (3) the cough was accompanied by a problem in the chest with or without a blocked/runny nose.

Strengths and Limitations

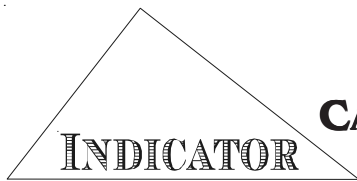
The indicator is useful for evaluating the effectiveness of specific public health interventions aimed at reducing the frequency of ARI. It is simple to calculate and can be used to examine trends in ARI over time. However, it should be borne in mind that the data are subjective. They are based on the mother's perception of illness and are not validated by medical examination.

It is to be noted that the analysis of time trends in this indicator and regional or cross-national comparisons of ARI prevalence is limited by the use of different definitions. In previous versions of the DHS, ARI was defined as the presence of cough and fast/difficult breathing in the last two weeks. In IMCI, the numerator was defined as children with difficult breathing, with or without cough, in the two weeks preceding the survey. The argument behind the IMCI definition was that while cough and rapid breathing are symptoms that are compatible with pneumonia, about 95% of children with pneumonia will have a cough, while a small proportion will not have a cough, but will have difficulty breathing. Current recommendations, as are reflected in the definition presented here, are to define the numerator as children with cough and rapid/or difficult breathing that is due to a problem in the chest in the two weeks preceding the survey. Therefore,

successive changes and differences in the definition of ARI must be taken into account when interpreting trends in this indicator or making regional/cross-national comparisons.

Sample Questions

- o Has [NAME] had an illness with a cough at any time in the last two weeks?
- o When [NAME] had an illness with a cough, did s/he breathe faster than usual with short, rapid breaths or have difficulty breathing?
- o When [NAME] had this illness, did s/he have a problem in the chest or a blocked or runny nose?



CARE SEEKING FOR ARI IN CHILDREN 0-59 MONTHS OF AGE

Definition

Proportion of children aged 0-59 months with cough and fast and/or difficult breathing due to a problem in the chest in the last two weeks who were taken to an appropriate health provider.

Numerator: Number of children aged 0-59 months with cough and fast and/or difficult breathing due to a problem in the chest in the last two weeks who were taken to an appropriate health provider.

Denominator: Total number of children aged 0-59 months with cough and fast and/or difficult breathing due to a problem in the chest in the last two weeks.

As defined by UNICEF and WHO, “*appropriate providers*” for the diagnosis and treatment of acute respiratory infection (ARI) include hospitals, health centers, dispensaries, village health workers, mobile/outreach clinics, and private physicians. This definition can be modified according to national guidelines and local terminology.

Measurement Tools

Population-based surveys such as DHS, KPC, and MICS

What It Measures

ARI, especially pneumonia, is a leading cause of death in children under the age of five in developing countries, killing approximately two million in 2000. To prevent deaths when children develop ARI, early diagnosis of the condition and appropriate health care are crucial. Goal 24 of the World Summit for Children sought a reduction by one third in the deaths due to acute respiratory infection in children under age five years. In the majority of 73 countries where data

were available, more than half of the children suffering from ARI were not taken to appropriate health care providers. This indicator measures two things: the knowledge of the caretaker about when and where to seek care, and actual care-seeking behavior.

How to Measure It

In a household survey, mothers/caretakers of children under the age of five years are asked whether the child had a cough and short, rapid, or difficult breathing in the last two weeks and whether the illness was accompanied by a problem in the chest and/or a blocked or runny nose. The respondent is also asked whether she sought advice or treatment for the child’s illness from any source and who provided advice or treatment to the child. Some surveys do not collect information on contact with an appropriate health provider but on contact with health facilities. A child with ARI enters the numerator if s/he was taken to an appropriate provider. Appropriate providers for the diagnosis and treatment of ARI include hospitals, health centers, dispensaries, village health workers, mobile/outreach clinics, and private physicians. If national guidelines do not define who is an “appropriate provider” for the diagnosis and treatment of ARI, UNICEF and WHO definitions may be used instead.

No global targets exist for this indicator. Target setting needs to be based on clear baseline information, specific interventions, and realistic estimates based on the likelihood of change (WHO, 1999a).

Strengths and Limitations

When combined with facility-level information, this indicator enables programs to understand and interpret observed ARI-related mortality patterns

in the community. For example, if a high proportion of ARI cases seek appropriate care, mortality resulting from ARI should decline. However, there are some methodological concerns with this indicator. First, it is likely to be affected by caretakers' perceptions of disease causation and selectivity. If ARI cases among certain subpopulations are less likely to be reported than among other groups, this will affect how representative the indicator is of children with ARI in the general population. Additionally, even though ARI is common, a relatively large sample size is required to measure this indicator in order to capture the required population for the denominator, that is, children with ARI in the last two weeks. This has survey cost implications.

This indicator assumes that once the child is taken to an appropriate provider, s/he will receive quality care in terms of appropriate drugs with the right dosage and proper counseling. Neither the quality of health facility case management nor caretaker compliance with the treatment are captured by the indicator. The indicator also does not reflect the timeliness of care seeking. Ideally, children under five-years of age with recognized danger signs of moderate or severe illness should be taken to a health facility or trained service provider within 48 hours after the commencement of symptoms. Given the focus on early consultation and treatment for moderate to severely ill children, it is recommended that the indicator be modified as follows to reflect prompt care-seeking behavior:

Proportion of children aged 0–59 months with cough and fast and/or difficult breathing due to a problem in the chest in the last two weeks who were taken to an appropriate health provider within 48 hours after the illness began.

Sample Questions

- o Has [NAME] had an illness with a cough at any time in the last two weeks?
- o When [NAME] had an illness with a cough, did s/he breathe faster than usual with short, rapid breaths or have difficulty breathing?

- o When [NAME] had this illness, did s/he have a problem in the chest or a blocked or runny nose?
- o If yes, then:
 - Did you seek advice or treatment for the illness from any source?
 - If YES, where did you seek advice or treatment?
 - How many days after the illness began did you first seek advice or treatment for [NAME]?

Supplemental Indicator for IMCI at the Household Level
Definition

Proportion of children aged 0-59 months with a report of fever in the last two weeks.

Numerator: Number of children aged 0-59 months with a report of fever in the last two weeks.

Denominator: Total number of children aged 0-59 months surveyed.

Measurement Tools

Population-based surveys such as DHS, KPC, and MICS

What It Measures

Malaria is one of the three leading causes of morbidity and mortality in the developing world. In Africa, malaria accounts for about 20% of under-five mortality, excluding neonatal, and constitutes 10% of the region's overall disease burden mortality (WHO, 2000c). In malaria-endemic areas, the major manifestation of malaria is fever. Therefore, the prevalence of fever in these populations is used as a proxy for the prevalence of malaria.

How to Measure It

In a household survey, mothers are asked whether the child had an episode of fever within the two weeks prior to the interview. This information is used to calculate the indicator. Data from surveys are generally available every three to five years. Target 8 of the MDGs is to have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.

Strengths and Limitations

This indicator is relatively simple to collect and calculate. It can be used to examine trends over time in the prevalence of fever, especially as a method of evaluating the probable impact of intervention programs in controlled settings. The disaggregation of the data by urban and rural area, where possible, can enable an assessment of the extent to which malaria varies across communities and help monitor drug resistance.

It is difficult, however, to determine the cause of the fever. Various infectious diseases are accompanied by fever, the most common being malaria, pneumonia, intestinal infections, measles, and typhoid. Furthermore, the indicator does not allow one to establish whether the fever was clinically determined or defined based on the caretaker's perception that the child's body temperature was above the normal level. Therefore, the severity of the fever cannot be assessed. In some areas, there is seasonal variation of malaria with incidence peaking at certain times of year. Where malaria is sporadic or seasonal, care should be exercised in interpreting trends in the indicator as they could be influenced by the time of the year in which the surveys are conducted. These factors contribute to questionable validity of the data for establishing the prevalence of malaria.

Priority Indicator for IMCI at the Household Level
Definition

Proportion of children aged 0-59 months who slept under an insecticide-treated net the previous night.

Numerator: Number of children aged 0-59 months who slept under an insecticide-treated net the previous night.

Denominator: Total number of children 0-59 months surveyed.

An insecticide-treated net (ITN) is a net that has been dipped in an insecticide effective against local malaria-causing mosquitoes.

Measurement Tools

Population-based surveys such as DHS, ICHS, KPC, MICS

What It Measures

This indicator is a measure of malaria prevention. The Roll Back Malaria (RBM) initiative, established in 1998 by WHO, the United Nations Children's Fund, and the World Bank, identifies the use of ITNs as one of the four main interventions to reduce the burden of malaria in Africa. Studies conducted in the 1980s and 1990s showed that the use of ITNs reduced deaths in young children by an average of 20% (see, for example, Alonso et al., 1993; Lengeler et al., 1996).

How to Measure It

To calculate this indicator, two pieces of information are required: the number of children aged 0-59 months that slept under an ITN the night preceding the survey and the total number of children aged 0-59 months surveyed.

Data on ITN-use are usually collected by asking women aged 15-49 in households possessing bednets about the use of bednets by all of their biological children under five years old. In the ICHS, the definition of bednets includes baby nets (nets that are specially designed to fit an infant) and regular mosquito nets that hang over sleeping places and can be used to protect family members against mosquitoes while sleeping.

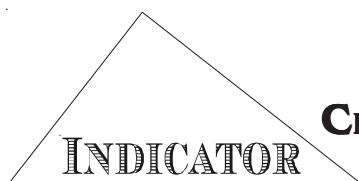
Respondents are then asked whether the bednet under which the child slept on the night preceding the survey has ever been treated with insecticide to repel mosquitoes or bugs since it was obtained. The next question asks how long ago the bednet (under which the child slept the previous night) was last treated with insecticide. Respondents may also be asked how long ago the bednet was bought or obtained. With the increased availability of permanently impregnated nets, additional questions must be asked in surveys to obtain information on the brand of ITN used by children and other household members.

Data on coverage of children's use of insecticide-treated bednets should be collected about every two to three years. Disparities by sex, mother's education, and area of residence should be assessed. One of the targets set at the Abuja Summit in April 2000 was to have 60% of the population at risk sleeping under ITNs by 2005 (WHO, 2000a). RBM's goal is to halve the burden of malaria by 2010.

Strengths and Limitations

This indicator allows programs to monitor widespread use of insecticide-nets to limit human-mosquito contact. By asking about use of an insecticide-treated net the night prior to the survey, the question aims to reduce recall bias. There are several caveats to this indicator. First, the indicator assumes the insecticide-treated net is maintained and properly used. It has been shown, however, that the effectiveness of the bednet depends on the condition, age, and the care given to the bednet.

The prevalence of malaria-carrying mosquitoes varies seasonally, with a peak during and immediately following periods of rain. Thus, ITN use may follow a similar seasonal pattern. When evaluating trends in the use of ITNs, attention should be paid to the time of the year in which the surveys were conducted in order to clarify whether estimates of ITN use reflect levels during the peak or low malaria season.



CHILD WITH FEVER RECEIVES APPROPRIATE ANTIMALARIAL TREATMENT

Priority Indicator for IMCI at the Household Level

Definition

Proportion of children aged 0-59 months with fever in the last two weeks who received a locally recommended anti-malarial.

Numerator: Number of children aged 0-59 months with fever in the last two weeks who received a locally recommended anti-malarial.

Denominator: Total number of children aged 0-59 months surveyed with fever in the last two weeks.

The “locally recommended anti-malarial” is the anti-malarial chosen by the National Drug Policy Program, which assesses the rate of resistance to different anti-microbials and decides on the drugs most appropriate for the treatment of uncomplicated malaria.

Measurement Tools

Population-based surveys such as DHS, KPC, MICS

What It Measures

This indicator measures the extent to which children with fever who are living in high malaria risk areas receive presumptive treatment for malaria. Malaria is one of the three leading causes of morbidity and mortality in the developing world. In Africa, malaria accounts for about 20% of all childhood mortality below five years of age (WHO, 2000c). Most deaths due to malaria in children could be avoided by prompt recognition and treatment with antimalarial drugs.

How to Measure It

The data requirements for calculating this indicator are: (1) the number of children aged 0-59 months with fever in the last two weeks who were treated with a locally recommended anti-malarial; and (2) the total number of children aged 0-59 months surveyed who had fever in the last two weeks.

In DHS surveys conducted in malaria-endemic areas, caretakers of children with fever in the two weeks preceding the survey are asked what actions were taken to treat or seek assistance in treating the child's fever. The caretaker is asked if the child was given any drugs for the fever and if so, what drugs were given. All drugs administered to the child to treat the fever are noted. If a caretaker does not know the name of the drug, she is shown samples of various drugs that are typically administered against fever and asked to identify the one(s) given to the child. In some surveys, the caretaker is asked how many days after the fever began did the child take antimalarial drugs.

One of the targets set at the Abuja Summit in April 2000 was to have at least 60% of those suffering from malaria have prompt access to correct, affordable, and appropriate treatment within 24 hours of the onset of symptoms by 2005 (WHO, 2000a).

Strengths and Limitations

This indicator is useful for evaluating the impact of information, education and communication (IEC) programs targeted at improving the home management of fever in malaria-endemic areas. However, there are several caveats worth mentioning. Various infectious diseases are accompanied by fever, the most common being

malaria, pneumonia, intestinal infections, measles, and typhoid. In high-risk malaria areas, the sensitivity of “any fever” for classification of malaria varies between 98 and 100%. However, the specificity is low, varying from 6 to 13%. This could lead to over-treatment with antimalarials in high-risk areas. But classifying all children with fever as having malaria and in need of appropriate treatment with antimalarials is considered an acceptable strategy because the risk of developing cerebral malaria and other complications of malaria is high in infants and young children.

Increasing drug resistance requires national policies to be active in detecting ineffective treatments. This means that locally-recommended drugs for the treatment of malaria could change over time to avoid significant increases in malaria-associated morbidity and severe disease if drug resistance develops.

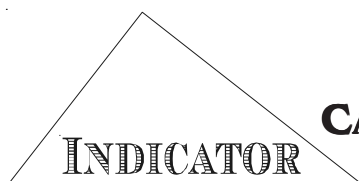
It must be noted that the indicator does not take into consideration the duration of the fever, which could mean that the child has a more severe illness such as typhoid fever (if the fever lasts for more than five days). The indicator also does not reflect level of malaria risk in the season or consider the presence of other infections. In a low malaria-risk season, children with fever who have evidence of another infection may not need to be given an anti-malarial. The indicator also does not allow one to assess the timing of the treatment relative to the onset of fever. It is also important to note that the indicator only measures whether the child received an appropriate antimalarial without reference to adequate dosing.

In order to assess whether fever is treated appropriately within 24 hours of the onset of symptoms, the indicator can be modified as follows to reflect prompt care-seeking behavior:

Proportion of children aged 0-59 months with fever in the last two weeks who received a locally recommended anti-malarial within 24 hours of the onset of fever.

Sample Questions

- o Has [NAME] been ill with a fever at any time in the last two weeks?
- o Did you seek advice or treatment for the illness from any source?
- o Where did you seek advice or treatment?
- o How many days after the illness began did you first seek advice or treatment for [NAME]?
- o Is [NAME] still sick with a fever?
- o At any time during the illness, did [NAME] take any drugs for the illness?
 - What drugs did [NAME] take?



CARETAKER KNOWS AT LEAST TWO SIGNS FOR SEEKING CARE IMMEDIATELY

Priority Indicator for IMCI at the Household Level

Definition

Proportion of caretakers of children aged 0-59 months who know at least two signs for seeking immediate care when their child is sick.

Numerator: Number of caretakers of children aged 0-59 months who know at least two of the following signs for seeking care immediately: child not able to drink or breastfeed; child becomes sicker despite home care; child develops a fever; child has fast breathing; child has difficult breathing; child has blood in stool; and child is drinking poorly

Denominator: Number of caretakers of children aged 0-59 months surveyed.

“*Know*” refers to the ability to spontaneously name at least two signs for seeking care immediately when a child is sick.

Measurement Tools

Population-based surveys (e.g., ICHS, KPC, MICS); client exit interviews

What It Measures

The purpose of this indicator is to measure caretakers’ knowledge and awareness of the danger signs of childhood illness in order to plan and monitor the impact of behavior change communication (BCC) at the community level. Knowledge of danger signs of childhood illness is an essential first step to appropriate and timely care seeking, though it is by no means sufficient to ensure it.

How to Measure It

Data requirements for measuring this indicator are the number of caretakers of children aged 0-59 months who can spontaneously name at least two of the danger signs of childhood illness listed in the previous column and the total number of caretakers of children aged 0-59 months surveyed. In surveys, this information is usually collected by asking the caretaker to name what signs would cause him/her to take a child under the age of five years to a health facility or health worker immediately. The question usually has multiple answers indicating various options. Interviewers are instructed not to read the answers out aloud, but to record only those mentioned spontaneously by the caretaker.

Strengths and Limitations

The indicator could be used to plan and monitor community BCC efforts. Knowledge of the danger signs of childhood illness should decrease child mortality by increasing rates of early recognition of complications and increasing the likelihood of prompt referral and service use. The indicator could easily be obtained in household surveys and would be responsive to programmatic intervention on the short term. An increase in the value of the indicator would signify improvement in community knowledge of these warning signs.

However, this indicator only measures knowledge, not behavior. It is widely known that behavior change does not always follow increased knowledge of a given topic. Also, adequate knowledge does not guarantee that a caretaker will recognize a danger sign in practice. Care seeking is also strongly influenced by cultural beliefs about the etiology of illness. These beliefs may exert a more powerful influence on the mother’s care-

seeking behavior than will knowledge of the appropriate action to take when a sick child exhibits the symptoms outlined above. Therefore, programs that choose to utilize the knowledge indicator should also investigate barriers (if any) to enacting behavior once knowledge is widespread.

Sample Questions

- o Sometimes children have severe illnesses and should be taken immediately to a health facility. What types of symptoms would cause you to take your child to a health facility right away?
 - A. Fever
 - B. Seizure/shaking
 - C. Not eating/not able to breastfeed well
 - D. Drinking poorly
 - E. Getting sicker/very sick/not getting better
 - F. Fast breathing
 - G. Difficult breathing
 - H. Chest indrawing
 - I. Blood in stool
 - J. Other (specify)
 - K. Don't know

INTERVIEWER: Circle all symptoms mentioned. Do NOT prompt with any suggestions.

Definition

The number of malaria cases, severe and uncomplicated (probable and confirmed) among children aged 0-59 months in a defined population.

WHO standard case definitions are as follows (WHO and UNICEF, 2005):

“Uncomplicated malaria.” Any person with fever or fever with headache, back pain, chills, sweats, myalgia, nausea, and vomiting diagnosed clinically as malaria.

“Probable malaria.” A person with symptoms and/or signs of malaria and who receives antimalarial treatment.

“Confirmed uncomplicated malaria.” Any person with fever or fever with headache, back pains, chills, sweats, myalgia, nausea and vomiting, and laboratory confirmation of diagnosis by malaria blood film or other diagnostic test for malaria

“Severe malaria.” The signs and symptoms of severe malaria are the following: cerebral malaria; convulsions; circulatory collapse; abnormal breathing (pulmonary edema or respiratory distress syndrome); jaundice; macroscopic hemoglobinuria; extreme weakness/prostration (inability to sit without support, or inability to feed, depending on the age of the child), renal impairment; severe anemia; and hypoglycemia. These manifestations can occur singly, or more commonly in combination in the same person. The most common and important manifestations of severe malaria in children are cerebral malaria, severe anemia, respiratory distress, and hypoglycemia (WHO, 2000b; WHO/AFRO, 2001).

“Probable severe malaria.” A person requiring hospitalization for signs and/or symptoms of severe malaria who receives antimalarial treatment with laboratory confirmation of diagnosis.

“Confirmed severe malaria.” Any person hospitalized with a primary diagnosis of malaria and confirmed by a positive blood smear or other diagnostic test for malaria (WHO-AFRO and CDC, 2001).

Measurement Tools

Integrated disease surveillance systems; routine health information systems

What It Measures

Malaria is a major public health problem in the developing world. Each year there are at least 300 million acute cases of malaria globally, which result in more than one million deaths. Most of these deaths occur in sub-Saharan Africa. Malaria is Africa’s leading cause of under-five mortality (20%) and constitutes 10% of the continent’s overall disease burden. This indicator measures achievement towards the Roll Back Malaria (RBM) goal of halving malaria mortality for the African population by 2010 (WHO, 2000c).

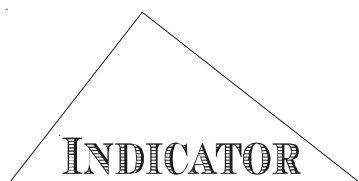
How to Measure It

The data requirement is the number of malaria cases, severe and uncomplicated (probable and confirmed), among children aged 0-59 months in a defined population. Many countries report only laboratory-confirmed cases, but many in Sub-Saharan Africa report clinically diagnosed cases as well. Some countries occasionally conduct mortality surveys, and most countries with a high proportion of malaria deaths carry out routine surveillance in “endemic” areas. However, in many cases, surveillance systems function poorly.

Strengths and Limitations

A number of issues need to be mentioned. First, this indicator reflects the overall magnitude of the problem of malaria cases but does not offer a precise estimate because of serious underreporting from surveillance data. Second, because this indicator is reported as a number rather than as a proportion, countries with lower rates of malaria deaths but larger populations will rank ahead of countries with proportionately higher malaria deaths rates. Third, aggregate figures at a national level may disguise pockets of high risk in certain regions.

The indicator is to be interpreted with caution as the level of completeness and timeliness of reporting can vary across place and time. Surveillance systems reporting the number of malaria cases should also give the percent completeness of reporting. When examining trends in national malaria cases, it must be established whether a decrease in the number of malaria cases is perhaps due to incomplete reporting or a decrease in the true cases resulting from education programs and malaria interventions.



INDICATOR

MALARIA DEATH RATE AMONG UNDER-FIVES

Definition

The number of deaths due to malaria (probable and confirmed) among children aged 0-59 months in a specified period per 100,000.

Numerator: The number of deaths due to malaria (probable and confirmed) among children aged 0-59 months in a specified period x 100,000.

Denominator: The total number of children aged 0-59 months in the same period.

WHO standard case definitions are as follows (WHO and UNICEF, 2005):

“Probable malaria death.” death of a person who was diagnosed with probable severe malaria.

“Probable severe malaria.” a person who requires hospitalization for signs and/or symptoms of severe malaria and receives antimalarial treatment.

“Confirmed malaria death.” death of a person who was diagnosed with severe malaria, with laboratory confirmation of diagnosis.

“Confirmed severe malaria.” a person requiring hospitalization for signs and/or symptoms of severe malaria who receives antimalarial treatment with laboratory confirmation of diagnosis.

“Severe malaria.” the signs and symptoms of severe malaria are the following: cerebral malaria; convulsions; circulatory collapse; abnormal breathing (pulmonary edema or respiratory distress syndrome); jaundice; macroscopic hemoglobinuria; extreme weakness/prostration (inability to sit without support, or inability to feed, depending on the age of the child); renal impairment; severe anemia; and hypoglycemia.

These manifestations can occur singly, or more commonly, in combination in the same person. The most common and important manifestations of severe malaria in children are cerebral malaria, severe anemia, respiratory distress, and hypoglycemia (WHO, 2000b; WHO/AFRO, 2001).

Measurement Tools

Administrative data; community/demographic surveillance; vital registration; verbal autopsy; household surveys

What It Measures

This indicator measures deaths from malaria among children under the age of five years. Malaria accounts for one in five of all childhood deaths in Africa. Measurement of the malaria death rate among children is important for several reasons. These include: (1) to establish the relative public health importance of malaria as a cause of under-five mortality; (2) to evaluate health interventions aimed at reducing under-five mortality from malaria when these interventions are being introduced in a limited geographic area on a trial basis; (3) to investigate the circumstances surrounding the deaths of children in order to identify ways to reduce unnecessary death; and (5) to facilitate research into factors associated with under-five mortality from malaria.

How to Measure It

Data come from administrative sources, community/demographic/integrated disease surveillance, household surveys, and vital statistics registrations. Administrative data are derived by health ministries from routine health information systems. Vital statistics registration systems collect data on cause of death, including deaths caused by malaria. Good quality information requires that

death registration be near universal, that the cause of death be reported routinely on the death record, and that it be determined by a qualified observer according to the International Classification of Diseases (ICD). Such information is not generally available in developing countries.

This indicator can be measured at the community or health facility, district, and national levels. In areas where medical certification of the cause of death is rare, verbal autopsy can be used to identify the causes of death among infants and children. In verbal autopsy, two different methods can be used to get a verbal account of the cause of death: an open-ended history of final illness and close-ended questions. In the open-ended history, the caregiver or next-of-kin is asked to tell about the events leading up to the child's death in their own words and probed to follow-up on particular aspects. Then the descriptive account is reviewed by medical experts who then code the interview in terms of cause of death. Close-ended questions ask whether specific symptoms and signs were present during the final illness (WHO, 1999b).

Some DHS and MICS also provide data on causes of under-five mortality. Demographic surveillance, where all deaths are reported on a regular basis throughout the year (often once every two weeks), can also be used for identifying deaths. WHO also produces model-based estimates of malaria-specific mortality.

The overall goal set by the Abuja Declaration is to halve the malaria mortality for Africa's people by 2010 (WHO, 2000a).

Strengths and Limitations

Obtaining reliable data on malaria mortality is difficult, partly because it is difficult to assign causes of death. Misclassification of the cause of death not only affects estimates of levels of malaria mortality over time, but it also affects differences in malaria mortality rates between two population groups, and difference in mortality due to all other causes. In mortality surveys, the accuracy of the

indicator depends on the ability of respondents to describe the final illness and on the way in which diseases are understood and described in the community.

At the community level, data collection is often retrospective and relies on verbal autopsy, rather than on a clinically determined cause of death. These factors contribute to recall bias and make the validity and reliability of the data questionable. In some cultures, death is a taboo subject. This makes asking questions about deaths problematic, which could lead to an underestimation of mortality. In addition, very large sample sizes are required to calculate under-five deaths rates. In most sites, therefore, it will be impossible to generate a malaria-specific mortality rate.

Vital registration systems often do not have sufficient coverage to provide accurate data of cause-specific mortality in developing countries. As demographic surveillance tends to cover limited geographic areas, underlying cause-specific mortality in these areas cannot necessarily be generalized to wider populations.

One limitation of the indicator is that the death of a child is commonly the result of more than one cause. Some verbal autopsy questionnaires, such as that developed by WHO, Johns Hopkins School of Hygiene and Public Health, and the London School of Hygiene and Tropical Medicine, allow for multiple causes of death, while others only allow one cause of death. When interpreting this indicator, it is important to know whether multiple causes of death are allowed for in the coding since the expected proportions of death for each cause, including malaria, will generally be higher when multiple causes of death are allowed.

References

- Alonso PL, Lindsay SW, Armstrong-Schellengberg JRM, Keita K, Gomez P, Shenton FC, Hill AG, David PH, Fegan G, Cham K, and Greenwood BM. (1993). A Malaria Control Trial Using Insecticide-Treated Bednets and Targeted Chemoprophylaxis in a Rural Area of Gambia, West Africa. The Impact of the Interventions on Mortality and Morbidity from Malaria. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 87(supp. 2):37-44.
- Bateman O, Jahan R, Brahman S, Zeitlyn S, and Laston S. (1995). *Prevention of Diarrhea through Improving Hygiene Behaviors: The Sanitation and Family Education (SAFE) Pilot Project Experience*. Bangladesh: CARE-ICDDR,B.
- Billig P, Bendahmane D, and Swindale A. (1999). *Water and Sanitation Indicators Measurement Guide*. Washington, DC: Food and Nutrition Technical Assistance (FANTA) Project.
- Black RE. (1993). Persistent Diarrhea in Children in Developing Countries. *Pediatric Infectious Disease Journal*, 12:751-761.
- Black RE, Morris SS, and Bryce J. (2003). Where and Why Are 10 Million Children Dying Every Year? *Lancet*, 361(9376):2226-34.
- Curtis V, and Cairncross S. (2003). Effect of Washing Hands with Soap on Diarrhoea Risk in the Community: a Systematic Review. *Lancet Infect Dis*, 3(5):275-81.
- EHP. (2004). *Hygiene Improvement: Guidelines for Household and Community Levels*. Washington, DC: The Environmental Health Project.
- Esrey SA, Potash JB, Roberts L, and Shiff C. (1991). *Effects of Improved Water Supply and Sanitation on Ascariasis, Diarrhoea, Dracunculiasis, Hookworm Infection, Schistosomiasis, and Trachoma*. Geneva, Switzerland: World Health Organization. Bulletin of the World Health Organization, 69(5):609-21.
- Howard G, and Bartram J. (2003). *Domestic Water Quantity, Service Level and Health*. Geneva, Switzerland: World Health Organization. WHO/SDE/WSH/03.02. Retrieved from http://www.who.int/water_sanitation_health/diseases/wsh0302/en/
- Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS, and Bellagio Child Survival Study Group. (2003). How Many Child Deaths Can We Prevent This Year? *Lancet*, 362(9377):65-71.
- Kosek M, Bern C, and Guerrant RL. (2003). *The Global Burden of Diarrhoeal Disease, as Estimated from Studies Published Between 1992 and 2000*. Geneva, Switzerland: World Health Organization. Bulletin of the World Health Organization, 81(3):197-204.
- Lengeler C, and Snow RW. (1996). From Efficacy to Effectiveness: Insecticide-Treated Bednets in Africa. *Lancet*, 347(9006):325-332.
- Remme JH, Binka F, and Nabarro D. (2001). Toward a Framework and Indicators for Monitoring Roll Back Malaria. *American Journal of Tropical Medicine and Hygiene*, 64(1-2 Suppl):76-84.

UNICEF. (1999). *The Household and Community Component of IMCI: A Resource Manual on Strategies and Implementation Steps*. Nairobi, Kenya: UNICEF ESARO.

United Nations. (2000). *Resolution 55/2: Millennium Declaration*. New York: United Nations, General Assembly. Retrieved from <http://www.un.org/millennium/declaration/ares552e.htm>

Victora CG, Bryce J, Fontaine O, and Monasch R. (2000). *Reducing Deaths from Diarrhoea Through Oral Rehydration Therapy*. Geneva, Switzerland: World Health Organization. Bulletin of the World Health Organization, 78(10):1246-55.

Whiteford L, Laspina C, and Torres M. (1996). *Monitoring the Effect of Behavior Change Activities on Cholera: A Review in Chimborazo and Cotopaxi, Ecuador*. Arlington, VA: Environmental Health Project. Activity Report #25. Retrieved from http://www.dec.org/pdf_docs/PNABZ379.pdf

WHO. (1999). *IMCI Indicators, Monitoring and Evaluation*. Geneva, Switzerland: World Health Organization. WHO/CHS/CAH/98.1K REV.1. Retrieved from http://www.who.int/child-adolescent-health/New_Publications/IMCI/WHO_CHS_CAH_98.1/Rev99.K.pdf

WHO. (1999a). *The Evolution of Diarrhoeal and Acute Respiratory Disease Control at WHO: Achievements 1980-1995 in Research, Development, and Implementation*. Geneva, Switzerland: World Health Organization. WHO/CHS/CAH/99.12. Retrieved from http://www.who.int/child-adolescent-health/New_Publications/CHILD_HEALTH/WHO_CHS_CAH_99.12.pdf

WHO. (1999b). *A Standard Verbal Autopsy Method for Investigating Causes of Death in Infants and Young Children*. Geneva, Switzerland: World Health Organization. WHO/CDS/CSR/ISR/99.4. Retrieved from http://www.who.int/csr/resources/publications/surveillance/WHO_CDS_CSR_ISR_99_4/en/

WHO. (2000). *Roll Back Malaria: Framework for Monitoring Progress and Evaluating Outcomes and Impact*. Geneva, Switzerland: World Health Organization. WHO/CDS/RBM.2000.25. Retrieved from http://rbm.who.int/cmc_upload/0/000/012/168/m_e_en.pdf

WHO. (2000a). *The Abuja Declaration and the Plan of Action: An Extract from the African Summit on Roll Back Malaria, Abuja, 25 April 2000*. Geneva: World Health Organization. WHO/CDS/RBM/2000.1. Retrieved from http://mosquito.who.int/docs/abuja_declaration.pdf

WHO. (2000b). *Management of Severe Malaria: A Practical Handbook*, 2nd Ed. Geneva, Switzerland: World Health Organization. Retrieved from <http://www.mosquito.who.int/docs/hbsm.pdf>

WHO. (2000c). *Malaria in Africa. Roll Back Malaria Information Sheet No. 3*. Retrieved March 2005, from http://www.rbm.who.int/cmc_upload/0/000/015/370/RBMInfosheet_3.htm

WHO/AFRO. (2001). *Severe Malaria in the African Region: Results of a Multicentre Study*. Belvedere, Zimbabwe: WHO/AFRO. Malaria: Liaison Bulletin of the Malaria Programme. WHO/AFRO. Vol. 4, No. 2. Retrieved from http://www.afro.who.int/malaria/bulletins/2001-04_vol4-2.pdf

WHO, and UNICEF. (2000). *Global Water Supply and Sanitation Assessment 2000 Report*. Geneva, Switzerland: World Health Organization. Retrieved from http://www.who.int/docstore/water_sanitation_health/Globassessment/GlobalTOC.htm

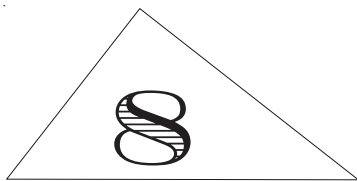
WHO, and UNICEF. (2004). *WHO/UNICEF Joint Statement: Clinical Management of Acute Diarrhoea*. Geneva, Switzerland: World Health Organization. WHO/FCH/CAH/04.7; UNICEF/PD/Diarrhoea/01.

WHO, and UNICEF. (2005). *World Malaria Report 2005*. Geneva, Switzerland: World Health Organization. WHO/HTM/MAL/2005.1102.

WHO-AFRO, and CDC. (2001). *Technical Guidance for Integrated Disease Surveillance and Response in the African Region*. Retrieved from http://www.cdc.gov/epo/dih/Eng_IDSR_Manual_01.pdf

Zinc Investigators' Collaborative Group. (2000). Therapeutic Effects of Oral Zinc in Acute and Persistent Diarrhea in Children in Developing Countries: Pooled Analysis of Randomized Controlled Trials. *American Journal of Clinical Nutrition*, 72:1516-22.

Zinc Investigators' Collaborative Group. (1999). Prevention of Diarrhea and Pneumonia by Zinc Supplementation in Children in Developing Countries: Pooled Analysis of Randomized Controlled Trials. *Journal of Pediatrics*, 135:689-97.



GROWTH MONITORING AND NUTRITION

Indicators:

- Sick child checked for three danger signs (cross-referenced in Chapter six)
- Sick child's weight checked against a growth chart (cross-referenced in Chapter six)
- Sick child under two years of age assessed for feeding practices (cross-referenced in Chapter six)
- Caretaker of sick child is advised to give extra fluids and continue feeding (cross-referenced in Chapter six)
- Proportion of hospitals and maternity facilities designated as baby friendly (cross-referenced in Chapter three)
- Exclusive breastfeeding rate (cross-referenced in Chapter three)
- Timely initiation of breastfeeding
- Complementary feeding rate
- Mean dietary diversity of foods consumed by children aged 6-23 months
- Proportion of children aged 6-23 months with good young child feeding practices
- Proportion of households with access to essential handwashing supplies (cross-referenced in Chapter seven)
- Proportion of households where the caretaker of the youngest child under five reported appropriate handwashing behavior (cross-referenced in Chapter seven)
- Sick child aged 6-23 months is offered increased fluids and continued feeding
- Proportion of children living in households using adequately iodized salt
- Proportion of children aged 12-59 months who were dewormed in the past six months
- Prevalence of night blindness in children
- Vitamin A supplementation
- Vitamin A deficiency (serum retinol concentration)
- Proportion of children aged 6-59 months with anemia
- Low weight-for-height/length (wasting)
- Low height/length-for-age (stunting)
- Low weight-for-age (under weight)
- Under-five mortality rate (cross-referenced in Chapter nine)

CHAPTER 8. GROWTH MONITORING AND NUTRITION

Causes of Child Malnutrition and Relevant Interventions

The widely accepted ‘framework’ for child malnutrition was provided by UNICEF in 1990 (UNICEF, 1990) and serves as a guide for assessing and analyzing the causes of child malnutrition. The framework, presented in Figure 8.1 on the following page, highlights the multi-sectoral nature of the causes of malnutrition, which encompass inadequate access to food, inadequate care for mothers and children, and insufficient health services. The causes of malnutrition are also categorized as immediate, underlying, and basic. Basic causes of malnutrition include inadequate education, the political and ideological superstructure, the economic structure, and the resource base. These factors influence the underlying causes – food, care, and health – which affect directly, in turn, the two primary proximate determinants of nutritional status and survival, namely dietary intake and disease.

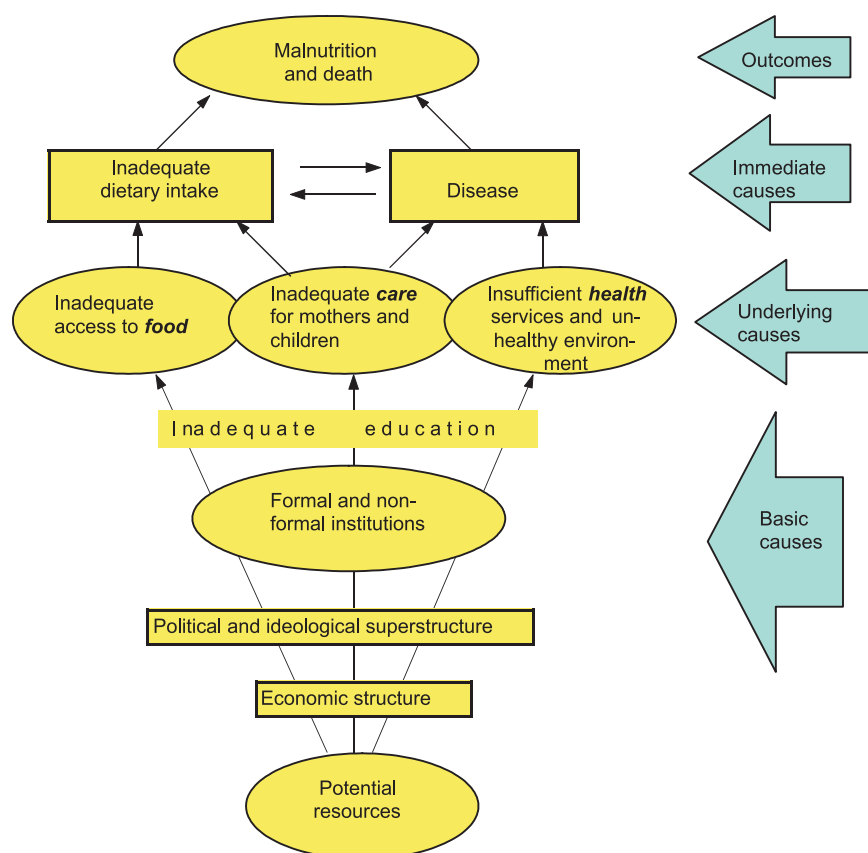
Inadequate dietary intake and infection constitute a vicious cycle that contributes to approximately half of the morbidity and mortality levels in developing countries. Malnutrition leads to compromised immunity which results in greater incidence, severity and duration of disease, impaired motor and cognitive development, and reduced physical fitness. For girls, poor nutrition has an intergenerational component. Children born to malnourished mothers are more likely to be low birth weight and to die as infants. If these children are female and survive, they are likely to be stunted in adulthood and to give birth to low birth weight babies if something is not done to break the cycle. The framework does not emphasize the distributional aspects of malnutrition – of resources in society, for instance – nor the dynamic interaction between the factors, notably between malnutrition and infection. This

“malnutrition-infection cycle” (Tomkins & Watson, 1989) accounts for much of child ill health and mortality in developing countries (Pelletier, 1994; WHO, 1996).

The framework helps programs to identify the most appropriate mixture of child nutrition interventions. In general, child nutrition programs aim to affect immediate and underlying causes of malnutrition and cut into the vicious cycle of malnutrition-infection, often through a combination of community organizations and service delivery (Tontisirin & Winichagoon, 1999) plus specific micronutrient interventions (Mason, Mannar, & Mock, 1999). The content of community-based program activities is fairly well established and includes antenatal care, breastfeeding support, complementary feeding, growth monitoring, micronutrient supplementation, supplementary feeding, immunization, de-worming, and health referral. Additional activities not always identified with nutrition (but which affect it) include day-care, water/sanitation, and microcredit (see Mason et al, 2001b, pp. 53-54). The precise scope of programs aimed at child health and nutrition depends, of course, on local circumstances. However, the main focal points are food, health, and care.

Improving “household food security” should be an essential component of interventions that seek to promote adequate access to food. Indeed, most policies and programs aimed at improving food access are the same as those aimed at reducing poverty – which is not surprising since about two-thirds of the income of poor households goes to food. However, many activities undertaken to improve household security may be outside the scope of health/nutrition programs. Interventions may be introduced from several sectors, for example, agriculture, education, and livelihoods.

Figure 8.1. Conceptual framework for the causes of malnutrition in society.



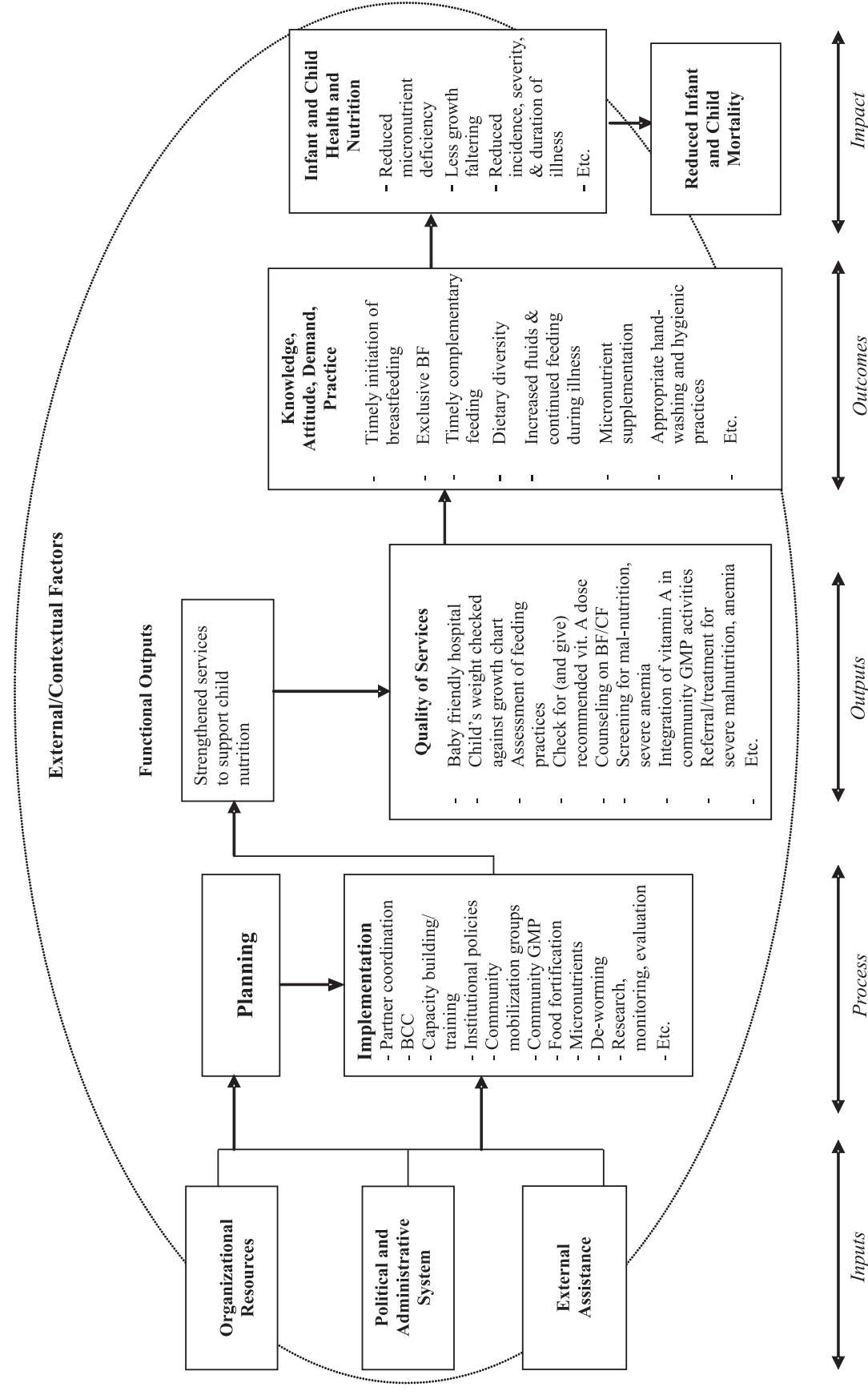
Source: Redrawn from UNICEF, 1990

From a monitoring and evaluation standpoint, nutrition programs that seek to improve household food security may have to draw on indicators from other sectors. Furthermore, if programs are introduced as packages of services, it may be difficult to establish that observed changes in nutrition outcomes are attributable to a particular intervention. These issues will be discussed in greater detail in subsequent sections. For the present purposes, the most common components of child nutrition programs are used as a guide. They include both interventions aimed at general malnutrition (or caloric deficit measured by growth) and those aimed at specific micronutrient deficiencies.

Conceptual Framework

Figure 8.2 on the following page presents a conceptual framework for monitoring and evaluating child nutrition programs. The causal pathways by which nutrition interventions improve child health and nutritional status are outlined and outputs and outcomes for common components of nutrition programs specified. Activities conducted in various functional areas of nutrition programs contribute to strengthened services to support breastfeeding and child nutrition. For example, service providers must be trained to manage child-feeding problems when they arise. IEC campaigns could be undertaken

Figure 8.2. Conceptual framework for monitoring and evaluating child nutrition programs.



to increase levels of knowledge regarding infant feeding and child nutrition. As in the previous chapters, outputs are categorized into functional outputs and services output. Functional outputs may include the availability of vitamin A capsules; the presence of health workers whose training includes key nutrition elements; the availability of child feeding counseling and IEC materials; supervisory visits that include observation of nutrition counseling; and so forth. Although measures relevant to the functional areas of child health programs are not presented here, they are important for tracking whether activities are being implemented as planned.

The service outputs suggested by the monitoring and evaluation (M&E) framework recapitulate and expand on indicators developed by WHO and UNICEF for infant feeding and child nutrition. Measures of the quality of services encompass the nutrition content of sick childcare (routine screening of sick children for visible signs of wasting, edema, very low weight and illness; assessment of breastfeeding and complementary feeding practices; weighing of sick children and plotting their weight on a growth chart); regular weighing of well children; counseling of mothers about infant and young child feeding; checking of vitamin A supplementation when immunizations are given; integrating vitamin A supplementation and guidance into community-based weighing session, and so forth. Commitment to the Baby Friendly Hospital Initiative is another aspect of the quality of care that demonstrates institutional recognition of the importance of breastfeeding and appropriate birthing practices to support its initiation. Many of the indicators of the quality of services are particularly significant for evaluation purposes because they measure the implementation of interventions commonly considered key to successful child feeding promotion and support.

In the long term, the results of child nutrition activities are manifested in the reduced prevalence of micronutrient deficiency; less growth faltering; the reduced incidence, severity, and duration of

illness; and lower infant and child mortality. Child malnutrition is often measured by growth, to the point that low anthropometric measurement has become almost synonymous with malnutrition. This phenomenon used to be referred to as caloric or energy deficit. However, since growth failure is non-specific to cause, and because specific nutrient deficiencies can cause growth failure, general malnutrition (from unspecified causes) is the term that is increasingly being used to refer to growth failure (Beaton et al., 1990). Other outcomes that may stem indirectly from nutrition activities but are not included in the framework include cognitive and motor development, physical fitness, and overall functioning.

A crucial aspect of this M&E framework is the recognition that the effects of program activities depend on contextual factors. Contextual factors include women's status, literacy, and environmental and political factors that cannot easily be changed by a project's activities, but may fundamentally modify their effects (see Mason et al., 2001b, pp 42-49). In M&E terms, this means that contextual factors need to be measured, and statistical methods used to control for them, to arrive at a better understanding of how different groups are influenced by program actions. Although many contextual factors are straightforward to measure (e.g., female education, proxies for socioeconomic status [SES] such as housing, access to services, etc.) and are included in surveys such as the DHS and MICS, these factors are often ignored in program planning.

Coverage, Intensity, Targeting, and Content

The effect of an intervention on child nutrition outcomes can be seen as depending on four factors: coverage, intensity, targeting, and content. Coverage refers to the proportion either of the population, or the needy in the population (e.g. underweight children) that participate in the program. Coverage can be estimated from program-derived data alone, if the size of the target population is known from other sources.

Targeting means focusing an intervention on specific groups based on their age, socioeconomic characteristics, and/or geographic location. Targeting may address different dimensions of the expected results and be expressed in terms of quantity (how much), quality (how good), or efficiency (least cost) values to be achieved within a specific time frame. When a program's progress is to be measured in terms of its effects on people, the expectation is that changes in nutrition outcomes, health, and behavior would be more beneficial among program participants than in the general population; hence the ratio of the prevalence of desired nutrition outcomes among the intended beneficiaries to the prevalence in the overall population should be greater than 1. This would signify that the program is preferentially getting to the malnourished. In practice, when this indicator is calculated by administrative area, it usually emerges that programs are only slightly targeted, if at all, towards the worst-off.

The idea underlying intensity is that it is necessary to reach a certain level of exposure to an intervention for there to be an impact. Intensity can be measured in terms of expenditure per participant per year or resources per capita required, which can be estimated in concrete terms as numbers of people to be trained, equipped, or otherwise supported. For community-based nutrition programs, key resource requirements may include increased numbers of village-level workers or volunteers (mobilizers), supported by supervisory staff (facilitators). Experiences in Thailand have shown that the achievement of impact in community-based nutrition programs requires ratios of mobilizers to populations of approximately 1:100, ratios of mobilizers to households of approximately 1:10-20, and ratios of facilitators to mobilizers of approximately 1:10-20.

Intensity estimates should be related to rates of change in the level of malnutrition, usually measured by underweight prevalence in children aged 0-5 years. The underlying rate of change of underweight prevalence is around 0.5 percentage

points per year (pp/yr) – more in SE Asia (up to 1 pp/yr) and less in Sub-Saharan Africa (about static). For community-based programs, with the usual content of activities and adequate resources (i.e. intensity), an additional 1 to 1.5 pp/year of improvement in underweight prevalence can be expected (Swindale, Deitchler, Cogill, and Marchione, 2004). Though experience is somewhat limited, it has been shown that an intensity of \$5-15/child/year should lead to an accelerated decrease in the child underweight prevalence of approximately 1-1.5 percentage points/year. This level of intensity may be beyond the range of some projects. However, if program input is low, it is questionable as to whether programs can actually have an impact. Thus, investing insufficient resources in nutrition interventions may be wasteful (see Mason & Habicht, 1984). One option would be to focus available resources by targeting until a level is reached where impact can be achieved.

Given adequate coverage and intensity, the remaining factor for success is the content of the program – that is, the activities supported and the extent to which they are matched to local causes of malnutrition and existing opportunities and organizational conditions. An incorrectly assumed relation of a problem to its causes may lead to selecting interventions that cannot be effective. For example, low dietary iron might be taken as the cause of anemia when the real issue is worms or malaria. Thus, program content needs to be assessed for its relevance and likely effectiveness.

Efficacy and Effectiveness

In general, nutrition interventions suffer from a lack of rigorous evaluation. Small-scale studies showing the efficacy of different interventions on nutritional status are perhaps sufficient to establish what factors are needed for success (e.g., Pinstrup-Andersen et al., 1993). The term “efficacy” is often used to refer to the effect of an intervention on the outcome at the pilot level, where conditions are carefully controlled (and the change in outcome can be more rigorously ascribed to the

intervention and referred to as impact). Many governments are now interested in applying interventions on a large scale. For large-scale programs (which should be based on the efficacy experience) the change in outcome ascribed to the program (i.e. impact) is referred to as “effectiveness.”

The distinction between these concepts is important. It cannot be assumed that an efficacious pilot project can always be scaled up to directly lead to an effective large-scale program. There are many well-known reasons for this. The pilot community or area may represent ideal conditions that are far from the reality of other regions, communities, or areas. Therefore, the pilot program may not work as well if implemented in a different region or community. Another common explanation is that strong leadership in pilot projects is an important factor contributing to program success. However, individuals or groups who represent leadership, interest, enthusiasm, determination, and assertiveness cannot easily be reproduced or identified on a large-scale.

How does one choose an appropriate evaluation design to measure program efficacy or effectiveness? The complexity of the evaluation design depends on who the decision maker is and on what types of decisions will be taken as a consequence of the evaluation findings. Different decision makers demand not only different types of information but also vary in their requirements of how informative and precise the findings must be. Habicht and his colleagues (1999) have proposed a framework for choosing an appropriate evaluation design based on two considerations. The first consideration concerns the indicators: What does the program want to measure: service provision or utilization, program coverage, or impact? The second consideration refers to the type of inference: How confident does the program or decision maker want to be that any observed effects were in fact due to the program activities/intervention(s)?

Based on these considerations, evaluations may be categorized into three groups: adequacy, plausibility, and probability evaluations (Habicht et al., 1999). An adequacy evaluation answers the questions: Did the expected changes occur? A plausibility evaluation wants to find out whether the program seems to have an effect above and beyond other external influences. Finally, a probability evaluation aims at ensuring that there is only a small known probability that the difference between program and control areas are due to confounding problems, bias, or chance. Probability evaluations, also known as impact evaluations, require randomization of treatment and control activities and are the gold standard of efficacy research.

When considering M&E needs and design, it is important that an individual program finds out the following:

- Has the effectiveness of similar large-scale programs been established (plus, in what direction and how large was the effect)? If a large-scale program is based on an intervention with proven efficacy in field trials, there would be little need for a probability evaluation (involving randomization of treatment and control).
- If the outcomes of similar large-scale programs are positive, then it may be enough to know that the program is being implemented as intended and the trend in outcome is in the right direction.
- But if not, then it may be important to have a carefully designed evaluation that can elicit plausible evidence of actual impact.

Methodological Challenges of Evaluating Infant and Young Child Feeding

The major challenge of evaluating child nutrition programs is establishing a causal relationship between the intervention in question and the desired outcome. This occurs because of the complexity of the interventions necessary to

improve children's nutritional status. The fact that interventions are rarely carried out in isolation of other health programs complicates establishing definitive cause and effect relationships. In this section, we focus on the specific challenges of monitoring and evaluating programs aimed at improving infant and young child feeding and draw on Bertrand and Escudero's (2003) summary for such interventions. Readers are referred to WHO (2001a; 2001b) for a review of the methodological challenges of monitoring programs aimed at the elimination of iodine deficiency disorders and the prevention and control of iron-deficiency anemia.

Infant feeding behavior data relies upon accurate age data of the infant

Although evaluators may track health interventions with only a general reference to the child's age (e.g., less than one year), tracking breastfeeding practices requires an accurate assessment of the infant's age. Interviewers can ascertain the age by first asking the mother for the infant's birth date and then by confirming the birth date with a child health card or other official registry of the child's birth date.

24-hour recall data tend to overestimate the percentage of infants who have been exclusively breastfed since birth

A 24-hour recall measure reflects current breastfeeding status and may cause the proportion of exclusively breastfed infants to be slightly overestimated, since some infants who consume other liquids irregularly may not have received them in the 24 hours before the survey. WHO's Indicators for Assessing Breastfeeding Practices (WHO, 1991), Wellstart International's Tool Kit for Monitoring and Evaluating Breastfeeding Practices and Programs, and DHS reports all calculate the exclusive breastfeeding rate (EBR) using the 24-hour recall method. Using cross-sectional surveys, one can obtain the best estimates of exclusive breastfeeding from current status data that include all births within a specified time

period. The advantage of this approach is that it is not subject to recall error. Evaluators should then interpret the measure as the percentage of infants who “are currently being exclusively breastfed” rather than the percentage that have been exclusively breastfed since birth.

Large sample sizes are needed to detect change in breastfeeding practices, but infants represent a small proportion of the population.

Any assessment of behavioral change in infant feeding requires attention to sample size. The sample size depends on both the magnitude of change and on the prevalence of the condition or practice. The detection of relatively small changes (e.g., five to ten percentage points) over time in breastfeeding or other infant feeding behaviors requires large sample sizes. By contrast, simple monitoring of infant feeding practices does not require a specific sample size and can be very useful in tracking ongoing project outreach. However, monitoring neither allows for a rigorous evaluation of change, nor measures actual prevalence of this behavior because of small unrepresentative samples.

Breastfeeding questions typically require more than a “yes” or “no” response.

Multiple factors define whether breastfeeding is optimal, including the exact liquids and foods, if any, given in the preceding 24 hours and the age of the infant. Ideally, this list of liquids and foods will be comparable to those included in the core DHS questionnaire, with additional items that reflect local food preferences and food availability. The data needed to calculate exclusive breastfeeding and timely complementary feeding rates require that the interviewer ask the respondent a series of questions about all foods and liquids given within the previous 24-hours. This line of questioning requires more than a “yes” or “no” response, thus increasing the likelihood of interviewer or respondent error. Interviewers should undergo intensive training on this set of items.

The accepted standard complementary feeding indicator reflects general dietary intake of solid and semi-solid foods during a specified period only and fails to capture several important elements of optimal complementary feeding.

Complementary feeding, a highly complex issue, involves factors such as the quantity and quality of food, frequency and timeliness of feeding, food hygiene, and feeding during/after illness. Program personnel at the country level must consider these factors when they try to address the problems of infant and young child feeding in the local context. The standard complementary feeding (CF) indicator fails to account for program-specific or context-specific feeding recommendations regarding the frequency, quality, or quantity of foods given during the preceding 24 hours.

The lack of consensus on recommended young child feeding practices has hindered progress in developing appropriate child feeding indicators. Recent efforts by WHO to develop and disseminate consistent and internationally accepted guidelines and comprehensive reviews of scientific knowledge regarding complementary feeding (Dewey and Brown, 2003; WHO/UNICEF, 1998) have led to the 10 “Guiding Principles” for complementary feeding of the breastfed child (PAHO/WHO, 2003). These guiding principles are presented in Table 8.1 on page 312 and form the basis for current efforts to generate indicators of appropriate feeding of children aged six through 23 months (Arimond and Ruel, 2003).

Selection of Indicators

The indicators presented in this chapter are few in number, fairly easy to measure and interpret, and operationally useful. Moreover, they have been field-tested, are consistent with worldwide breastfeeding and complementary feeding goals, and can be obtained from available DHS, MICS, or KPC data. The indicators include measures of the quality of the nutrition component of sick child care, water, sanitation, and hygiene, infant and

young child feeding, micronutrient deficiency, vitamin A supplementation, and anthropometry, and can be grouped into the three categories presented below:

Service output

- Sick child checked for three danger signs
- Sick child’s weight checked against a growth chart
- Sick child under two years of age assessed for feeding practices
- Caretaker of sick child is advised to give extra fluids and continue feeding
- Proportion of hospitals and maternity facilities designated as baby friendly

Outcome

- Exclusive breastfeeding rate
- Timely initiation of breastfeeding
- Complementary feeding rate
- Mean dietary diversity of children aged 6-23 months
- Proportion of children aged 6-23 months with good young child feeding practices
- Proportion of households with access to essential handwashing supplies
- Proportion of households where the caretaker of the youngest child under five reported appropriate handwashing behavior
- Sick child aged 6-23 months is offered increased fluids and continued feeding
- Proportion of children living in households using adequately iodized salt
- Proportion of children aged 12-59 months who were dewormed in the past six months
- Prevalence of night blindness in children
- Vitamin A supplementation
- Low weight-for-height/length (wasting)

Impact

- Vitamin A deficiency (serum retinol concentration)
- Proportion of children aged 6-59 months with anemia
- Low height/length-for-age (stunting)
- Low weight-for-age (under weight)
- Under-five mortality rate

The indicators pertaining to infant and young child feeding during the first two years of life can be further broken down into two groups: (1) those concerning breastfeeding behaviors during the first six months of life, and (2) those concerning the introduction of complementary foods while maintaining breastfeeding beginning at six months. Together, these age groups represent the continuum of infant and child nutrition care in the first two years of life. The child feeding indicators for these two age groups reflect expert consensus as to the optimal period for exclusive breastfeeding, as well as for the introduction of complementary foods to an infant's diet. In population-based surveys, measuring these infant-feeding indicators requires the sampling of infants 0-5 months of age and 6-23 months of age.

The descriptions of some of the indicators presented in this chapter draw heavily from or are guided by previous work by Arimond and Ruel (2003), Bertrand and Escudero (2003), Cogill (2003), the World Health Organization, and UNICEF. Programs can use these indicators to monitor and evaluate behavior change interventions in the context of an experimental or quasi-experimental design. Programs can also calculate these indicators from routine statistics for tracking behaviors among clients, and for measuring the long-term outcomes of specific interventions. In certain circumstances, additional indicators may be warranted. These can be formulated at the national, regional, or district level to reflect special needs and concerns.

Table 8.1. PAHO/WHO guiding principles for complementary feeding of the breastfed child

- (1) **Duration of exclusive breastfeeding and age of introduction of complementary foods**
Practice exclusive breastfeeding from birth to six months of age, and introduce complementary foods at six months of age while continuing to breastfeed.
- (2) **Maintenance of breastfeeding**
Continue frequent, on-demand breastfeeding until two years of age or beyond.
- (3) **Responsive feeding**
Practice responsive feeding, applying the principles of psycho-social care. Specifically: (a) feed infants directly and assist older children when they feed themselves, being sensitive to their hunger and satiety cues; (b) feed slowly and patiently, and encourage children to eat, but do not force them; (c) if children refuse many foods, experiment with different food combinations, tastes, textures, and methods of encouragement; (d) minimize distractions during meals if the child loses interest easily; (f) remember that feeding times are periods of learning and love – talk to children during feeding, with eye-to-eye contact.
- (4) **Safe preparation and storage of complementary foods**
Practice good hygiene and proper food handling by: (a) washing caregivers' and children's hands before food preparation and eating; (b) storing foods safely and serving foods immediately after preparation; (c) using clean utensils to prepare and serve foods; (d) using clean cups and bowls when feeding children; and (e) avoiding the use of feeding bottles which are difficult to keep clean.
- (5) **Amount of complementary foods**
Start at six months of age with small amounts of food and increase the quantity as the child gets older, while maintaining frequent breastfeeding. The energy needs from complementary foods for infants with average breastmilk intake in developing countries are approximately 200 kcal per day at 6-8 months, 300 kcal per day at 9-11 months of age, and 550 kcal per day at 12-23 months of age. In industrialized countries these estimates differ somewhat (130, 310, and 580 kcal/d at 6-8, 9-11, and 12-23 months, respectively), because of differences in average breastmilk intake.
- (6) **Food consistency**
Gradually increase food consistency and variety as the infant gets older, adapting to the infant's requirements and abilities. Infants can eat pureed, mashed, and semi-solid foods beginning at six months. By eight months, most infants can also eat "finger foods" (snacks that can be eaten by children alone). By 12 months, most children can eat the same types of foods as consumed by the rest of the family (keeping in mind the need for nutrient-dense foods, as explained in #8 on the following page). Avoid foods that may cause choking (i.e., items that have a shape and/or consistency that may cause them to become lodged in the trachea, such as nuts, grapes, and raw carrots).

Table 8.1. PAHO/WHO guiding principles for complementary feeding of the breastfed child (continued)

(7) Meal frequency and energy density

Increase the number of times that the child is fed complementary foods as s/he gets older. The appropriate number of feedings depends on the energy density of the local foods and the usual amounts consumed at each feeding. For the average healthy breastfed infant, meals of complementary foods should be provided 2-3 times per day at 6-8 months of age and 3-4 times per day at 9-11 and 12-24 months of age, with additional nutritious snacks (such as a piece of fruit or bread or chapatti with nut paste) offered 1-2 times per day, as desired. Snacks are defined as foods eaten between meals – usually self-fed, convenient, and easy to prepare. If energy density or the amount of food per meal is low, or the child is no longer breastfed, more frequent meals may be required.

(8) Nutrient content of complementary foods

Feed a variety of foods to ensure that nutrient needs are met. Meat, poultry, fish, or eggs should be eaten daily, or as often as possible. Vegetarian diets cannot meet nutrient needs at this age unless nutrient supplements or fortified products are used (see #9 below). Vitamin A-rich fruits and vegetables should be eaten daily. Provide diets with adequate fat content. Avoid giving drinks with low nutrient value, such as tea, coffee, and sugary drinks such as soda. Limit the amount of juice offered so as to avoid displacing more nutrient-rich foods.

(9) Use of vitamin-mineral supplements or fortified products for infants and mother

Use fortified complementary foods or vitamin-mineral supplements for the infant, as needed. In some populations, breastfeeding mothers may also need vitamin-mineral supplements or fortified products, both for their own health and to ensure normal concentrations of certain nutrients (particularly vitamins) in their breastmilk. (Such products may also be beneficial for pre-pregnant and pregnant women.)

(10) Feeding during and after illness

Increase fluid intake during illness, including more frequent breastfeeding, and encourage the child to eat soft, varied, appetizing, favorite foods. After illness, give food more often than usual and encourage the child to eat more.

Excerpted from PAHO/WHO (2003).

Priority Indicator for IMCI at Health-Facility Level
Definition

Proportion of sick children checked for the three general danger signs.

Numerator: Number of sick children aged 2-59 months seen who are checked for three danger signs (is the child able to drink or breastfeed; does the child vomit everything; has the child had convulsions).

Denominator: Number of sick children aged 2-59 months seen.

Measurement Tools

Service Provision Assessment (SPA); Health Facility Assessment (HFA); supervision checklist

What It Measures

This indicator measures the performance of one of the tasks associated with the routine assessment of sick children aged two months to five years: checking for general danger signs. The indicator presupposes that the health worker has been trained in IMCI. Given this assumption, the indicator measures both the adequacy of IMCI training to impart these skills and the ability of the trainees to assimilate and retain the information and skills over time.

How to Measure It

Measurement of this indicator requires direct observation of sick child consultations to determine whether the health worker asked about or the caretaker reported each of the following danger signs: the child is unable to drink or breastfeed, the child vomits everything, and the

child has had convulsions during the present illness. It is recommended that health workers not rely completely on the caretaker's report of whether the child is able to drink or breastfeed but observe the mother while she tries to breastfeed or to give the child something to drink.

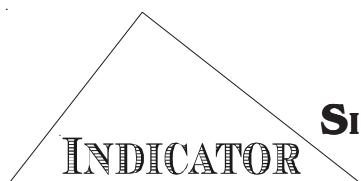
Strengths and Limitations

Measuring this indicator is straightforward and can be done in a routine basis during supervisory visits. Immediate feedback can be given to the health worker to improve future practice. The indicator can help identify if health workers of a particular health facility need refresher training. If no improvement in this indicator is seen over time, program managers may wish to monitor health workers' assessment of the presence of each danger sign separately to identify whether a particular danger sign is not routinely checked.

Sample Questions

Sample instructions from a checklist completed by an observer during a SPA are the following:

- o Record whether a provider asked about or whether the caretaker mentioned any of the following:
 - (1) Whether the child is unable to drink or breastfeed at all;
 - (2) Whether the child vomits everything; and
 - (3) Whether the child has had convulsions with this sickness



SICK CHILD'S WEIGHT CHECKED AGAINST A GROWTH CHART

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of sick children aged 2-59 months who are weighed the day they are seen and whose weights are checked against a recommended growth chart.

Numerator: Number of sick children aged 2-59 months who are weighed the day they are seen and whose weights are checked against a recommended growth chart.

Denominator: Total number of sick children aged 2-59 months seen.

Measurement Tools

SPA; HFA; supervision checklist

What It Measures

This indicator measures health worker compliance with IMCI guidelines for the routine assessment of the nutritional status of sick children by weighing the child and plotting the weight on a recommended growth chart. There are two main reasons for this assessment. The first is to identify children with severe malnutrition who are at increased risk of mortality and need urgent referral. Second, an assessment of the nutritional status of sick children helps to identify children with low weight-for-age who may benefit from nutritional counseling. All sick children should be assessed for malnutrition.

How to Measure It

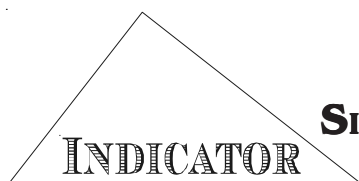
The data are gathered by direct observation of sick child consultation. The observer records whether the health worker weighed the child and plotted the child's weight on a recommended growth chart (usually a standard WHO or national growth chart).

Strengths and Limitations

Data for this indicator are easy to collect during sick child observation or routine supervisory visits. They give a good indication of health worker compliance with IMCI guidelines regarding the nutritional assessment of all sick children. The indicator can be applied at a specific interval post-training to those who attended IMCI training to evaluate the retention of this particular component of clinical assessment skills. This may help identify health workers who need refresher training or health centers in which weighing of sick children and recording the weight on a growth chart are not enforced.

Limitations to the use of observation for measuring quality of sick child assessment have already been discussed. These include "observation bias," in that a health worker may abide to the guidelines more strictly when he or she is conscious of being monitored. Another limitation of the indicator pertains to variability between observers in measurement. This is hard to measure but can be assessed by having two independent observers rate a sick child consultation and then comparing the degree of agreement or disagreement in their ratings.

Note that the indicator does NOT reflect the correct measurement of the child's weight, whether the child's weight was accurately plotted on a growth chart, how effectively health workers interpret the information on the growth chart, or whether the health worker took an appropriate course of action based on insights from the growth chart. It is also difficult to tell from the indicator whether health workers are weighing/not weighing the children at all, or whether children are weighed but their weights are not plotted on a growth chart.



SICK CHILD UNDER TWO YEARS OF AGE ASSESSED FOR FEEDING PRACTICES

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of sick children under two years of age whose caretakers are asked about breastfeeding, complementary foods, and feeding practices during this episode of illness.

Numerator: Number of sick children under two years of age whose caretakers are asked if they breastfeed this child, whether the child takes any other food or fluids other than breast milk, and if during this illness the child's feeding has changed.

Denominator: Number of sick children under two years of age seen.

Measurement Tools

SPA; HFA; supervision checklist

What It Measures

This indicator is a composite of the steps a health worker must undertake in order to correctly assess a sick child's feeding and counsel the mother to solve any feeding problems that exist. Thus, it measures the correct assessment of a sick child's feeding. The IMCI guidelines require that all sick children under two years have a feeding assessment even if they have a normal Z-score (WHO, 1998).

The standard deviation unit or Z-score is the simplest way of making comparisons to the reference population. The Z-score is defined as the difference between the value for an individual and the median value of the reference population in the same age or weight, divided by the standard

deviation of the reference population. The median is the value at exactly the mid-point between the largest and smallest.

How to Measure It

The measurement of this indicator is based on observations of the performance of health workers with regard to the assessment of feeding practices for sick children who are brought to a health facility. The observer records on a questionnaire or checklist whether the health worker asked about or the care taker reported on whether the child is breastfed, whether the child is taking any other foods or fluids, and whether feeding practices had changed during the illness. Routine supervisory visits can also yield data for measuring this indicator.

Exit interviews are a second option for collecting data to measure this indicator. The caretaker is asked whether the health worker had asked him/her questions about breastfeeding, complementary feeding, and changes in the child's feeding during the current illness.

Only a sick child less than two years old who has a "yes" answer on all three aspects of the assessment of feeding practices is included in the numerator. The denominator is the total number of sick children under the age of two years who were seen by the health worker.

Strengths and Limitations

Methodologically, this indicator is relatively easy to construct. The indicator could be aggregated across all health workers in a facility to calculate an average child feeding assessment score for a given health facility. This is useful for identifying facilities that are performing below standards with

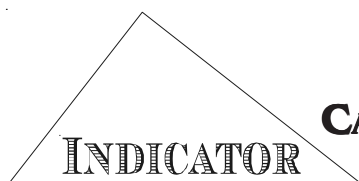
regard to the assessment of feeding practices. A low score on the indicator is a fairly sound indication of the need for refresher training or targeted supervision.

There are, however, difficulties in interpreting changes in this indicator. Lack of change in the indicator could mean deterioration in one or more aspects of child feeding assessment counteracted by improvements in other aspects, or could merely indicate a general lack of performance improvement in this component of sick child assessment. For purposes of planning and monitoring, it may be useful to monitor changes in the individual components of the indicator that are of most interest to program managers. Thus, programs may want to calculate a separate indicator for each task associated with the assessment of child feeding in order to identify which tasks are not routinely performed.

Sample Questions

The following are sample questions from the SPA (dated March 2004):

- o Record whether a provider asked about or performed other assessments of the child's health by doing any of the following:
 - (1) Offer the child something to drink or ask the mother to put the child to the breast (to find out whether the child can drink);
 - (2) Ask about normal breastfeeding practices when the child is not ill; and
 - (3) Ask about feeding or breastfeeding practices for the child during this illness.



CARETAKER OF SICK CHILD IS ADVISED TO GIVE EXTRA FLUIDS AND CONTINUE FEEDING

Priority Indicator for IMCI at Health-Facility Level

Definition

Proportion of sick children with validated classifications who do not need urgent referral whose caretakers are advised to give extra fluid and continue feeding.

Numerator: Number of sick children with validated classifications, who do not need urgent referral, whose caretakers are advised to give extra fluid and continue feeding.

Denominator: Number of sick children with validated classifications, who do not need urgent referral.

Validated classification: All sick children need to be classified correctly by the health worker. The validation of the health worker's classification needs to be done at the health center by an authorized person (basically a doctor or clinical supervisor) who reexamines a sample of cases seen by the health worker to see if a correct classification was made.

Measurement Tools

SPA; supervisory checklist

What It Measures

This indicator measures the extent to which health workers are complying with standards for counseling a mother or caretaker of a sick child on the need to continue feeding and increase the child's fluid intake at home. Sick children need to increase their fluid intake during and after illness to avoid dehydration. This is especially important for diarrheal illness but is also true for

other illnesses that may make children less likely to drink. Continued feeding (including breastfeeding) during illness shortens the duration of the illness episode and reduces the risks of dehydration and growth faltering.

How to Measure It

The information required for this indicator can be obtained during a health facility survey through direct observations of sick child consultations or exit interviews of caretakers. A health worker is included in the numerator if he or she scores positively on both advice about the need to continue feeding during illness and advice about the need to increase the sick child's fluid intake. The denominator comprises sick children with validated classifications who do not need urgent referral.

There are two groups of interest: (1) sick children aged zero through five months and (2) sick children aged six to 23 months. The former should be counseled for continued and increased on-demand breastfeeding during illness (no foods or liquids). The latter should be counseled for continued and increased breastfeeding on-demand (greater frequency and longer), age-appropriate feeding recommendations, and general increase of fluids (breastfeeding and other).

Strengths and Limitations

The indicator does not measure whether the mother or caretaker complies with the advice or whether the advice on continued feeding specifies the types of food and frequency of feeding recommended for the child's age. As with many of the indicators in chapter six, observation bias is of concern if the data are collected through direct observations of sick child consultations. Although exit interviews of caretakers may be a more cost-

effective method of data collection, some degree of misreporting of the content of counseling could occur. If no changes are observed in this indicator over time, it may be useful to report separately the two elements of this indicator: continued feeding and increased fluid intake during illness.

Sample Questions

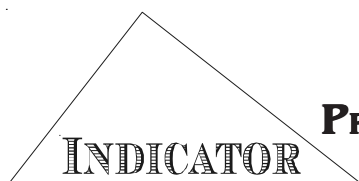
Sample questions from the SPA (dated March 2004) are the following:

Option 1: Observation of sick child consultation

- o Record whether a provider did any of the following when counseling the caretaker:
 - (1) Provide general information about feeding or breastfeeding the child even when not sick
 - Yes/No/Don't know/NA
 - (2) Tell the caretaker to give extra fluids to the child during this sickness
 - Yes/No/Don't know/NA
 - (3) Tell the caretaker to continue feeding the child during this sickness
 - Yes/No/Don't know/NA

Option 2: Exit interview

- o What did the provider tell you about feeding [NAME] during this illness?
 - Give less than usual
 - Give same as usual
 - Give more than usual
 - Give nothing/not feed
 - Didn't discuss
 - Don't know
- o What did the provider tell you about giving fluids (or breastmilk, if the child is breastfed) to [NAME] during this illness?
 - Give less than usual
 - Give same as usual
 - Give more than usual
 - Give nothing/not feed
 - Didn't discuss
 - Don't know



PROPORTION OF HOSPITALS AND MATERNITY FACILITIES DESIGNATED AS BABY FRIENDLY

WHO-Recommended indicator for Newborn Health

Definition

The proportion of hospitals and maternity facilities that have been accredited as “Baby Friendly” according to the ten UNICEF/WHO criteria related to breastfeeding and newborn care.

Numerator: Number of hospitals and maternity facilities accredited as “Baby Friendly.”

Denominator: Total number of hospitals and maternity facilities that handle deliveries.

To be designated as “Baby Friendly,” the hospital must:

- Have a written breastfeeding policy that is routinely communicated to all health care staff;
- Train all health-care staff in the skills necessary to implement this policy;
- Inform all pregnant women about the benefits and management of breastfeeding;
- Help mothers initiate breastfeeding within an hour of birth;
- Show mothers how to breastfeed and how to maintain lactation, even if they should be separated from their infants;
- Give newborn infants no food or drink other than breast milk, unless medically indicated;
- Practice “rooming in” by allowing mothers and infants to remain together 24 hours a day;
- Encourage breastfeeding on demand;
- Give no artificial teats, pacifiers, dummies, or soothers to breastfeeding infants; and

- Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or birthing center.

Measurement Tools

UNICEF/WHO/Wellstart Baby Friendly Hospitals Initiative internal self-assessment and external evaluation instruments

What It Measures

This indicator provides useful information on the availability of baby-friendly services in a given country. The Baby Friendly Hospitals Initiative (BFHI) is a joint UNICEF/WHO/Wellstart initiative aimed at increasing breastfeeding rates and encouraging global standards for maternity services in hospitals and maternities.

How to Measure It

Data requirements are the number of maternities meeting BFHI criteria and the total number of maternities and hospitals. Facilities first conduct a self-assessment; then independent assessors appointed by the national BFHI committee or UNICEF country offices evaluate them according to the above criteria. These same bodies aggregate information on the numbers and proportions of facilities acquiring “Baby Friendly” status for national and global reporting (WHO, UNICEF, and Wellstart International, 1999)

Strengths and Limitations

The number of facilities achieving “Baby Friendly” status may be presented more often than the proportion because of difficulties in ascertaining the total number of maternities required for the denominator. Ascertaining the number of maternities in the private sector is particularly difficult, and in many cases, private facilities may not be represented in national estimates. The

number of facilities achieving “Baby Friendly” status is of limited use for regional and cross-country comparisons because it is clearly affected by geographic size. For example, by December 2000, 6312 hospitals in China (or 47% of all eligible facilities) had achieved “Baby Friendly” status compared to 232 (or 66% of all eligible facilities) in Kenya.

Second, the listing of facilities that are recorded as “Baby Friendly” may be out of date because periodic reaccreditation to maintain standards is voluntary and depends on the interest and motivation of each individual facility. The date of acquiring “Baby Friendly” status and whether reaccreditation has occurred are not routinely recorded.

Priority Indicator for IMCI at the Household Level
Definition

Proportion of infants aged 0–5 months who were exclusively breastfed in the last 24 hours.

Numerator: Number of infants aged 0–5 months (less than 180 days) who were exclusively breastfed in the last 24 hours.

Denominator: Total number of infants aged 0–5 months (less than 180 days) surveyed.

Exclusive breastfeeding is the practice of giving breast milk only to the infant, with no other solids or liquids, including water. Infants are, however, allowed to have drops of vitamins/minerals/medicines (WHO, 1991).

Measurement Tools

Population-based surveys employing representative samples (e.g., DHS, KPC) and program records of exclusive breastfeeding rate (to track trends but not impact)

What It Measures

This indicator gives an overall measure of the degree to which women have adopted behaviors consistent with the recommendation that infants aged of 0–5 months should be exclusively breastfed.* Relative to infants who are exclusively breastfed, infants not breastfed at all have at least 14 times the risk of death due to diarrhea. The risk is greatest in the first two months of life (Murray et al., 1997). Even the introduction of herbal teas and water to infants who have been exclusively breastfed increases the risks of diarrheal

morbidity and death. UNICEF and WHO recommend that all women breastfeed their children exclusively for the first six months.

How to Measure It

The data requirements are the number of living infants under six months of age and a 24 hour recall of all liquids and solid food consumed by living infants less than six months of age. Respondents should be probed about the different types of liquids the infant may have received, including water, juice, milk, formula, and other liquids. Both the DHS country reports and nutrition reports present the exclusive breastfeeding rate (EBR) for infants less than four months of age. However, programs can obtain and calculate the EBR for infants less than six months of age using DHS data.

Strengths and Limitations

This indicator should be interpreted as the proportion of infants who “are currently being exclusively breastfed,” rather than the proportion that have been exclusively breastfed since birth. The use of a 24-hour recall period causes the

*The 2001 UN policy statement on HIV and infant feeding is as follows: “When replacement feeding is acceptable, feasible, affordable, sustainable, and safe, avoidance of all breastfeeding by HIV-infected mothers is recommended. Otherwise, exclusive breastfeeding is recommended during the first months of life. To minimize HIV transmission risk, breastfeeding should be discontinued as soon as feasible, taking into account local circumstances, the individual woman’s situation, and the risks of replacement feeding (including infections other than HIV and malnutrition). When HIV-infected mothers choose not to breastfeed from birth or stop breastfeeding later, they should be provided with specific guidance and support for at least the first two years of the child’s life to ensure adequate replacement feeding. Programmes should strive to improve conditions that will make replacement feeding safer for HIV-infected mothers and families” (WHO, 2001).

indicator to slightly overestimate the percent of exclusively breastfed infants because some infants who are given other liquids irregularly may not have received them in the 24 hours before the survey. WHO's *Indicators for Assessing Breast-Feeding Practices* (WHO, 1991), Wellstart International's *Tool Kit for Monitoring and Evaluating Breastfeeding Practices and Programs*, and the DHS reports all calculate EBR using the 24-hour recall method.



INDICATOR

TIMELY INITIATION OF BREASTFEEDING

Definition

Proportion of infants less than 12 months of age who were put to the breast within one hour of delivery (WHO, 1991).

Numerator: Number of infants less than 12 months of age who were put to the breast within one hour of delivery.

Denominator: Total number of infants less than 12 months of age.

Measurement Tools

Population-based surveys employing representative samples (e.g., DHS, MICS, KPC). Facility records may also be used to track trends in breastfeeding initiation among clients but not to measure the impact of interventions on women with infants in the population of the catchment area.

What It Measures

This indicator measures whether mothers in the population and/or in health facilities initiate early breastfeeding with its respective benefits to both mother (reduced postpartum hemorrhage) and infant (skin-to-skin contact and exposure to maternal antibodies in colostrum). Mothers are more likely to successfully initiate lactation, to encounter fewer problems breastfeeding, and to maintain optimal breastfeeding behaviors if they initiate breastfeeding shortly after birth. Breastfeeding should begin no later than one hour after the delivery of the infant.

How to Measure It

The data requirements for calculating this indicator from population-based data are the following: the number of infants less than 12 months of age in the population and the number

of infants less than 12 months of age reported to have been put to the breast within one hour of birth.

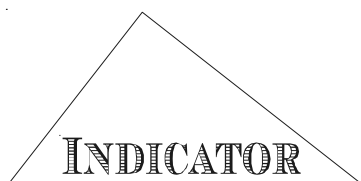
When facility data are used to calculate this indicator, the data requirements are the number of infants discharged from the facility during the reference period and the number of infants discharged who were put to the breast within one hour of birth during the same reference period. It is important to note that the two indicators (population-level and facility-level) are not comparable.

Strengths and Limitations

In population-based surveys, mothers may have difficulty recalling correctly when they initiated breastfeeding for their youngest children and whether this was within one hour of delivery. This indicator may also mask changes in population or health facility practices that have occurred within one year. The facility-based indicator does not have as much recall bias. However, the facility level indicator cannot be used to determine population-level trends because it only reflects breastfeeding initiation by women who gave birth in facilities.

Sample Questions

- o Did you ever breastfeed [NAME]?
- o How long after birth did you first put [NAME] to the breast?



INDICATOR

COMPLEMENTARY FEEDING RATE

Priority Indicator for IMCI at the Household Level

Definition

Proportion of infants aged 6-9 months receiving breastmilk and complementary food (based on last 24 hours).

Numerator: Number of infants aged 6-9 months who received breastmilk and complementary foods in the last 24 hours.

Denominator: Total number of infants aged 6-9 months surveyed.

Complementary foods are defined as solid or semi-solid/mushy foods; complementary foods do not include fluids.

Measurement Tools:

Population-based surveys employing representative samples (e.g., DHS, KPC, MICS)

What It Measures

The complementary feeding indicator is a basic, simple indicator that measures continued breastfeeding and consumption of complementary foods among children in the age group six through nine months. Breast milk alone does not provide all the nutrients needed by an infant over six months of age (Scrimshaw, 1996). UNICEF and WHO recommend that all women breastfeed their children exclusively for the first six months. After this age, the introduction of complementary foods is critical to meet the protein, energy, and micronutrient needs of the child. Continuing to breastfeed with complementary feeding is also important (Dewey et al., 1996) as breastfeeding accounts for a substantial proportion of fat, vitamin

A, calcium, and quality protein into the second year of life (Murray et al., 1997).

How to Measure It

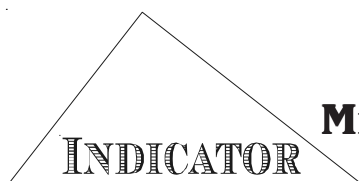
This basic calculation of complementary feeding requires a sample of children 6-9 months of age and information about feeding practices in the last 24 hours, including breastfeeding status and whether the child was given complementary foods.

Facility records may be used to track trends in complementary feeding but not to measure impact.

Strengths and Limitations

This indicator is simple to calculate and allows for a comparison of feeding practices for different population subgroups and an assessment of changes in feeding practices. The indicator can be calculated for subgroups of children and participants in specific programs (e.g., programs that promote good feeding practices among young children and children seen in well-baby and immunization clinics).

However, this indicator has several limitations. First, it reflects only the prevalence of complementary feeding. It does not allow one to assess the quality of food (energy density, micronutrient composition, or food handling), food quantity, or frequency of feeding. Second, it provides minimal information on the extent to which children are fed according to prescribed guidelines.



MEAN DIETARY DIVERSITY OF FOODS CONSUMED BY CHILDREN AGED 6-23 MONTHS

Definition

Mean number of food groups eaten in the last 24 hours by children six through 23 months of age.

Numerator: Sum of the number of food groups (0 through 8) eaten in the last 24 hours by children aged 6 through 23 months.

Denominator: Total number of children aged 6 through 23 months.

“Dietary diversity” is defined here as the number of food groups (0 through 8) eaten in the last 24 hours.

Measurement Tools

Population based surveys with 24-hour dietary recall information; DHS; KPC 2004

What It Measures

Dietary diversity has long been recognized as a key element of high quality diets. A dietary diversity indicator is based on the idea that more diverse diets are more likely than those that are less diverse to provide an adequate range of nutrients. There is considerable evidence to support this idea (Ruel, 2003). Results from several studies to date demonstrate that simple indicators of dietary diversity (including mean dietary diversity in children six through 23 months, based on 24-hour food group recall questions) reflect important nutritional differences in child diet patterns and are positively associated with child nutritional status (Arimond and Ruel, 2004).

Dietary diversity is included in the *Guiding Principles for Complementary Feeding of the Breastfed Child* (PAHO/WHO, 2003), where Guiding Principle #8 states, “Feed a variety of

foods to ensure that nutrient needs are met. Meat, poultry, fish, or eggs should be eaten daily, or as often as possible. Vegetarian diets cannot meet nutrient requirements at this age (six through 23 months) unless nutrient supplements or fortified products are used. Vitamin A-rich fruits and vegetables should be eaten daily. Provide diets with adequate fat content. Avoid giving drinks with low nutrient value, such as tea, coffee, and sugary drinks such as soda. Limit the amount of juice offered so as to avoid displacing more nutrient-rich food.”

How to Measure It

To measure this indicator, the following food group categories are summed, with each of the food group categories scoring “1” if the child had an item from that food group category yesterday, and “0” if the child did not. This results in a dietary diversity score ranging from “0” to “8,” for each child. Complementary feeding questions are presented in Annex 8.1 on page 369, and food groups can be aggregated into the eight categories as shown below.

The food group categories are:

- Grains, roots, and tubers (including complementary foods like porridge, rice cereal, and gruel);
- Vitamin A-rich fruits and vegetables;
- Other fruits and vegetables;
- Meat, poultry, fish, and shellfish (and organ meat, where eaten);
- Eggs;
- Legumes and nuts;
- Dairy; and
- Foods cooked with fat or oil.

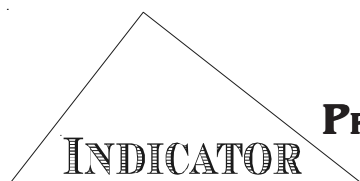
Strengths and Limitations

Data collection is relatively simple and mean dietary diversity is an easy indicator to understand. Because the mean dietary diversity indicator sums the total number of food groups eaten, higher scores correspond to a higher likelihood that any particular food group has been consumed.

While there is a consensus that greater dietary diversity is good, a number of outstanding questions remain. Research is underway to further clarify the relationship between dietary diversity and nutrient adequacy. Furthermore, there are still inconsistencies in the definition and measurement of dietary diversity, but comparability among indicator results should improve as the food groupings and reference periods become more standardized.

No specific guideline is available at this time to indicate an adequate or high level of dietary diversity. The following ideas, however, guide the scoring for levels of dietary diversity. When children receive only one food, it is extremely likely to be a staple food. A diversity score of “2” allows only one additional food group, and therefore the child’s diet cannot meet the PAHO/WHO (2003) Guidelines, which recommend animal source foods (supplement/fortified foods) and vitamin A rich plant foods daily. Therefore, children eating 0–2 food groups are considered to have “low” diversity. In contrast, children eating five or more food groups in the previous day are very likely to receive a variety of nutrient-dense foods and are considered to have “high” diversity. The middle diversity group includes children eating 3–4 food groups the previous day.

Mean dietary diversity in children aged six through 23 months is a meaningful measure of food consumption patterns at the population level. However, a single 24-hour measure of dietary diversity in individual children six through 23 months is not sufficient to provide useful information about an individual child’s food consumption; multiple observations would be necessary.



PROPORTION OF CHILDREN AGED 6-23 MONTHS WITH GOOD YOUNG CHILD FEEDING PRACTICES

Definition

Proportion of children aged 6-23 months scoring “6” on the young child feeding practices score.

Numerator: Number of children aged 6-23 months scoring “6” on the young child feeding practices score.

Denominator: Total number of children aged 6-23 months surveyed.

“*Young child feeding practices score:*” This index is constructed by combining scores for continued breastfeeding, age-appropriate frequency of feeding, and dietary diversity, as indicated in Table 8.2 below (Arimond and Ruel, 2003).

Measurement Tools

DHS; KPC

What It Measures

This indicator is a summary measure of the prevalence of optimal or adequate young child feeding practices across the age range 6-23 months. The transition from exclusive breastfeeding to family foods typically covers the period from six to 18-23

months of age – a vulnerable period during which malnutrition starts in many infants and young children. Worldwide about 30% of children under five are stunted because of poor feeding practices and repeated infections. Appropriate feeding practices are associated with improved nutrition and physical growth, reduced susceptibility to common childhood infections, and better resistance to cope with them. These improved health outcomes in young children have long-lasting health effects throughout the lifespan, including increased performance and productivity, and reduced risk of certain non-communicable diseases (WHO/UNICEF, 1998).

How to Measure It

Data to measure the young child feeding practices score can be collected through household surveys by asking the child’s mother or the caretaker a series of questions about whether they gave their infant/young child various foods in the previous 24 hours. In addition to questions about breastfeeding and liquids and solids that the child had yesterday, a question on the number of times the child was given semi-solid foods the previous day is also asked. Complementary feeding questions in the KPC are the same as those in the DHS and are presented in Annex 8.1.

Table 8.2. Components and scoring of a young child feeding practices score for children aged 6-23 months

Element included	Scoring	
Continued breastfeeding	No = 0 Yes = 2	
Frequency of feeding (Number of feeds yesterday)	6-8 months: None = 0 One = 1 2+ = 2	9-23 months: 0-1 = 0 2 = 1 3+ = 2
Dietary diversity (Number of food groups yesterday)	Low (0-2) = 0 Middle (3-4) = 1 High (5-8) = 2	

Source: Arimond and Ruel, 2003, Table 7, p. 28.

The young child feeding practices score is constructed by combining scores for continued breastfeeding, age-appropriate frequency of feeding, and dietary diversity. Table 8.2 details how each element contributes to a score for the index.

The scoring for continued breastfeeding is straightforward: either the mother is still breastfeeding the child or she is not, so scores are assigned easily. In the case of frequency of feeding, there is a clear recommendation. This scoring reflects the idea that there is a continuum. For example, clearly feeding a 6–8 months old infant once or twice is better than not feeding solids/semi-solids at all; the highest score (2) should be assigned to the age-specific recommended number of feeds.

In the case of dietary diversity, no specific guideline is available at this time to indicate an adequate level of dietary diversity. The following ideas guide the scoring for diversity. There is evidence that more diverse diets are more likely to provide adequate levels of a range of nutrients. When children receive only one food, it is extremely likely to be a staple food. A diversity score of “2” allows only one additional food group, and therefore the child’s diet cannot meet the PAHO/WHO (2003) Guidelines, which recommend animal source foods (supplement/fortified foods) and vitamin A rich plant foods daily. Therefore, children eating 0–2 foods groups are considered to have “low” diversity. On the other side, children eating five or more food groups in the previous day are very likely to receive a variety of nutrient-dense foods and are considered to have “high” diversity. The middle diversity group includes children eating 3–4 food groups the previous day.

The scoring provides equal weights (two points) to each of the three components (breastfeeding, frequency of feeding, and dietary diversity). Children are counted in the numerator if they scored six points on the young child feeding practices score. All children with a 0–5 on the young child feeding practices score would in turn receive a zero (no) on good young child feeding practices.

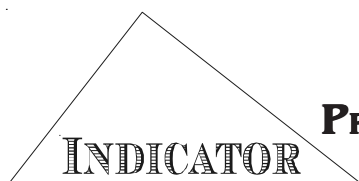
No numeric targets have been set for this indicator.

Strengths and Limitations

This indicator is relatively new. Its development stems from the recent WHO-led consensus building process of developing consistent, internationally accepted guidelines for breastfeeding and complementary feeding, and a set of indicators to allow assessment of feeding practices in the context of surveys. Previous work in this area was hampered by the lack of international standards and consensus, both on recommended practices and on measurement tools and indicators, for complementary feeding (Piwoz, Huffman, and Quinn, 2003). Ten “Guiding Principles” covering all aspects of complementary feeding for breastfed children were recently developed by PAHO/WHO (2003) and a technical meeting to discuss indicators of complementary feeding and their field testing and validation was convened in December 2002 (Ruel, Brown, and Caulfield, 2003).

The advantage of this indicator is that it captures the multidimensional and age-specific nature of child feeding practices. It is useful, therefore, for assessing the overall effectiveness of programs aimed at improving complementary feeding practices, particularly if interventions target the entire range of practices included in the measure. As feeding practices are likely to cluster, both at one point in time and over time (mothers who engage in early positive practices may also engage in a variety of better practices in subsequent years), the composite nature of the index is useful (Arimond and Ruel, 2003). An additional advantage of this indicator is that subsample sizes in the age range 6–23 months are far more likely to yield adequately precise estimates than the complementary feeding rate, which covers ages 6–9 months only.

However, some dimensions of feeding practices, specifically, the quality, texture, and nutrient density of complementary foods, are not addressed by this indicator. Further work using data from many contexts could help define the relationship between the young child feeding practices score and actual nutrient intake.



PROPORTION OF HOUSEHOLDS WITH ACCESS TO ESSENTIAL HANDWASHING SUPPLIES

Core Hygiene Improvement Indicator

Definition

Proportion of households with access to essential handwashing supplies.

Numerator: Number of households that have access to essential handwashing supplies.

Denominator: Total number of households surveyed.

“Access” means that all essential items for handwashing are either present (visible at the time of survey) or can be produced within one minute. A special place for handwashing may not be always feasible, but ideally one should be located in or near the toilet facility or kitchen.

“Essential handwashing supplies” include all of the following:

1. Water (stored in a separate container, other than in the washing device);
2. Soap (or locally available cleansing agent); and
3. Washing device allowing for unassisted handwashing (tap, basin, bucket, sink, or tippy tap)

Clean drying materials such as towels are not essential, because air drying is an acceptable alternative.

Disposal of wastewater after handwashing does not require specific measures, unlike wastewater from cleaning up children’s stool. However, letting wastewater from handwashing accumulate in puddles should be avoided to keep surroundings dry and to prevent mosquitoes from breeding.

Measurement Tools

Population-based surveys such as KPC and DHS/ Environmental Health (EH) Module

What It Measures

Basic handwashing is an important element of the control of diarrheal disease (DD). Handwashing behavior is strongly influenced by the presence and access to water as well as access to essential handwashing supplies. To be optimally effective, the handwashing place should be located in close proximity to the toilet facility so that household members can conveniently wash their hands after defecation, or to the place where cooking takes place so that food preparers can wash their hands easily before preparing food. At a minimum, the handwashing place should be inside the yard.

How to Measure It

Data for calculating this indicator are collected during a household interview. A question is asked to determine where household members usually wash their hands. The interviewer then asks to examine the site and notes whether the site contains a water supply (it is desirable but not essential that this is of the improved type, because even handwashing with water unsafe for drinking can be effective), a device for containing water and rinsing hands, and a cleansing agent such as soap. These items can either be displayed or brought out within one minute for the household to qualify as having access to essential handwashing supplies. To calculate the indicator, divide the number of households with access to all essential handwashing supplies by the total number of households in the sample.

Strengths and Limitations

The indicator does not measure the use of handwashing supplies at appropriate times or

knowledge of appropriate handwashing techniques. Ideally, actual handwashing practices should be observed, but this is often not practical during household surveys. Some surveys do not collect data on all criteria required in the definition of appropriate handwashing places. The current version of the core questionnaire of the DHS, for example, does not ask about a handwashing place and supplies; however the DHS/EH module does assess all essential criteria plus whether there is clean material for hand-drying, which can be used where relevant to calculate an additional indicator. It is important, therefore, that baseline and follow-up surveys use exactly the same methodology to calculate the indicator so that any measurement biases would be systematic.

* Priority questions are needed for estimating the indicator described. Supplemental questions are optional and may be useful for calculating additional indicators.

Sample Questions

Priority questions:*

- o Can you show me where you usually wash your hands and what you use to wash hands?
- o Observation only: Is there water? Interviewer: turn on tap and/or a check container and note if water is present or brought in one minute or less.
- o Observation only: Is there soap or detergent or locally used cleansing agent? Note if present or brought in one minute or less.
- o Observation only: Is there a hand-washing device such as a tap, basin, bucket, sink, or tippy tap present or brought in one minute or less?

Optional supplemental questions:*

- o Observation only: Does the washing device allow unassisted washing and rinsing of both hands, for example, a tap, basin, bucket, sink, or tippy tap?
- o Observation only: Is there a towel or cloth to dry hands? Note if present or brought in one minute or less.
- o Observation only: Does the towel or cloth appear to be clean?



INDICATOR

PROPORTION OF HOUSEHOLDS WHERE THE CARETAKER OF THE YOUNGEST CHILD UNDER FIVE REPORTED APPROPRIATE HANDWASHING BEHAVIOR

Core Hygiene Improvement Indicator

Definition

Proportion of households where the caretaker of the youngest child under five years reported using soap for washing hands within the past 24 hours at two or more critical times (after defecation and one of the following four: after changing a young child; before preparing food; before eating; or before feeding a child).

Numerator: Number of households where the caretaker of the youngest child under five years reported using soap for washing hands within the past 24 hours at two or more critical times (after defecation and one of the following four: after changing a young child; before preparing food; before eating; or before feeding a child).

Denominator: Total number of households with children under five years surveyed.

The above indicator is based on the assumption that in each household only one caretaker (i.e., the caretaker of the youngest child) will be interviewed. Where programs decide to interview more than one caretaker and assess reported handwashing behavior by caretakers of all children under five, the indicator should be calculated separately for children 0-23 months and children 24-59 months. In addition, the indicator definition, numerator, and denominator should be modified as follows:

Definition: Proportion of caretakers of children aged 0-23 months (or some appropriate age range under five years) who report using soap for washing hands within the past 24 hours at two or more critical times (after defecation and one of the following four: after changing a young child; before preparing food; before eating; or before feeding a child).

Numerator: Number of caretakers of children aged 0-23 months (or some appropriate age range under five years) who report using soap for washing hands within the past 24 hours at two or more critical times (after defecation and one of the following four: after changing a young child; before preparing food; before eating; or before feeding a child)

Denominator: Total number of caretakers of children aged 0-23 months (or some appropriate age range under five years) surveyed.

“Appropriate handwashing behavior” includes two dimensions: use of soap and critical times for handwashing.

Critical times for handwashing listed by WHO are:

- After defecation;
- After handling a child’s feces/cleaning babies’ bottoms/changing a young child;
- Before food preparation;
- Before eating; and
- Before feeding a child.

Measurement Tools

Population-based surveys (KPC and DHS/ Environmental Health Module)

What It Measures

Evidence from trials and observational studies show that handwashing with soap reduces the risk of diarrheal disease by 30-50% (Curtis and Cairncross, 2003). This indicator inquires about actual behavior, and not knowledge. In many instances, the behavior of the actual caretaker of the child (which could be the mother, a sibling, other family, or other help with whom the child spends most of his/her time) and that of the household member who prepares food would be most important. Handwashing with soap

at two critical times, “after defecation” plus another critical time, is suggested as a minimum but programs may chose to set higher targets if more frequent handwashing seems achievable. Although ash, sand, and mud are mentioned in the literature as local alternatives, neither their acceptability as a cleansing agent nor their actual use on a significant scale has been established. The use of soap is promoted commonly, for example through public-private partnerships for handwashing.

How to Measure It

In a household survey, this indicator is measured by self-reporting of critical times for handwashing; rarely by demonstration of handwashing technique. Data on handwashing techniques are collected by asking whether the caretaker has soap, has used it in the past 24 hours for handwashing, and the occasions during which soap was used for this purpose. The 24 hour recall period can be approximated by respondents mentioning “today” or “yesterday.” If only one caretaker is interviewed per household, all households with children under five years old surveyed are counted in the denominator, whether or not they have soap. Where other locally appropriate cleansing materials are common (see indicator about handwashing supplies), this indicator can be calculated only for households that have soap. If more than one caretaker is interviewed per household, all caretakers of children under five are counted in the denominator.

In past household surveys, caretakers were frequently asked to name the critical times for washing hands. The question had multiple answers and measured knowledge. Interviewers were instructed not to read the answers out loud, but to record only those mentioned spontaneously by the caretaker. Unfortunately, these knowledge questions had little discriminatory power. Therefore, the soap use questions mentioned above are now recommended.

Social marketing and health extension/education programs have shown that considerable improvement in handwashing behavior can be achieved over time (Bateman et al., 1995; Whiteford et al., 1996). Targets aimed at increasing appropriate

handwashing by 50% over the baseline are realistic and attainable.

Strengths and Weaknesses

Appropriate handwashing behavior includes three dimensions: critical times, frequency, as well as technique. However, handwashing frequency and technique are difficult and time-consuming to assess.

Requesting a handwashing demonstration and direct observation of the handwashing technique would be desirable, but may be unfeasible in most surveys because it requires extensive training of the observers and is intrusive, time-consuming, and expensive.

Handwashing behavior is strongly influenced by the presence or absence of a convenient source of water. Where water is scarce, people may resort increasingly to using recycled water for handwashing. Where possible, the use of recycled water for handwashing should be assessed during the interview. Since different methods can be used to collect data on handwashing, it is important that baseline and follow-up surveys use exactly the same methodology to calculate the indicator so that any measurement biases would be systematic.

It is also important to recognize that this indicator is based partly on self-reported behavior in the past 24 hours and does not indicate whether appropriate handwashing at critical times is practiced routinely. Note that some large-scale surveys as the ICHS do not collect data on handwashing.

Sample Questions

- o Do you have soap?
- o Have you used soap today or did you use soap yesterday?
- o When you used soap today or yesterday, what did you use it for? If “for washing my or my children’s hands is mentioned,” probe what was the occasion, but do not read the answers.

Note that these questions are not available in the DHS.



INDICATOR

SICK CHILD AGED 6-23 MONTHS IS OFFERED INCREASED FLUIDS AND CONTINUED FEEDING

Priority Indicator for IMCI at the Household Level

Definition

Proportion of children aged 6-23 months who were sick during the past two weeks and who were offered increased fluids and continued feeding during the illness.

Numerator: Number of children aged 6-23 months who were sick in the past two weeks and who were offered increased fluids and continued feeding during the illness.

Denominator: Total number of children aged 6-23 months surveyed who were sick in the past two weeks.

“*Fluids*” include breastmilk; oral rehydration salts (ORS); recommended home fluids (RHF); and water. Home fluids may include soups, cereal gruels, yogurt-based drinks, unsweetened fruit juice, green coconut water, weak tea, plain clean water, or homemade sugar-and-salt solutions. Note that homemade sugar-and-salt solution is not recommended in some settings due to the difficulty of getting the quantities right.

Measurement Tools

Population-based surveys, such as DHS, KPC, and MICS

What It Measures

This indicator measures the performance of programs aimed at improving home case management of sick children. The restriction of the indicator to children aged 6-23 months makes it more consistent with the PAHO/WHO (2003) *Guiding Principles for Complementary Feeding of the Breastfed Child* and with recommendations of

exclusive breastfeeding for children who are under six months of age. Any illness in children is likely to reduce caloric intake and increase children’s susceptibility to malnutrition following each illness episode. Both increased fluid intake and continued feeding during illness are important to reduce this nutritional impact.

How to Measure It

Data requirements for calculating this indicator are: (1) the number of children age 6-23 months who were sick in the two weeks preceding the survey and whose caretakers offered them increased fluids and continued feeding; and (2) the total number of children age 6-23 months surveyed who were sick in the two weeks preceding the survey.

Caretakers of children who were sick in the two weeks preceding the survey are asked whether the child was given an increased amount of fluids, the same amount, somewhat less, or much less to drink while s/he was sick. Questions about feeding practices during illness ask whether the child was offered less than usual to eat, about the same amount, or more than usual to eat during the illness, and if less, how much less.

Note that in the DHS, questions about increased fluids and continued feeding during illness are restricted to children who had diarrhea in the past two weeks.

A target of 80% was set for 2000 by the World Summit for Children (WHO, 1999b).

Strengths and Limitations

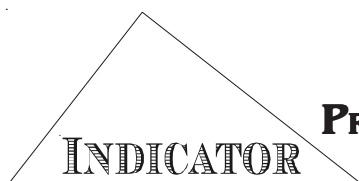
The “increased fluids” component of the indicator does not capture how soon after the start of the illness episode children are offered increased fluids. The timing of the administration of increased fluids is especially important in diarrhea cases, as

early increased fluid intake can prevent many children from becoming dehydrated and facilitate continued feeding by restoring appetite. Also, the indicator does not measure the nutritional value of food given to child during illness.

The indicator can be disaggregated into an indicator of increased fluid intake during illness and an indicator of continued feeding during illness. These separate indicators can be used for the purpose of tracking the individual components of feeding practices during illness, especially if a low value is obtained on the basic indicator.

Sample Questions

- o During [NAME'S] illness, did s/he drink much less, about the same, or more than usual?
- o During [NAME'S] illness, did s/he eat less, about the same, or more food than usual?



PROPORTION OF CHILDREN LIVING IN HOUSEHOLDS USING ADEQUATELY IODIZED SALT

Definition

Proportion of children aged 6-59 months who live in households using adequately iodized salt.

Numerator: Number of children aged 6-59 months who live in households with salt containing 15+ parts per million (ppm) of iodine.

Denominator: Total number of children aged 6-59 months.

“Adequately iodized salt” is defined as salt containing 15+ ppm of iodine.

Measurement Tools

Population-based surveys; the testing of household salt for iodine is part of the core questionnaire in the DHS and in other surveys such as the MICS.

What It Measures

This indicator is a proxy measure for the proportion of children (breastfeeding and non-breastfeeding) who may be receiving adequate amounts of iodine. The purpose of this indicator is to evaluate the availability of adequately iodized salt in a given population. Iodine deficiency disorders (IDD) are prevalent throughout the world. WHO, UNICEF, and ICCIDD recommend that the daily intake of iodine should be 90 micrograms/millionth of a gram (μg) for preschool children aged 0-59 months. IDD interventions often focus on women of reproductive age because of their increased need for iodine during pregnancy. Iodine deficiency in pregnancy may impair the development of the fetus, and may cause extreme and irreversible mental and physical retardation known as

cretinism and other harmful effects. The most critical period is from the second trimester of pregnancy to the third year after birth (WHO, 2001a).

How to Measure It

During household surveys, the iodine content of salt is determined using rapid test kits. These are small bottles of 10-50 ml containing a stabilized starch-based solution. One drop of solution placed on salt containing iodine (in the form of potassium iodate) produces a blue/purple coloration, which indicates that iodate is present (WHO, 2001a).

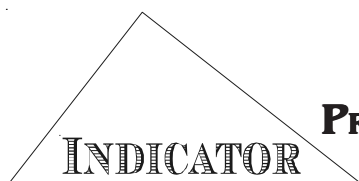
UNICEF's goal is to achieve the sustainable elimination of iodine deficiency disorders by 2005.

Strengths and Limitations

Data for calculating this indicator are easy to collect in household surveys. Rapid test kits can be used in the field to give immediate results. However, the kit can only assess whether the salt is iodized. It cannot reliably determine the iodine concentration. The iodine concentration is most accurately measured by titration (liberating iodine from salt and titrating the iodine with sodium thiosulphate using starch as an external indicator). Although titration is the preferred method for accurate testing of the concentration of iodine in salt, it is time-consuming and not recommended for routine process monitoring.

Sample Questions

- o INTERVIEWER: Ask respondent for a teaspoonful of cooking salt. Test salt for iodine. Record PPM (parts per million).



PROPORTION OF CHILDREN 12-59 MONTHS WHO WERE DEWORMED IN THE PAST SIX MONTHS

Definition

Proportion of children aged 12-59 months who received a recommended deworming drug in the past six months.

Numerator: Number of children aged 12-59 months who received a recommended deworming drug in the past six months.

Denominator: Number of children aged 12-59 months surveyed.

The “*recommended deworming drug*” is the one recommended by the National Drug Policy Program and may include Albendazole, Levamisole, Mebendazole, Praziquantel, Pyrantel, or other WHO-recommended drugs.

Measurement Tools

DHS; MICS

What It Measures

This indicator measures drug coverage for soil-transmitted helminth infections among children who are under five years of age. Infants and young children make up a substantial proportion of people infected with or at risk of infection from parasitic infections, such as roundworm, hookworms, or whipworms, in developing countries. The prevalence of soil-transmitted helminths (STH) among children less than 24 months ranges from 20-80% (Crompton, Montresor, Nesheim, and Savioli, 2003; Montresor, Awasthi, and Crompton, 2003; WHO, 2002, 2003). Schistosomiasis infection levels are normally highest in school-age children who also tend to have more rapid and higher reinfection rates than older children and adults. Parasitic disease is a major contribution to the malnutrition-infection complex. Studies have shown that de-

worming is associated with a decrease in the intensity of infection, improved nutritional status in the form of increased weight gain, and improved iron status in anemic children (Montresor et al., 2003; Crompton et al., 2003).

How to Measure It

The data needed to measure this indicator are collected during a household survey. Mothers with children under the age of five years are asked whether the child was given any of the recommended antihelminthic medication over the last six months. The global target set by the Fifty-fourth World Health Assembly in 2001 is to regularly treat at least 75% of all school-aged children at risk of illness from schistosomiasis and soil transmitted helminths by 2010 (WHO, 2001c). Deworming programs may apply this target of 75% antihelminthic drug coverage to children aged 12-59 months.

Strengths and Limitations

Collecting information for calculating this indicator is relatively easy and calculation of the indicator is fairly simple. However, this indicator is likely to suffer from reporting and recall bias. In addition, the respondent might not be knowledgeable about deworming status, if deworming was conducted in his or her absence.

Supplemental Indicator for IMCI at the Household Level
Definition

Proportion of children aged 24-59 months who are reported to be night blind by their caretakers (in areas with high vitamin A deficiency).

Numerator: Number of children aged 24-59 months who are reported to be night blind by their caretakers.

Denominator: Total number of children aged 24-59 months surveyed.

Measurement Tools

Population-based surveys (micronutrient surveys, vitamin A surveys)

What It Measures

This indicator measures the prevalence of night blindness in children. Night blindness is an early manifestation of vitamin A deficiency in children marked by poor adjustment to dim light. WHO and the International Vitamin A Consultative Group (IVACG) have established that if night blindness prevalence among young children (18-59 or 25-59 months) is higher than one percent, vitamin A deficiency (VAD) is a problem of public health significance in the community (WHO, 1982; Sommer, 1995).

How to Measure It

In order to determine whether a child is demonstrating signs of night blindness, a caretaker is asked a number of questions: whether the child has any problems seeing during the daytime; whether the child has any problems seeing in the nighttime; whether the child's problems with night-time vision

is different from that of other children in the community. In many societies, there is a local term to describe the problem of night blindness that can have a high sensitivity for finding night blindness.

In addition to the questions described above, caretakers are also asked a direct question on whether the child has night blindness, using local terms that describe the symptoms. Focus group discussions may be helpful in identifying local terms or descriptions of symptoms for night blindness and their usefulness for identifying VAD should be validated.

In analyzing the data, children reported to have night blindness but who also experience vision problems during the day should be excluded from the numerator. The cut-off of 24 months is used because below this age, night blindness is often not noticed due to the child's limited mobility.

Strengths and Limitations

Data on night blindness are easy to obtain when a local term exists for the condition. In countries with a low prevalence of VAD, it may be difficult to find a widely recognized local term for night blindness and interviewers must be carefully trained to adequately describe the condition. Where the prevalence of VAD is low, large samples may be necessary to detect changes at the population level. It is also important to note that night blindness can be sensitive to seasons.

Night blindness is easier to detect in adults than in children. It was recently recommended that maternal night blindness be adopted as an indicator of vitamin A deficiency in the community as a whole (IVACG, 2002; Ramakrishnan and Darnton-Hill, 2002). However, maternal night blindness cannot be used for the purposes of monitoring and evaluating child-based VADD programs.

Supplemental Indicator for IMCI at the Household Level
Definition

Proportion of children aged 6-59 months of age who received a high dose of vitamin A in the last six months (in countries where there is a vitamin A supplementation policy).

Numerator: Number of children aged 6-59 months who received a high dose of vitamin A in the last six months.

Denominator: Total number of children aged 6-59 months surveyed.

Doses are set by the national MOH or by following WHO guidelines. Based on suggestions from the IVACG meeting in 2000 in Annecy, France, and at the pre-XX IVACG meeting February 11, 2001, in Hanoi Vietnam, the recommended schedule for routine high-dose vitamin A supplementation has been revised as outlined in the table below (IVACG, 2002; Ramakrishnan and Darnton-Hill, 2002). Please note that WHO has not yet adopted the guidelines in the Annecy Accords:

Infants 0-5 months	150,000 international units (IU) as three doses of 50,000 IU with at least a one-month interval between doses	At each DTP contact (6, 10, and 14 weeks); otherwise at other opportunities
Infants 6-11 months	100,000 IU as a single dose every 4-6 months	At every opportunity (e.g., measles immunization)
Children 12 months or older	200,000 IU as a single dose every 4-6 months.	At any opportunity

Measurement Tools

Program statistics; vitamin A surveys; population-based surveys such as DHS, KPC, and MICS

What It Measures

This indicator measures the coverage achieved through national vitamin A supplementation program efforts in a specified period. Vitamin A deficiency (VAD) is a major public health problem in developing countries. WHO estimates that between 100 and 140 million children are vitamin A deficient. For children, lack of vitamin A causes visual impairment, blindness, and significantly increases the risk of severe illness and death from common childhood infections such as diarrheal disease and measles. Supplementation as a vitamin A deficiency control strategy is the most immediate and direct approach to improving vitamin A status and the one most widely implemented.

How to Measure It

Data requirements for calculating this indicator are the number of children aged 6-59 months surveyed and the number of children aged 6-59 months who received a high dose of vitamin A in the past six months. In household surveys, it is

best to ask the caretaker to see the child's immunization card so as to ascertain the vitamin A supplementation status of the child and the date the last dose of vitamin A was received. This will increase the validity of survey information.

In DHS surveys, women are shown the vitamin A capsule when collecting information about children's vaccination status. This is because oral vitamin A supplements can be given to children in the form of liquid drops that come in capsules or syrup and it is important to ensure that the respondent is clear that the questions of interest refer to vitamin A as opposed to oral polio vaccine (OPV), which is also given as drops. If the child has ever received a dose of vitamin A, the mother/caretaker is asked how many weeks or months ago the child received his/her last dose of vitamin A.

This indicator can also be calculated from service statistics and program records. If the indicator is based on an overall figure for the district, it is generally more accurate than if it is based on data from specific clinics. When the indicator is based on service statistics, the numerator is the number of children 6-59 months of age who received a high dose of vitamin A in the past six months and the denominator is the number of children aged 6-59 months in the target or service area. The denominators for the calculation of the vitamin A supplementation rate for children aged 6 to 59 months can be extrapolated from census data on the age and sex distribution of the total population, using population projection models such as SPECTRUM (www.tfgi.com). When service statistics and program records are used, it is essential to specify whether this indicator measures supplements distributed through outreach workers or only those given at fixed facilities, or both.

UNICEF's short-term goal (by 2005) is to double the number of countries with more than 70% vitamin A supplementation of children between the ages of six and 59 months. The UN Special Session on Children in 2002 set as one of its goals the elimination of VAD and its consequences by 2010.

Strengths and Limitations

This indicator can be adapted to evaluate the distribution of vitamin A capsules during National Immunization Days and National Vitamin A Weeks. If sample sizes permit, the indicator can also be disaggregated by subgroups of the population (urban/rural residence and socioeconomic level) to examine whether the program is reaching certain target groups. However, this indicator is a coverage indicator and does not provide any information regarding the prevalence of vitamin A deficiency (as manifested by night blindness, bitot spots, and corneal scarring). Although oral supplementation is used for both treatment and prevention of vitamin A deficiency, it is not recommended as the only long-term approach. In the home, vitamin A deficiency can be prevented by the regular consumption of vitamin A-rich foods, including fortified foods.

Service statistics are relatively inexpensive to collect and can be obtained at more frequent intervals than surveys. However, they are generally not representative of an entire population. Since the quality of health statistics can vary among facilities, indicators calculated from service statistics may be less accurate than those based on survey data in places where the quality of routine data is poor. In addition, it may be difficult to estimate the denominator for indicators based on service statistics. The population denominators are often extrapolated from census data that are several years old. If population growth and rural-urban migration patterns have substantially changed over time, then census information may be unsuitable for providing appropriate denominators for local program managers to determine vitamin A supplementation coverage.

An alternative indicator reflecting the adequacy of the program in meeting children's vitamin A needs is:

- Number of capsules distributed per eligible child (age six through 59 months) in a specified time period

A six-month time frame is suggested for the above alternative indicator. Note that some vitamin A supplementation programs are timed to coincide with low seasonal availability of vitamin A or high seasonal prevalence of illness. This would have to be taken into account when using this alternative indicator.

Sample questions

- o Has [NAME] ever received a vitamin A dose like (this/any of these)?

SHOW COMMON TYPES OF AMPULES/
CAPSULES/SYRUPS.



INDICATOR

VITAMIN A DEFICIENCY (SERUM RETINOL CONCENTRATION)

IVACG Outcome Indicator

Definition

Proportion of children aged 6-59 months whose serum vitamin A (retinol) concentration is less than 0.70 $\mu\text{mol/L}$.

Numerator: Number of children aged 6-59 months whose serum retinol concentration is less than 0.70 $\mu\text{mol/L}$.

Denominator: Total number of children aged 6-59 months surveyed.

Children with serum retinol concentration less than 0.70 $\mu\text{mol/L}$ are considered to be vitamin A deficient.

Measurement Tools

Population-based surveys that include the collection of blood samples and measurement of serum retinol (e.g. DHS)

What It Measures

This indicator measures the prevalence of vitamin A deficiency (VAD) among children. It can be used by the MOH to determine the need for programs to reduce levels of VAD, to help design and ensure they are targeted at areas of highest risk, and also to monitor and evaluate their success. Originally, VAD was associated with loss of vision or with other vision impairments, including night blindness, but research has now demonstrated a direct link between vitamin A deficiency and elevated mortality in children 6 to 59 months of age. That link is due, in part, to the role played by vitamin A in the development of the immune system in young children.

How to Measure It

Levels of serum retinol concentrations in blood samples are used to calculate this indicator. The gold standard for measuring retinol concentrations in blood is the drawing of venous blood for analysis using high-performance liquid chromatography (HPLC). Alternative methods under development include a technique applied in the DHS, in which blood spots from the finger or heel prick used for anemia testing are collected on a filter paper card and the filter paper specimens are stored in a specially designed box where they are protected from sunlight and moisture while drying overnight. The samples are conveyed to North Carolina to the only laboratory currently capable of analyzing the blood spots; the Program for Appropriate Technologies in Health (PATH) is developing a technique that measures the Retinol Binding Protein (RBP) using an enzyme-linked immunosorbent assay (ELISA) machine. Neither the blood-spot technique nor the PATH test is fully validated.

VAD is considered a public health problem if the prevalence of low serum retinol ($<0.7 \mu\text{mol/L}$) is greater than 15% (IVACG, 2002). UNICEF's long-term goal is to eliminate VAD by 2010.

Strengths and Limitations

This indicator can be used to measure the effectiveness of vitamin A intervention programs. It is reliable at assessing the vitamin A status of a population and is effective in detecting changes in population status over time (Wasantwisut, 2002). The indicator can be used to provide estimates of VAD for specific geographic areas. However, the indicator is less reliable for assessing individual vitamin A status because serum retinol is influenced by infections, protein and zinc malnutrition, and other factors.

The practicality of this indicator is limited because the ease of collecting blood samples varies by setting. It can be especially difficult to collect blood samples in populations with high prevalence of HIV. There are also logistical difficulties in maintaining the sample under the right storage conditions. In addition, it has been shown that vitamin A levels derived from dried blood spot samples are affected by the fact that the retinol-binding protein in the serum collected on filter paper decays in the first 7-10 days after collection. To account for this problem, the DHS collects both filter paper and venous blood samples for a limited number of children. Then, vitamin A levels obtained from the survey are adjusted by a recovery factor, which is calculated as the correlation between the vitamin A levels measured from dried blood spot retinol and plasma retinol.

Another issue pertains to the validity of the indicator. The relationship between serum retinol and vitamin A status as indicated by body reserves is complex. Vitamin A circulates in the blood as retinol bound to its specific carrier protein, retinol-binding protein (RBP). The level of retinol in the blood is under homeostatic control over a broad range of body stores and reflects body stores only when they are very low or very high. Since retinol-binding protein is an acute phase protein, acute and chronic infections can make interpretation of serum retinol levels difficult. Lack of laboratories for analysis of blood samples is another limitation for this assessment.

Finally, this indicator is not particularly useful for evaluating the most common vitamin A intervention, the distribution of high-dose vitamin A supplements to children six to 59 months of age. The supplement elevates the retinol levels in children for three to four months. Measurements taken near the time of administration of the supplements are artificially high while measurements taken more than four to five months after the administration of the supplements may fail to capture the benefits children derive from having received the supplement.



INDICATOR

PROPORTION OF CHILDREN 6-59 MONTHS WITH ANEMIA

Definition

Proportion of children aged 6-59 months of age who have a hemoglobin level below 110 g/l.

Numerator: Number of children aged 6-59 months who have a hemoglobin level below 110 g/l.

Denominator: Total number of children aged 6-59 months with valid hemoglobin measurement.

Measurement Tools

DHS; routine data collection from health centers

What It Measures

Anemia is the most common and widespread nutritional deficiency in the world. Nearly 40% of children aged 0-4 in non-industrialized countries are estimated to be iron deficient (WHO, 2001b). Approximately half of anemia prevalence can be attributed to iron deficiency, but there are settings in which malaria or helminth infections may cause more than 50% of anemia seen in children. It is important, therefore, to determine and address the multiple causes of anemia in a population in an integrated fashion. Anemia is associated with premature birth, low birth weight, infections, and elevated risk of death. Anemia has also been associated with later physical and cognitive impairment, resulting in lowered school performance (Gleason, 2002; Lozoff, 2000; Pollit, 1997; WHO, 2001b). Among children under five years of age, the greatest prevalence of anemia occurs during the second year of life due to low iron content in the diet and rapid growth during the first year.

Anemia occurs when mobilizable iron stores are fully depleted and the supply of iron to tissues is compromised. When individual hemoglobin levels are below two-standard deviation (-2 SD)

of the distribution mean for hemoglobin in an otherwise normal population of the same gender and age who are living at the same altitude, then iron deficiency is considered to be present. In a normal population, 2.5% of the population would be expected to be below this threshold. Anemia is considered to be a public health problem when the prevalence of concentration exceeds 5.0% of the population (WHO, 2001b).

How to Measure It

The data needed to measure this indicator are collected during a household survey. The recommended method for determining hemoglobin concentration in field surveys is the HemoCue system. It consists of a set of disposable cuvettes in which blood is collected and a battery operated photometer. The system is uniquely suited for rapid field surveys because the one-step blood collection and hemoglobin determination do not require addition of liquid reagent. Based on prevalence estimated from blood levels of hemoglobin, anemia in a population can be categorized into mild (5.0-19.9 %), moderate (20-39.9 %) and severe (40% or above).

UNICEF's goal is to reduce the prevalence of anemia (including iron deficiency) by one third by 2010.

Strengths and Limitations

Data for calculating this indicator can easily be collected in household surveys using the HemoCue system, which has proven to be reliable in terms of precision against standard laboratory methods. The indicator can be used to determine the magnitude, severity, and distribution of iron deficiency and anemia among children who are under five years of age in a population. This can provide a basis for planning policies and

interventions or for identifying subgroups in which infants and young children are more affected or at a greater risk of iron deficiency and anemia. The indicator can also be used to monitor and evaluate the impact of interventions or provide a basis for advocacy programs for iron deficiency and anemia prevention.

A major limitation of the indicator is that anemia is not a specific indicator of iron deficiency. Not all cases of anemia are due to iron deficiency and not all iron deficiency will be reflected in anemia (Yip and Ramakrishnan, 2002). Other nutritional deficiencies (e.g., low intakes of folic acid and vitamins A, B₁₂ and C) and infectious diseases (e.g., malaria, schistosomiasis, and hookworm) may also contribute to anemia.



INDICATOR

LOW WEIGHT-FOR-HEIGHT/LENGTH (WASTING)

Supplemental Indicator for IMCI at the Household Level

Definition

Proportion of children (target age group) who are below -2 standard deviations from the median weight-for-height according to the NCHS/WHO reference population.

Numerator: Number of children (target age group) who are below -2 standard deviations from the median weight-for-height according to the NCHS/WHO reference population.

Denominator: Total number of children (target age group) surveyed.

The National Center for Health Statistics/World Health Organization (NCHS/WHO) reference population for weight-for-height provides standards for individual-level screening for malnutrition and population-level monitoring. It is one of the most commonly used reference populations.

The target age is that set by the national MOH policy. It may be set at under five years, under three years, or under two years of age.

Measurement Tools

Growth monitoring records; DHS; KPC; and household nutrition surveys

What It Measures

Weight-for-height is an index that reflects body weight relative to height. Low weight-for-height helps to identify children suffering from current or acute undernutrition or wasting. Wasting is the result of a weight falling significantly below the weight expected of a child of the same length or height.

Wasting indicates current or acute malnutrition resulting from failure to gain weight or actual weight loss. Causes include inadequate food intake, incorrect feeding practices, diseases, and infections or, more frequently, a combination of these factors (Cogill, 2003; WHO, 1995). In humanitarian assistance activities, wasting or thinness in children aged 6-59 months, combined with nutritional edema, is an indicator of acute malnutrition and should be used to reflect the overall severity of a crisis. In general, weight-for-length (in children under two years of age) or weight-for-height (in children over two years of age) is appropriate for examining short-term changes, such as seasonal changes in food supply or short-term nutritional stress brought about by illness.

How to Measure It

Weight-for-height is calculated as the weight of each child in relation to the weight of a well-nourished child of the same sex and stature using the NCHS/WHO reference population. The data may be collected in household surveys such as the DHS and other nutrition surveys. Regular weighing and charting of weight-for-height on the child's growth chart provides another source of data for calculating this indicator.

Children under two years of age are measured lying down on the board (recumbent length). Standing height measurement is done for older children and is often referred to as stature. The child's length or height is recorded to the nearest 0.1 centimeter. The child's measurement is then compared with the median or average measurement for children of the same age and sex in the NCHS/WHO standard reference population. More information on length and height measurement and the NCHS/WHO international reference tables can be found on FANTA's Web site at www.fantaproject.org.

Children's weight may be measured by using a Salter-like hanging scale or a UNICEF mother/child electronic scale, also referred to as the UNISCALE. If a UNISCALE is used, the enumerator first records the mother's weight while she is holding the baby. The weight is recorded in kilograms to one decimal point. A second weight reading is then recorded with just the mother standing on the scale. The difference in the readings is the weight of the child.

The standard deviation unit or Z-score is the simplest way of making comparisons to the reference population. The Z-score is defined as the difference between the value for an individual and the median value of the reference population in the same weight or height, divided by the standard deviation of the reference population. The median is the value at exactly the mid-point between the largest and smallest.

The cut-off points for different malnutrition classifications under the NCHS/WHO system is listed below:

Between -1 SD and -2 SD	mild
Between -2 SD and -3 SD	moderate
Below -3 SD	severe

Children who are below -2 SD from the median of the NCHS reference population in terms of weight-for-height are considered thin or wasted. In humanitarian assistance activities, it is recommended to include all children under the age of five years who have pitted edema in their limbs in the numerator, irrespective of their anthropometric status. This is because edema is a clinical sign of severe malnutrition and shows strong associations with mortality.

In clinic-based growth monitoring, the Road-to-Health (RTH) system is typically used instead of the NCHS/WHO system. When examining malnutrition patterns over time, it is important to use the same system to analyze and present trend data because the cutoff points for mild, moderate, and severe malnutrition are different in each classification system.

In non-disaster areas, the prevalence of low weight-for-height is usually at less than 5% (WHO, 1995). Prevalence of wasting between 10-14 % is considered serious and prevalence greater than 15 % is considered critical.

Strengths and Limitations

This indicator is simple to calculate and is useful when exact ages are difficult to determine. Low weight-for-height can be used as a screening or targeting indicator, for example to identify infants/children who need supplementary or therapeutic food and/or treatment for diseases, particularly diarrhea. In emergency settings, weight-for-height is a useful indicator for screening and surveillance. As mentioned above, humanitarian activities also need to take into account nutritional edema when calculating this indicator. Percentage of the reference median should be reported as well, as it is used as an entry criterion for feeding programs. Because wasting in individual children and population groups can change rapidly, the indicator is responsive to short-term program influences. However, the indicator is also highly susceptible to seasonal variations in food availability. Weight-for-height is not recommended for evaluating change in anthropometric status in non-emergency situations.

The main limitation of this indicator is that weight and height can be difficult to obtain, leading to problems of validity of measurement. The most frequent problems in height measurement are inadequate positioning of the child's head and feet, a reading done in an oblique position, and not facing the reading point of the measuring board or height-measuring apparatus. The largest acceptable difference between repeated measurements of height is 1.0 cm. For weight, the largest acceptable difference between repeated measurements is 0.5 kg (Cogill, 2003). If repeated measurements are different from each other, the measurements should be disregarded and the measuring should start again. Enumerator variability in weight measurement can be reduced through good training and supervision.



INDICATOR

Low HEIGHT/LENGTH-FOR-AGE (STUNTING)

Supplemental Indicator for IMCI at the Household Level

Definition

Proportion of children (target age group) surveyed who are below -2 standard deviations from the median height/length-for-age of the NCHS/WHO reference population.

Numerator: Number of children (target age group) surveyed who are below -2 standard deviations from the median height/length-for-age of the NCHS/WHO reference population.

Denominator: Number of children (target age group) surveyed.

The National Center for Health Statistics/World Health Organization (NCHS/WHO) reference population for height-for-age provides standards for individual-level screening for malnutrition and population-level monitoring. It is one of the most commonly used reference populations.

The target age is that set by the national MOH policy. It may be set at under five years, under three years, or under two years of age.

Measurement Tools

Growth monitoring records; DHS; KPC; and household nutrition surveys

What It Measures

Low height-for-age reflects past undernutrition or a past growth failure and is a measure of stunting in an individual or the extent of stunting in a population. For children below two years of age, the term is length-for-age. Above two years of age, the term is height-for-age. Low length-for-

age stemming from a slowing in the growth of the fetus and the child and resulting in a failure to achieve length as compared to a healthy well-nourished child of the same age is a sign of stunting. Low height-for-age is associated with a number of long-term factors including chronic insufficient food intake, frequent infection, sustained inappropriate feeding practices, and poverty. Worldwide about 30% of children under five are stunted because of poor feeding practices and repeated infections.

In areas of high prevalence, the age of the child modifies the interpretation of height-for-age. For younger children (under 24-35 months), low height-for-age reflects a continuing process of “failing to grow” or stunting. For older children, it reflects the state of “having failed to grow” or being stunted (WHO, 1995). For these reasons, the prevalence of stunting disaggregated by age categories and sex is easier to interpret.

How to Measure It

To measure this indicator, data are collected on the height and date of birth for all children, usually under five years of age. The child’s age in completed months is required for sampling. To measure the age of the child, enumerators need to examine documentary evidence of the birth date (such as a birth or baptismal certificate, clinical records, etc.) in addition to asking the mother, in order to minimize recall errors. If the child’s date of birth cannot be recalled, a local calendar should be used to assist the mother in recalling the date of birth.

The age of the child determines whether the child is measured standing or lying down for height or length, and for converting height into standard indices. Children under two years of age are measured lying down on the board (recumbent

length). Standing height measurement is done for older children and is often referred to as stature. The child's length or height is recorded in centimeters up to one decimal point. The child's measurement is then compared with the median or average measurement for children of the same age and sex in the NCHS/WHO standard reference population. More information on collection of weight and height data and the NCHS/WHO international reference tables can be found on the Food and Nutrition Technical Assistance (FANTA) project's Web site at www.fantaproject.org.

The standard deviation unit or Z-score is the simplest way of making comparisons to the reference population. The Z-score is defined as the difference between the value for an individual and the median value of the reference population in the same age or height, divided by the standard deviation of the reference population. The median is the value at exactly the mid-point between the largest and smallest.

The cut-off points for different malnutrition classifications under the NCHS/WHO system is listed below:

Between -1 SD and -2 SD	mild
Between -2 SD and -3 SD	moderate
Below -3 SD	severe

Children who are below -2 SD from the median of the NCHS reference population in terms of height-for-age are considered short for their age or stunted.

In clinic-based growth monitoring, the Road-to-Health (RTH) system is typically used instead of the NCHS/WHO system. When examining malnutrition patterns over time, it is important to use the same system to analyze and present data because the cutoff points for mild, moderate, and severe malnutrition are different in each classification system.

Data on the prevalence of stunting should be examined separately by age categories and sex. In areas of high prevalence, the age of the child modifies the interpretation of height-for-age. For younger children (under 24-35 months), low height-for-age reflects a continuing process of "failing to grow" or stunting. For older children, it reflects the state of "having failed to grow" or being stunted (WHO, 1995).

One of the goals established at the May 2002 United Nations General Assembly Special Session on Children is the reduction of malnutrition among children under five years of age by at least one third, with special attention to children under two years of age (United Nations, 2002). It is recommended not to measure height-for-age annually as the prevalence of growth failure or stunting would not be expected to change in that time frame.

Strengths and Limitations

Stunting is a measure of the long-term effects of malnutrition in a population and is unaffected by seasonal variation. It provides a better indication of trends than the wasting indicator (low weight-for-height), since it reflects long-term outcomes, such as frequent and high disease burden, limited access to food supply, poor feeding practices, and/or low household socioeconomic status, in the target population. Because stunting in children reflects socioeconomic conditions that are not conducive to good health and nutrition, this indicator is often used to target development programs. A decrease in the prevalence of stunting at the population level is a long-term indicator that social development is benefiting the poor as well as the relatively wealthy. Information on stunting for individual children is also useful clinically as an aid to diagnosis. Stunting based on height-for-age can be used for evaluation purposes but it is not recommended for monitoring as it does not change in the short term, such as 6-12 months.

Some programs report the prevalence of stunting for children under age 24 months rather than the recommended 24-59 months. Restricting the age grouping to children under age 24 months has the disadvantage of not capturing the lagged effect of the program and reducing the number of potential participants in a survey. The advantage of using children under age 24 months is that the prevalence of stunting in children of this age group is likely to be more responsive to the impact of interventions than in older children. The data for children under age 24 months may be more useful, therefore, for determining the factors related to stunting for program design and redesign (Cogill, 2003).

The main limitation of this indicator is that length or height can be difficult to obtain, thus leading to problems of validity. The most frequent problems in height measurement are inadequate positioning of the child's head and feet, a reading done in an oblique position, and not facing the reading point of the measuring board or height-measuring apparatus. The largest acceptable difference between repeated measurements of height is 1.0 cm. If repeated measurements are different from each other, the measurements should be disregarded and the measuring should start again. Accuracy of measurement is achieved through good training and supervision.

**Millennium Development Goal
(MDG) Indicator**
Definition

Proportion of children (target age group) surveyed who are below -2 standard deviations from the median weight-for-age according to the NCHS/WHO reference population.

Numerator: Number of children (target age group) surveyed who are below -2 standard deviations from the median weight-for-age of the NCHS/WHO reference population.

Denominator: Number of children (target age group) surveyed.

The National Center for Health Statistics/World Health Organization (NCHS/WHO) reference population for weight-for-age provides standards for individual screening for malnutrition and population-level monitoring. It is one of the most commonly used reference populations.

The target age is that set by the national MOH policy. It may be set at under five years, under three years, or under two years of age.

Measurement Tools

Growth monitoring records; DHS; KPC; and household nutrition surveys

What It Measures

Weight-for-age reflects body mass relative to chronological age. Low weight-for-age identifies the condition of being light or underweight for a specific age and reflects the process of gaining insufficient weight relative to age or losing weight. Since weight-for-age is influenced by both the height of the child and by its weight, the indicator

reflects both past (chronic) and/or present (acute) undernutrition. This indicator is also a measure of health and nutritional risk in a population. Pelletier and colleagues (1995) calculated that the relative risk of death was 2.5, 4.6, and 8.4 for mild, moderate, and severe undernutrition (low weight-for-age), respectively. Thus, monitoring weight-for-age can help assess the contribution of growth promotion programs to mortality reduction. Underweight, based on weight-for-age, is recommended as the indicator to assess changes in the magnitude of malnutrition over time.

How to Measure It

To measure this indicator, data are collected on the weight and date of birth of the child for all children under five years of age. The child's age in completed months is required for sampling and for converting weight into standard indices. To measure the age of the child, enumerators need to examine documentary evidence of the birth date (such as a birth or baptismal certificate, clinical records, etc.) in addition to asking the mother, in order to minimize recall errors. If the child's date of birth cannot be recalled, a local calendar should be used to assist the mother in recalling the date of birth.

Children's weight may be measured by using a Salter-like hanging scale or a UNICEF mother/child electronic scale, also referred to as the UNISCALE. If a UNISCALE is used, the enumerator first records the mother's weight while she is holding the baby. The weight is recorded in kilograms to one decimal point. A second weight reading is then recorded with just the mother standing on the scale. The difference in the readings is the weight of the child.

The standard deviation unit or Z-score is the simplest way of making comparisons to the

reference population. The Z-score is defined as the difference between the value for an individual and the median value of the reference population in the same age or weight, divided by the standard deviation of the reference population. The median is the value at exactly the mid-point between the largest and smallest.

The cut-off points for different malnutrition classifications under the NCHS/WHO system is listed below:

Between -1 SD and -2 SD	mild
Between -2 SD and -3 SD	moderate
Below -3 SD	severe

Children who are below -2 SD from the median of the NCHS reference population in terms of weight-for-age are considered underweight for their age.

In clinic-based growth monitoring, the Road-to-Health (RTH) system is typically used instead of the NCHS/WHO system. When examining malnutrition patterns over time, it is important to use the same system to analyze and present data because the cutoff points for mild, moderate, and severe malnutrition are different in each classification system.

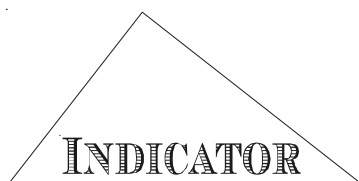
Data on the prevalence of underweight should be examined separately by age categories and sex. Underweight can be reported annually as it is influenced by short-term effects such as a recent outbreak of diarrheal diseases. Household surveys are generally conducted every three to five years.

One to the goals established at the May 2002 United Nations General Assembly Special Session on Children is the reduction of malnutrition among children under five years of age by at least one third, with special attention to children under two years of age (United Nations, 2002).

Strengths and Limitations

Weight-for-age is influenced by both height of the child (height-for-age) and by its weight (weight-for-height). The advantage of this indicator is that it reflects both present (acute) and/or past (chronic) undernutrition. Weight-for-age is a useful tool in clinical settings for continuous assessment of nutritional progress and growth. It can be used at the individual level to identify infants and children with poor health and nutrition, for interventions specially tailored to causes of poor growth (e.g., breastfeeding support, nutrition education, supplementation of infant/child and mother, prevention of diarrhea), and to assess response to the intervention(s). At the individual level, it can also be used to identify infants and children who are failing to thrive and who need treatment for underlying diseases and monitoring their response to therapy. However, the composite nature of the index makes interpretation difficult.

One of the major limitations of the indicator is the issue of the reliability of weight measurements. There may be some degree of variability between interviewers in performing the task of weighing. For weight, the largest acceptable difference between repeated measurements is 0.5 kg (Cogill, 2003). Enumerator variability in weight measurement can be reduced through extensive training. The validity of this indicator also depends on the accuracy of the weighing instruments and the caretaker's ability to report the correct age of the child.



UNDER-FIVE MORTALITY RATE (U5MR)

Millennium Development Goal (MDG) Indicator

Indicator Cross-referenced in Chapter Nine

Definition

The under-five mortality rate (U5MR) is the number of deaths of children aged 0-4 years in a specified year per 1000 live births in that specified year.

Numerator: Number of deaths of children aged 0-4 years in a specified year x 1000.

Denominator: Total number of live births in that specified year.

A “*live birth*” is described by the United Nations (1955) as “the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.”

The U5MR may also be expressed as the probability (expressed as a rate per 1,000 live births) of a child born in a specified year dying before reaching the age of five if subject to current age-specific mortality rates.

Measurement Tools

Census; population-based surveys (e.g., DHS, MICS); vital registration

What It Measures

This indicator measures the risk of dying in infancy and early childhood. It also reflects the social, economic, and environmental conditions in which children (and others in society) live, including their health care. The under-five mortality rate captures more than 90% of global mortality among children under the age of 18. The indicator may be used, therefore, as a measure of children’s well-being and the level of effort being made to maintain child health.

How to Measure It

At the national level, the best source of data is a complete vital statistics registration system – one covering at least 90% of vital events in the population. Such systems are uncommon in developing countries, so estimates are also obtained from sample surveys or derived by applying direct and indirect estimation techniques to registration, census, or survey data.

A wide variety of household surveys, including the MICS and DHS, are used in developing countries to estimate under-five mortality rates. In the DHS, birth histories are collected from women aged 15-49 years. Each eligible woman is asked the dates of birth and, where relevant, the age of death of every live-born child she has had. Using life-table analysis, this approach produces direct estimates of under-five mortality.

A second survey method is called the Brass method, which asks each woman surveyed simple questions such as her age, the total number of children she has borne, and the number of those children who have died. The age of the mother and the proportion of children that died, in conjunction with assumption of fertility and other factors, allow an estimation of under-five mortality. This approach is used by MICS and produces indirect estimates of under-five mortality. Longitudinal or prospective surveys following a sample of babies born in a specified year over a number of years may also be used to estimate under-five mortality. However, this approach is relatively uncommon in developing countries.

Vital statistics are typically available once a year, but they are unreliable in most developing countries. Household surveys that include questions on births and deaths are generally conducted every three to five years. Target 5 of the Millennium Development Goals (MDG) is to reduce the under-five mortality rate by two-thirds between 1990 and 2015.

Strengths and Limitations

Vital registration data may suffer from a number of problems. These include the omission of some births and deaths, especially infants that died shortly after birth, and the misreporting of the date of birth and age at death. Omission of under-five deaths is usually most severe for deaths that occur early in infancy.

In developing countries, household surveys are essential to the calculation of this indicator, but there are some limits to their quality. Survey data are subject to recall error, and surveys estimating under-five deaths require large samples, which may be costly. Therefore, when using household

surveys it is important to consider sampling errors. In addition, indirect estimates rely on estimated actuarial (“life”) tables that may be inappropriate for the population concerned.

The U5MR has been recommended as an indicator for determining the extent of vitamin A deficiency (VAD) in a population. This is because populations with high U5MR invariably tend to have significant VAD. An U5MR > 50 per 1000 live births is considered to indicate a high likelihood of VAD problems at the country level (IVACG, 2002). Under-five mortality rates are also frequently used to compare levels of socioeconomic development across countries. Comparisons between countries should be made with caution as the data used to arrive at estimates of under-five mortality come from a wide variety of sources of disparate quality and may refer to different reporting periods.

References

- Arimond M, and Ruel MT. (2003). *Generating Indicators of Appropriate Feeding of Children 6 through 23 Months from the KPC 2000+*. Washington, DC: Food and Nutrition Technical Assistance (FANTA) Project, Academy for Educational Development.
- Arimond M, and Ruel MT. (2004). *Dietary Diversity, Dietary Quality, and Child Nutritional Status: Evidence from Eleven Demographic and Health Surveys*. Washington, DC.: Food and Nutrition Technical Assistance (FANTA) Project, Academy for Educational Development.
- Beaton G, Kelly A, Kevany J, Martorell R, and Mason J. (1990). *Appropriate Uses of Anthropometric Indices in Children*. Geneva, Switzerland: ACC/SCN. ACC/SCN State of the Art Series, Nutrition Policy Discussion Paper No. 7.
- Bertrand JT, and Escudero G. (2003). *Compendium of Indicators for Evaluating Reproductive Health Programs*. Chapel Hill, NC: MEASURE Evaluation.
- Cogill B. (2003). *Anthropometric Indicators Measurement Guide*. Washington, DC: Food and Nutrition Technical Assistance (FANTA) Project, Academy for Educational Development.
- Crompton DWT, Montresor A, Nesheim MC, and Savioli L (eds.). (2003). *Controlling Disease Due to Helminth Infections*. Geneva, Switzerland: World Health Organization.
- Dewey KB, and Brown KH. (2003). Update on Technical Issues Concerning Complementary Feeding of Young Children in Developing Countries and Implications for Intervention Programs. *Food and Nutrition Bulletin*, 24(1):5-28.
- Galloway R. (2003). *Anemia Prevention and Control: What Works, Part I Program Guidance and Part II Tools and Resources*. Washington, DC: USAID.
- Gleason GR. (2002). Iron Deficiency Anemia Finally Reaches the Global Stage of Public Health. *Nutrition in Clinical Care*, 5(5):217-219.
- Habicht JP, Mason J, and Tabatabai H. (1984). Basic Concepts for the Design of Evaluation During Programme Implementation. In: Sahn D, Lockwood R, and Scrimshaw N (eds.). *Methods for the Evaluation of the Impact of Food and Nutrition Programmes*. UNU, Tokyo. 1 25.
- Habicht JP et al. (1999). Evaluation Designs for Adequacy, Plausibility and Probability of Public Health Programme Performance and Impact. *International Journal of Epidemiology*, 28:10-18.
- IVAGG. (2002). *The Anney Accords to Assess and Control Vitamin A Deficiency: Summary of Recommendations and Clarifications*. Washington, DC: ILSI Research Foundation.
- Lozoff B. (2000). Perinatal Iron Deficiency and the Developing Brain. *Pediatric Research*, 48:137-139.
- Mason J, Habicht JP, Tabatabai H, and Valverde V. (1984). *Nutritional Surveillance*. Geneva, Switzerland: World Health Organization. Monograph, 194 pp. ISBN 92 4 156078 9.

- Mason JB, and Habicht JP. (1984). Stages in the Evaluation of On-going Programs. In: Sahn D, Lockwood R, and Scrimshaw N (eds.). *Methods for the Evaluation of the Impact of Food and Nutrition Programmes*, p. 26-45. Tokyo: United Nations University.
- Mason JB, Mannar V, and Mock N. (1999). Controlling Micronutrient Deficiencies in Asia. *Asian Development Review*, 17(1-2):66-95.
- Mason J, Smith N, Deitchler M, Wetzler E, Agyeman Y, and Dobbs D. (2000). *CARE Food Review: A Review of CARE's Use of Title II Resources*. (1) Overview (2) Country Case Studies (Bangladesh, Bolivia, Guatemala, Haiti, Honduras, India, Kenya, Madagascar, Mozambique, and Peru). Mimeo. New Orleans: Department of International Health and Development, Tulane School of Public Health and Tropical Medicine.
- Mason JB, Lotfi M, Dalmiya N, Sethuraman K, and Deitchler M, with Geibel S, Gillenwater K, Gilman A, Mason K, and Mock N. (2001a). *The Micronutrient Report: Current Progress in the Control of Vitamin A, Iodine, and Iron Deficiencies*. Ottawa, Canada: Micronutrient Initiative/International Development Research Center.
- Mason JB, Hunt J, Parker D, and Jonsson U. (2001b.) Improving Child Nutrition in Asia. Supplement to *Food and Nutrition Bulletin*, 22(3):5-80.
- Montresor A, Awasthi S, Crompton DWT. (2003). Use of Benzimidazoles in Children Younger than 24 Months for the Treatment of Soil-Transmitted Helminthiasis. *Acta Tropica*, 86(2-3):223-32
- PAHO/WHO. (2003). *Guiding Principles for Complementary Feeding of the Breastfed Child*. Washington, DC/Geneva, Switzerland: PAHO/WHO. Retrieved from http://www.who.int/child-adolescent-health/New_Publications/NUTRITION/guiding_principles.pdf
- Pelletier D. (1994). The Relationship between Child Anthropometry and Mortality in Developing Countries: Implications for Policy, Programs and Future Research (2047S). Supplement to *Journal of Nutrition*, 124:10S.
- Pelletier DL, Frongillo Jr. EA, Schroeder DG, and Habicht JP. (1995). The Effects of Malnutrition on Child Mortality in Developing Countries. *Bulletin of the World Health Organization*, 73(4):443-8.
- Pinstrup Andersen P, Burger S, Habicht JP, and Peterson K. (1993). Protein Energy Malnutrition. In: *Disease Control Priorities in Developing Countries*. Oxford Medical Publications, 391-420.
- Piwoz EG, Huffman SL, and Quinn VJ. (2003). Promotion and Advocacy for Improved Complementary Feeding: Can We Apply the Lessons Learned from Breastfeeding? *Food and Nutrition Bulletin*, 24:29-44.
- Pollit E. (1997). Iron Deficiency and Educational Deficiency. *Nutrition Review*, 55:133-144.
- Ramakrishnan U, and Darnton-Hill I. (2002). Assessment and Control of Vitamin A Deficiency Disorders. *Journal of Nutrition*, 132:2947S-2953S.
- Ruel MT. (2003). Operationalizing Dietary Diversity: A Review of Measurement Issues and Research Priorities. *Journal of Nutrition*, 133:3911S-3926S.

Ruel MT, Brown KH, and Caulfield LE. (2003). *Moving Forward with Complementary Feeding: Indicators and Research Priorities*. Washington, DC: International Food Policy Research Institute. Food Consumption and Nutrition Division Discussion Paper No. 146.

Sanders D. (1999). Success Factors in Community Based Nutrition Programmes. *Food & Nutrition Bulletin*, 20(3):307-314.

Sommer A. (1995). *Vitamin A Deficiency and Its Consequences: A Field Guide to Detection and Control*, 3rd Ed. Geneva, Switzerland: World Health Organization.

Swindale A, Deitchler M, Cogill B, and Marchione M. (2004). *Impact of Title II Maternal and Child Health and Nutrition Programs on the Nutritional Status of Children*. Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development. Retrieved from <http://www.fantaproject.org/downloads/pdfs/ffpOP4.pdf>

Tomkins AM, and Watson F. (1989). *Malnutrition and Infection: A Review*. Geneva, Switzerland: ACC/SCN and World Health Organization. ACC/SCN State of the Art Series, Nutrition Policy Discussion Paper No. 5.

Tontisirin K, and Winichagoon, P. (1999). Community Based Programs: Success Factors for Public Nutrition Derived from Thailand's Experience. *Food & Nutrition Bulletin*, 20(3):315-322.

UNICEF. (1990). *Strategy for Improved Nutrition of Children and Women in Developing Countries*. New York: UNICEF. Policy Review Paper E/ICEF/1990/1.6.

United Nations. (1955). Principles for a Vital Statistics System. Statistical papers series, M(19). Check also World Health Organization. International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10), vol. 1. Geneva, 1992. (definition 3.1) (http://unstats.un.org/unsd/demographic/vital_statistics/definitions.htm)

United Nations. (2002). *A World Fit for Children: Resolution Adopted by the General Assembly*. New York: United Nations. A/RES/S-27/2. Retrieved from http://www.unicef.org/specialsession/docs_new/documents/A-RES-S27-2E.pdf

Wasantwisut E. (2002). Recommendations for Monitoring and Evaluating Vitamin A Programs: Outcome Indicators. *Journal of Nutrition*, 132:2940S-2942S.

WHO. (1982). *Control of Vitamin A Deficiency and Xerophthalmia*. Geneva, Switzerland: World Health Organization. Report of a joint WHO/UNICEF/USAID/Hellen Keller International IVACG Meeting. WHO Technical Report Series 672:1-70.

WHO. (1991). *Indicators for Assessing Breastfeeding Practices*. Geneva, Switzerland: World Health Organization. Report of an Informal Meeting. Division of Diarrhoeal and Acute Respiratory Disease Control, June 11-12.

WHO. (1995). *Physical Status: The Use and Interpretation of Anthropometry*. Geneva, Switzerland: World Health Organization. WHO Technical Report Series 854.

WHO. (2001). *Assessment of Iodine Deficiency Disorders and Monitoring Their Elimination: A Guide for Programme Managers*, 2nd Ed. Geneva, Switzerland: World Health Organization. WHO/NHD/01.1.

WHO. (2001a). *Iron Deficiency Anaemia: Assessment, Prevention and Control – A Guide for Programme Managers*. Geneva, Switzerland: World Health Organization. WHO/NHD/01.3.

WHO. (2001b). *New Data on the Prevention of Mother-to-Child Transmission of HIV and Their Policy Implications: Conclusions and Recommendations*. Technical Consultation on Behalf of the UNFPA/UNICEF/WHO/UNAIDS. Inter-Agency Task Team on Mother-to-Child Transmission of HIV. Geneva, Switzerland: World Health Organization. WHO/RHR/01.28.

WHO. (2001c). *Schistosomias and Soil-transmitted Helminth Infections*. Geneva, Switzerland: World Health Organization. Fifty-fourth World Health Assembly, Agenda Item 13, WHA54.19. A54/VR/9. Retrieved from http://www.who.int/gb/EB_WHA/PDF/WHA54/ea54r19.pdf

WHO. (2002). *Report of the WHO Informal Consultation on the Use of Praziquantel and Albendazole/Meibendazole in Children Under 24 Months*. Geneva, Switzerland: World Health Organization. WHO/CDS/CPE/PVC/2002.4.

WHO/UNICEF. (1998). *Complementary Feeding of Young Children in Developing Countries: A Review of Current Scientific Knowledge*. Geneva, Switzerland: World Health Organization. WHO/NUT/98.1.

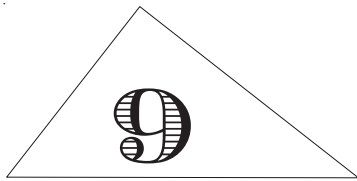
Wellstart International. *Wellstart International's Tool Kit for Monitoring and Evaluating Breastfeeding Practices and Programs*.

Yip R, and Ramakrishnan U. (2002). Experiences and Challenges in Developing Countries. *Journal of Nutrition*, 132:827S-830S.

Annex 8.1. Complementary feeding questions from the DHS and KPC

<p>Now I would like to ask you about liquids [NAME] drank yesterday during the day or at night.</p> <p>Did [NAME] drink any of the following liquids yesterday during the day or at night?</p> <p>Plain water?</p> <p>Commercially produced infant formula?</p> <p>Any other milk such as tinned, powdered, or fresh animal milk?</p> <p>Fruit juice?</p> <p>Tea or coffee?</p> <p>Any other liquids?</p>
<p>Now I would like to ask you about the food [NAME] ate yesterday during the day and at night, either separately or combined with other foods (1).</p> <p>Did [NAME] eat:</p> <ol style="list-style-type: none"> Any porridge or gruel? Any [BRAND NAME OF COMMERCIALY FORTIFIED BABY FOOD, E.G., Cerelac]? Any bread, rice, noodles, biscuits, cookies, or any other foods made from grains? (2) Any white potatoes, white yams, manioc, cassava, or any other foods made from roots? Any pumpkin, carrots, squash or sweet potatoes that are yellow or orange inside? (3) Any dark green, leafy vegetables? (4) Any ripe mangoes, papaya or [INSERT ANY OTHER LOCALLY AVAILABLE VITAMIN A - RICH FRUITS] Any other fruits and vegetables? Any liver, kidney, heart or other organ meats? Any beef, pork, lamb, goat, rabbit or [INSERT WILD GAME MEAT SUCH AS ANTELOPE OR DEER]? Any chicken, duck, or other birds? Any eggs? Any fresh or dried fish or shellfish? Any foods made from beans, peas, or lentils? Any nuts? Cheese or yogurt? Any food made from oil, fat, or butter? Any other solid or semi-solid food?
<p>How many times did [NAME] eat solid, semi-solid, or soft foods other than liquids yesterday during the day or at night?</p> <p>IF 7 OR MORE TIMES, RECORD “7”</p>

- (1) A separate category for any foods made with red palm oil, palm nut, or palm nut pulp sauce must be added in countries where these items are fed to young children. A separate category for any grubs, snails, insects or other small protein food must be added in countries where these items are fed to children. Items in each food group should be modified to include only those foods that are locally available and/or consumed in the country. Local terms should be used.
- (2) Grains include millet, sorghum, maize, rice, wheat, or other local grains. Start with local foods, e.g. ugali, nshima, fufu, chapati, then follow with bread, rice, noodles, etc.
- (3) Items in this category should be modified to include only vitamin A rich tubers, starches, or red, orange, or yellow vegetables that are consumed in the country.
- (4) These include cassava leaves, bean leaves, kale, spinach, pepper leaves, taro leaves, amaranth leaves, or other dark green, leafy vegetables.



MORTALITY

Indicators:

- Late fetal death rate (cross-referenced in Chapter three)
- Perinatal mortality rate (cross-referenced in Chapter three)
- Cause-specific perinatal mortality rate (cross-referenced in Chapter three)
- Birth weight specific mortality rate (cross-referenced in Chapter three)
- Neonatal mortality rate (cross-referenced in Chapter three)
- Infant mortality rate
- Child mortality rate
- Under-five mortality rate (cross-referenced in Chapter eight)
- Cause-specific mortality rate

CHAPTER 9. MORTALITY

Mortality reduction and improvements in child health and nutrition are the ultimate goal of child health programs. Most of the mortality impact is likely to occur through reductions in deaths from five main causes: pneumonia, diarrhea, malaria, measles, and malnutrition. As many child health programs do not include specific interventions targeted at the major causes of death among children younger than seven days, the infant, child, and under-five mortality rates have been the main mortality measures of impact. However, many newborn health programs include interventions prior to the birth of a child (during pregnancy, labor, and delivery) and in the first few weeks of an infant's life. Such interventions may include syphilis screening; improving the diagnosis and treatment of reproductive tract infections; expanding maternal immunization with tetanus toxoid; including malaria prophylaxis during routine antenatal care; and educating community health workers to improve the identification and malpresentation of labor and referral of complicated cases to higher level facilities. In the early weeks of life, interventions such as the use of resuscitation techniques for asphyxiated infants, proper management of neonatal sepsis and other infections; skin-to-skin kangaroo care for preterm infants, and the promotion of immediate and exclusive breastfeeding may also be introduced. Taking into account the diversity of child health interventions, this chapter addresses not only the conventional indicators of childhood mortality but also the measures of fetal and early neonatal mortality that were cross-referenced in Chapter three. We begin with a discussion of the methodological challenges of measuring fetal, infant, and child mortality.

Measurement Challenges

Large-scale survey data provide the most reliable estimates of child mortality, but they have limitations.

Surveys such as the DHS/MICS/KPC are valuable for tracking national infant and child mortality trends but they have a number of limitations. First, such surveys are conducted only once every three to five years (if that often). Second, in most countries, they do not yield precise estimates for geographic sub-areas (such as districts or provinces), which is the level at which program managers need the information. Third, these large-scale surveys are expensive to conduct and analyze and cannot detect short-term changes in mortality rates.

Few countries have sufficiently well developed vital registration systems that can yield valid and reliable information on all births and deaths in the community. Health information systems can only provide information on facility births and deaths and, in most settings, are poorly developed. Most community-based programs often do not have the capacity to measure infant and child mortality.

Concerning newborn health, prospective studies would provide the most reliable mortality rates but are costly for regular reporting purposes. Large-scale surveys that rely on the retrospective reporting of deaths in early infancy can provide estimates of neonatal mortality, but estimates of perinatal mortality (which includes fetal deaths) require complete pregnancy histories. Many population-based surveys in developing countries focus on obtaining birth histories.

The reliability of any survey estimate depends on the completeness of reporting. Under-reporting tends to be more pronounced for deaths in early infancy. Because of the relatively small numbers of deaths recorded in household surveys, national neonatal mortality rates are usually presented for the five-year period before the survey, and sub-national estimates for the ten-year period before the survey. The lack of precision in the estimates sometimes makes it difficult to assess the significance of small changes between surveys (Rutstein, 1999).

The quality of newborn and infant mortality data is poorer than the quality of data for other ages.

Evaluators require information on all births and deaths to derive valid measures of newborn and infant mortality. As mentioned previously, few developing countries have official vital registration systems that are reasonably reliable or complete. Institutional barriers leading to underreporting may include cost, distance to the registration office, and a lack of awareness of the importance of birth and death registration. Social and cultural barriers may also make it difficult to collect valid data. Even in countries with well-developed registration systems, biases towards reporting larger, older babies may exist, with deaths of small babies early in the neonatal period being omitted. Fetal deaths are much less likely to be reported than deaths of live-born babies (WHO, 1996a).

Definitions of newborn, infant, and child death are inconsistent.

Many countries define and record births and deaths in ways that may differ from the standard definitions recommended by WHO in ICD-10. Some countries, for example, only record a baby as a live birth if the baby survives beyond 24 hours (Lawn, McCarthy, and Ross, 2001). The definition of a perinatal death is particularly problematic, not only because legal reporting requirements may vary between countries, but also because the two standard international definitions have different gestational age and weight criteria (see the indicator **Perinatal Mortality Rate**).

Other difficulties may arise because national birth and death criteria may be differentially interpreted and applied, leading to the misclassification of live births as fetal deaths and vice versa. This problem may occur because of lack of training or experience (this is true of deaths that occur in facilities as well as at home) or because of how institutions and public-health authorities choose to interpret and apply national birth and death criteria. Changes in medical practice may also alter the way practitioners systematically classify deaths.

Ideally, all deaths (including fetal, perinatal, and neonatal) should be counted when estimating neonatal mortality, but in practice, counting neonatal deaths is often the only feasible approach.

In any program, the types of deaths to be counted depend on the program objectives, the measurement method chosen, and the resources available. Ideally, program staff should record information on all neonatal, perinatal, and fetal deaths in order to derive a complete picture of pregnancy outcomes. Having a complete picture is important because the causes of stillbirths and neonatal deaths are often the same, and the distinction between a stillbirth and a neonatal death may, in practice, be a very fine one. Just examining one rate or the other may underestimate the true level of mortality in the newborn period. Counting all deaths will provide a measure of the impact of interventions on etiologies that cause both fetal and neonatal deaths and will reveal the changes in the epidemiology of newborn deaths. Modern technologies, for example, may improve delivery outcome but increase neonatal mortality because fetal deaths are displaced from the antepartum to the postpartum period. Reporting neonatal, perinatal, and stillbirth rates together will also permit more valid comparisons across programs and settings. Realistically, however, few programs are able to achieve this goal as in many developing countries, the majority of births and deaths occur at home (WHO, 1996a).

Demonstrating the impact of child health programs on infant and child mortality requires more than simply tracking death rates over time.

While many programs would like to attribute improvements in child health and survival to their program activities or interventions, in practice, many factors other than the program may have contributed to these changes. Controlled field experiments demonstrating what would have happened in the absence of the program are often not feasible for evaluating ongoing national-level programs. Thus, an essential element of the evaluation of child health programs is to establish the level of certainty that is needed for decision makers to act on the findings of the evaluation.

Selection of Indicators

The indicators presented in this chapter are the following:

- Late fetal death rate
- Perinatal mortality rate
- Cause-specific perinatal mortality rate
- Birth weight specific mortality rate
- Neonatal mortality rate
- Infant mortality rate
- Child mortality rate
- Under-five mortality rate
- Cause-specific mortality rate

Note that the first five indicators are cross-referenced in chapter three. Methods based on deaths averted can be also used to measure the impact of child health programs. These methods compare the observed period child mortality rates with hypothetical rates that would have been expected in the absence of a program. The difference between the observed and potential mortality is used to derive an estimate of the number of deaths that did not occur during a specified reference period due to the effect of a program.



INDICATOR

LATE FETAL DEATH RATE (LFDR)

Definition

Number of late fetal deaths per 1,000 births (live births plus late fetal deaths) in a given period.

Numerator: Number of babies born dead after 28 weeks of gestation (or birth weight over 1 kg) in a given period.

Denominator: Total number of births (live births plus fetal deaths) in the same period.

A “*late fetal death*” is defined as death of a fetus after 28 weeks of gestation.

The WHO definition of a “*fetal death*,” also adopted by the United Nations and the National Center for Health Statistics (NCHS), is death before the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy. The death is indicated by the fact that after such separation, the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definitive movement of voluntary muscles.

A “*live birth*” is described by the United Nations (2001) as “the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.”

The terms “stillbirth” and “fetal death” are sometimes used interchangeably.

Measurement Tools

Population-based surveys; vital registration; service statistics; routine HIS

What It Measures

The LFDR directly reflects prenatal and intrapartum care. It is a measure of the quality of maternal health care services. There are an estimated four million late fetal deaths each year. Common causes of late fetal death are preventable maternal STIs such as syphilis, intrapartum birth asphyxia, pre-term birth, birth defects, maternal hypertension, and maternal diabetes.

How to Measure It

This indicator requires two pieces of information for a given population and reference period: the number of live-born babies and the number of fetal deaths from 28 weeks gestation (equivalent to birth weight over 1 kg). WHO usually refers to the expected weight at a given gestational age since gestational assessment is often unavailable (WHO, 1992). At the facility level, the numerator can be measured from birth registers or delivery room logs and from case reviews at the health facility (or in the community). Some countries, such as Malaysia, have nationwide systems for reporting late fetal deaths.

The denominator is the number of live births plus the number of fetal deaths occurring in the same reference period. Where data on the number of live births are unavailable, evaluators can estimate the total number of live births using census data for the total population and crude birth rates in a specified area as follows:

$$\text{Total expected births} = \text{population} \times \text{crude birth rate}$$

In settings where the crude birth rate is unknown, WHO recommends using 3.5% of the total population as an estimate of the number of pregnant women (i.e., number of live births or pregnant women = total population \times 0.035 [WHO, 1999a, 1999b]).

Fetal deaths or stillbirths are under-recorded in many settings. However, they can be estimated by using the ratio of stillbirths to early neonatal deaths, which is usually 1:1. Thus, if the number of deaths during the first week of life is known, the number of late fetal deaths can be estimated as this will be equal to the number of neonatal deaths. In some situations, such as high rates of syphilis infection, there may be more stillbirths than neonatal deaths.

Strengths and Limitations

This indicator suffers from underreporting and under-recording. Health facility-based data significantly underestimate the problem of late fetal deaths because in many settings, many late fetal deaths and live births occur outside the health system, which will cause substantial selection bias. Therefore, facility data are not recommended for estimating the LFDR for the general population.

Both the coverage and quality of data on late fetal deaths are insufficient and unreliable in many developing countries due to sociocultural reasons, health system barriers, and the poor coverage and quality of vital registration systems. Sociocultural barriers to obtaining information on pregnancy and birth outcomes include seclusion of women and newborns at home, misconceptions about the importance of registration and data collection, and acceptance of fetal-neonatal deaths as normal. Barriers within the health system include the lack of motivation for staff to collect necessary data, perceptions of the viability of the baby, and errors in the coding of cause of death. Barriers to registration include issues of accessibility and affordability and lack of awareness of the benefits of registration (Lawn et al., 2001).

Pregnancy histories, now included in many surveys, including the DHS, are another source of data for calculating this indicator. However, there has been relatively less experience with pregnancy histories than with birth histories because of concerns about the quality of retrospectively reported pregnancy histories. Common problems with data quality include the omission of late fetal and early neonatal deaths and difficulty in obtaining accurate information on gestational age or birth weight leading to the misclassification of some stillbirths as late spontaneous abortions.

International comparisons are limited by nonstandard definitions and terminology for late fetal deaths and highly variable application of these definitions. For example, ICD-10 defines late fetal deaths from 22 to 40-weeks gestation. For international comparisons, a birth weight of at least 1000g (or of 28-weeks gestation or more if weight is unavailable) is recommended. Errors or confusion may arise in distinguishing between a live birth and a late fetal death.



INDICATOR

PERINATAL MORTALITY RATE (PMR)

Definition

Number of perinatal deaths per 1,000 total births (live births and fetal deaths) in a given period.

Numerator: Sum of fetal deaths and deaths to live-born babies within the first seven completed days (i.e., age 0–6 days) of life in a given period.

Denominator: Total number of births (live births and fetal deaths) in the same period.

A “*perinatal death*” is a fetal death or an early neonatal death.

The WHO definition of a “*fetal death*,” also adopted by the United Nations and the National Center for Health Statistics (NCHS), is death before the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy. The death is indicated by the fact that after such separation, the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definitive movement of voluntary muscles.

A “*fetal death*” is the death of a fetus weighing 500g or more, or of 22-weeks gestation or more if weight is unavailable (ICD-10). The terms stillbirth and fetal death are sometimes used interchangeably.

A “*late fetal death*” is defined as death of a fetus after 28 weeks of gestation.

An “*early neonatal death*” (END) is the death of a live newborn within the first seven completed days (i.e., 0–6 days) of life. Note: The day of birth is counted as day 0, so that “within the first 7 completed days” or “within 1 week” includes babies 0–6 days old.

A “*live birth*” is described by the United Nations (2001) as “the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.”

Great variation exists both between and within countries on how the fetal death component of perinatal mortality is recorded, particularly for early fetal deaths that occur at 22 to 27-weeks gestation. For international comparison, WHO (1992) suggests including only deaths of fetuses weighing at least 1,000g or of 28-weeks gestation or more if weight is unavailable. Presentations of the PMR should include a clear statement of the definition of perinatal mortality used. In practice, in most developing countries, accurate data on birth weight or gestational age are difficult to obtain.

Measurement Tools

Population-based surveys; vital registration; service statistics; routine HIS

What It Measures

The PMR is a key outcome indicator for newborn care and directly reflects prenatal, intrapartum, and newborn care. It is estimated that perinatal deaths account for approximately 7% of the global burden of disease (World Bank, 1993). The early neonatal component of the PMR may respond relatively quickly to programmatic interventions, for example, following the introduction of elements of the WHO “Essential Newborn Care Package.” The fetal death component may decline more

slowly because it depends more on interventions that primarily influence maternal health and on the availability of technologies such as caesarian section.

How to Measure It

This indicator requires three pieces of information: the number of fetal deaths in a given population in a given period (i.e. 12 months); the number of deaths of live-born babies at age 0–6 days in the same population and period; and the number of births (live births plus fetal deaths) in the same population and period.

The PMR obtained from large population-based surveys may be calculated at the subnational level if sample sizes are sufficiently large.

Strengths and Limitations

Because the PMR includes both fetal deaths and deaths in the first week of life, it avoids the problems of defining a live birth. There are, however, problems with the identification of a fetal death or stillbirth. According to the WHO, a fetal death occurs after the twenty-second week of gestation. However, different countries often use slightly different definitions, making international comparisons of the PMR difficult.

In many countries, vital registration data are not sufficiently complete to allow reliable estimation of the PMR. Techniques now exist for collecting data on stillbirths, live births, and early neonatal deaths in population-based surveys through pregnancy histories. These pregnancy histories are now included in many surveys, including the DHS. However, there has been relatively less experience with pregnancy histories than with birth histories because of concerns about the quality of retrospectively reported pregnancy histories.

Data quality is an issue. Common problems with data quality include:

- Omission of stillbirths and early neonatal deaths. It is estimated that perinatal mortality rates are under-reported by at least 40% (WHO and UNICEF, 1996) and by as much as 500% in countries with high death rates (Lumbignon, Panamonta, Laopaiboon, Pothinam, and Patithat, 1990; McCaw-Binns, Fox, Foster-Williams, Ashley, and Irons, 1996);
- Difficulty in obtaining accurate information on gestational age or birth weight leading to the misclassification of stillbirths as late spontaneous abortions; and
- Heaping of the reported age at death of live births on seven days, leading to the misclassification of early neonatal deaths as late neonatal deaths.*

Prospective population-based surveys of pregnant women provide better quality data, but are expensive to undertake.

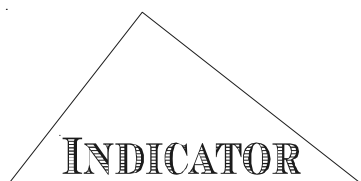
Survey-based estimates are generally subject to relatively large sampling errors making it difficult to detect changes over short periods unless the changes are quite large. Retrospective survey-based estimates are often based on a five-year period prior to the survey.

The following caveats bear mention. The PMR is sensitive to changes in the quality of data. For example, a rise in the PMR may indicate deterioration in perinatal outcomes, or an improvement in the reporting of perinatal deaths. Therefore, an assessment of data quality is an essential component of analysis. In this context, evaluators often find it useful to disaggregate the PMR into its two components: stillbirths and

* Heaping occurs when respondents do not know the exact age at death. Estimated ages at death are often reported on certain preferred ages, such as seven days, leading to a distorted age distribution of deaths in which too many deaths are reported at the preferred age, and too few at the ages just before and after.

early neonatal deaths. Data quality is generally more problematic for stillbirths than for early neonatal deaths, because of the ambiguity over the definition of fetal deaths and problems obtaining gestational age (WHO, 1996a).

Facility data are not recommended for estimating the PMR for the general population because in many settings, many perinatal deaths and live births occur outside the health system. Facility-based estimates of the PMR should also be interpreted with caution because the rate is sensitive to the types of deliveries occurring in the facility. Consequently, the PMR may rise or fall in response to changes in the mix of deliveries in a facility. In small facilities, the PMR will be potentially unstable because of the small number of deliveries and perinatal deaths; thus, the PMR may be ineffective for monitoring change over time in a single facility. Facility-based data are more useful for monitoring in countries where a large proportion of births take place in facilities and where the completeness of routine reporting is high.



CAUSE-SPECIFIC PERINATAL MORTALITY RATE

Definition

Number of perinatal deaths from a specific cause per 1,000 births (live births and fetal deaths) in a given period.

Numerator: Number of perinatal deaths from a specific cause in a given period x 1,000 (or 10,000 or 100,000).

Denominator: Total number of births (live births and fetal deaths) in the same period.

A “*perinatal death*” is a fetal death or an early neonatal death.

The terms “stillbirth” and “fetal death” are sometimes used interchangeably.

Specific causes that are commonly measured include:

- Lethal or severe congenital abnormalities;
- Acute intrapartum events, resulting in intrapartum stillbirths or neonatal deaths due to “asphyxia;” and
- Infections, which may be highly specific, e.g., syphilis infections as a cause of stillbirths and early neonatal deaths.

The exact causes of death being coded may differ depending upon the program or locality where the indicator is being collected.

The WHO definition of a “*fetal death*,” also adopted by the United Nations and the National Center for Health Statistics (NCHS), is death before the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy. The death is indicated by the fact that after such separation, the fetus does not breathe or show any other

evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definitive movement of voluntary muscles.

A “*fetal death*” is the death of a fetus weighing 500g or more or of 22-weeks gestation or more if weight is unavailable (ICD-10). The terms stillbirth and fetal death are sometimes used interchangeably.

An “*early neonatal death*” (END) is the death of a live newborn within the first seven completed days (i.e., 0-6 days) of life. Note: The day of birth is counted as Day 0, so that “within the first 7 completed days” or “within 1 week” includes babies 0-6 days old.

A “*live birth*” is described by the United Nations (2001) as “the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.”

Great variation exists both between and within countries on how the fetal death component of perinatal mortality is recorded, particularly for early fetal deaths that occur at 22 to 27-weeks gestation. For international comparison, WHO (1992) suggests including only deaths of fetuses weighing at least 1000g or of 28-weeks gestation or more if weight is unavailable. Presentations of the PMR should include a clear statement of the definition of perinatal mortality used. In practice, in most developing countries, accurate data on birth weight or gestational age are difficult to obtain.

Measurement Tools

Facility-based perinatal death audits; community/demographic surveillance; vital registration; verbal autopsy

What It Measures

This indicator measures death from specific causes during the perinatal period. Measurement of cause-specific perinatal mortality is important for several reasons, including the following: (1) to establish the relative public health importance of the different causes of death; (2) to evaluate trends over time for specific causes of death; (3) to evaluate health interventions aimed at reducing mortality from specific causes of death; (4) to investigate the circumstances surrounding the deaths in order to identify ways to reduce unnecessary death; and (5) to facilitate research into factors associated with mortality from specific causes of death.

How to Measure It

This indicator can be measured at the health facility, district, national or community levels, (although death coding at the community level may be less reliable), or a more simple surrogate measure of a specific cause may need to be used. Perinatal Death Audits (PNDAs) are being promoted increasingly in developing countries, particularly at the facility level. Several training programs are available for PNDAs with supporting software, including the Perinatal Education Program, a distance education program available on the internet that has been used to train over 30,000 doctors and nurses, largely in South Africa (www.pepcourse.co.za), with the Perinatal Problem Identification Program Software used to analyze the data (www.ppip.co.za).

In areas where medical certification of cause of death is rare, verbal autopsy is often used to identify the causes of death among infants and children. Demographic surveillance, where all deaths are reported on a regular basis throughout the year, may be used to identify deaths.

In verbal autopsy, differing methods can be used to obtain a verbal account of the cause of death. In an open-ended history, the caregiver or next-of-kin is asked to tell about the events leading up to the child's death in their own words and probed to follow-up on particular aspects. Close-ended questions ask whether specific symptoms and signs were present during the final illness. "Expert" opinions or computerized algorithms are then applied to allocate the presumed cause of death using the descriptive data.

Strengths and Limitations

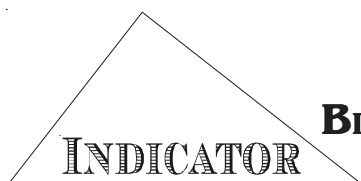
It is difficult to assign causes of death, even at the health facility level. At the community level, data collection is often retrospective and reliant upon verbal autopsy, rather than on a clinically determined cause of death. These factors contribute to bias and may make the validity and reliability of the data questionable. Failure to enumerate all deaths can lead to an invalid measure of proportionate cause of death. For example, selective undercounting of deaths in the first hour of life will disproportionately reduce the numbers of deaths due to asphyxia and severe preterm birth. Unless the neonatal mortality rate is high, and/or a large number of births are included, the cause-specific mortality rate may be misleading, as small numbers will not allow for the investigation of time trends.

Vital registration systems often do not have sufficient coverage to provide accurate data about cause-specific mortality in developing countries. Usually a 90% coverage rate is taken as a cut-off for representation. Demographic surveillance tends to cover limited geographic areas, thus the underlying cause-specific mortality in these areas cannot be necessarily generalized to wider populations, as some of the populations under surveillance are not typical due to multiple trials and interventions.

Misclassification of the cause of death not only affects estimates of levels of cause-specific mortality over time, but also comparisons in cause-

specific mortality rates between two population groups. In mortality surveys, the accuracy of the indicator depends on the ability of respondents to describe the final illness as well as on the way in which diseases are understood and described in the community. Clear case definitions and the use of hierarchical categories for allocating cause of death will minimize subsequent errors.

One limitation of cause-specific mortality rates is that the death of a child is commonly the result of more than one cause. Some verbal autopsy questionnaires, such as those developed by WHO, Johns Hopkins School of Hygiene and Public Health, and the London School of Hygiene and Tropical Medicine, allow for multiple causes of death, while others only allow for one. When interpreting this indicator, it is important to know whether multiple causes of death are allowed for in the coding since the sum of the proportions for each cause of death will generally be greater than 1.00 when multiple causes of death are allowed. For this reason, many analyses do restrict the major cause of death to one cause per child. The Perinatal Problem Identification Program in South Africa allows for the coding of primary obstetric causes of death (for stillbirths and neonatal deaths), final causes of death (in neonatal deaths), and avoidable causes of death that are patient related, health care worker related, and administrative.



BIRTH WEIGHT SPECIFIC MORTALITY RATE (BWSMR)

Definition

The Birth Weight Specific Mortality Rate (BWSMR) is a stratification of a “newborn mortality rate” by birth weight grouping. For example, the Birth Weight Specific Neonatal Mortality Rate (BWSNMR) for births weighing 2500g or more is calculated as:

Numerator: Number of neonatal deaths weighing 2500g or more at birth.

Denominator: Total number of live births weighing 2500g or more at birth.

And for births under 2500g, the BWSNMR is calculated as:

Numerator: Number of neonatal deaths weighing under 2500g at birth.

Denominator: Total number of live births weighing under 2500g at birth.

Measurement Tools

Service statistics; HIS (in highly developed systems)

What It Measures

Birth weight is the most sensitive predictor of infant survival and a good predictor of maternal health and well-being. The mortality rate for low birth weight babies is much higher than for those with a normal birth weight. Stratifying newborn deaths by birth weight helps to determine the cause of death and therefore to identify where interventions are needed. For example, deaths of very small babies are more likely related to maternal causes predisposing to intrauterine growth retardation and preterm birth, whereas deaths of normal birth weight babies are more

likely to be related to intrapartum asphyxia and poor obstetric care. In the first case, interventions should focus on the mother (improving nutrition and reducing antenatal infection) and, in the second case, the focus should be on improving the quality of delivery care. Evaluators can obtain additional information by stratifying birth weight by time of death (see Table 3.5 on page 102).

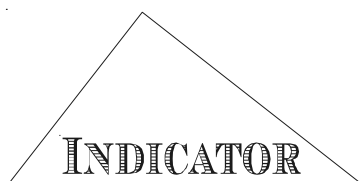
How to Measure It

The data requirements for calculating this indicator are the number of deaths in a particular birth weight grouping and the total number of births in the same weight grouping.

Strengths and Limitations

Information for this indicator can only be collected in settings where all babies are weighed. It is therefore most appropriate for use in health facilities but has been collected in some community settings as part of maternal and perinatal health area surveillance systems (Lawn et al., 2001).

One useful application of this type of disaggregation is to examine the number of intrapartum deaths in normal birth weight babies. If the quality of obstetric care is good (and women are not presenting very late in labor), then very few intrapartum deaths should occur because deliveries are expedited rapidly. The proportion of fetal deaths in babies of normal birth weight may serve as a proxy indicator for intrapartum asphyxia and quality of delivery care.



NEONATAL MORTALITY RATE (NMR)

Definition

Number of neonatal deaths per 1,000 live births in a given period.

Numerator: Number of deaths within the first 28 completed days of life (0-27 days) in a given period x 1000.

Denominator: Total number of live births in the same period.

The NMR is often broken down into early and late neonatal mortality rates. The early neonatal mortality rate (ENMR) is calculated as follows:

Numerator: Number of deaths within the first seven completed days of life (0-6 days) in a given period x 1000.

Denominator: Total number of live births in the same period.

The late neonatal mortality rate (LNMR) is calculated as follows:

Numerator: Number of deaths within 7-27 completed days in a given period x 1000.

Denominator: Total number of live births in the same period.

A “*neonatal death*” is defined as a death within the first 28 completed days of life (0-27 days).

A “*live birth*” is described by the United Nations (2001) as “the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite

movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.”

Note: The day of birth is counted as day 0, so that “within the first 7 completed days” or “within 1 week” includes babies 0-6 days old.

Measurement Tools

Census; population-based surveys (e.g., DHS, MICS, KPC); vital registration system; service statistics

What It Measures

The NMR is a key outcome indicator for newborn care and directly reflects prenatal, intrapartum, and neonatal care. Early neonatal deaths are more closely associated with pregnancy-related factors and maternal health, whereas late neonatal deaths are associated more with factors in the newborn’s environment.

How to Measure It

To calculate this indicator, two pieces of information are needed: the number of neonatal deaths in a given population and reference period, and the number of live births in the same population and reference period. The reference period is usually one year but it could also be five years.

Where data on the numbers of live births for the denominator are unavailable, evaluators can calculate total estimated live births using census data for the total population and crude birth rates in a specified area:

$$\text{Total expected births} = \text{population} \times \text{crude birth rate}$$

In settings where the crude birth rate is unknown, WHO recommends using 3.5% of the total population as an estimate of the number of pregnant women (number of live births or pregnant women = total population x 0.035 [WHO 1999a; WHO 1999b]).

Routine HIS may collect data for this indicator to obtain estimates of the NMR for facilities. Facility data are not recommended for estimating the NMR for the general population, because in many settings, a number of neonatal deaths and live births occur outside the health system, which will cause substantial selection bias.

The NMR is usually calculated at the national level. Sub-national estimates can also be calculated if sample sizes are sufficiently large. The NMR is sometimes calculated at a facility level to monitor the outcome of delivery and newborn care in health facilities. Reliable estimates for individual facilities can only be obtained for very large facilities if there are large numbers of deliveries and neonatal admissions.

Strengths and Limitations

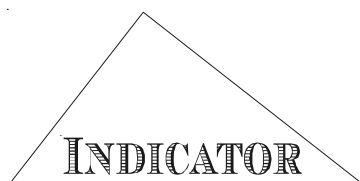
In many countries, vital registration data are not sufficiently complete to allow reliable estimation of the NMR. The standard techniques for collecting data on live births and neonatal deaths in population-based surveys have been widely applied in programs such as the WFS and DHS. Data quality is an important issue; common problems include omission of deaths, particularly very early neonatal deaths, and heaping of the reported age at death on seven, 28, or 30 days.* Heaping on these digits is particularly problematic because it will lead to the misclassification of early neonatal deaths as late neonatal death (seven days) or late neonatal deaths as post-neonatal deaths (28 and 30 days).

* Heaping occurs when respondents do not know the exact age at death. Estimated ages at death are often reported on certain preferred ages, such as seven, 28, or 30 days, leading to a distorted age distribution of deaths in which too many deaths are reported at these preferred ages, and too few at the ages just before and after.

The NMR may respond fairly quickly to programmatic interventions, for example, immunizing all pregnant women in areas of high tetanus prevalence. However, survey-based estimates are generally subject to relatively large sampling errors, so it is impossible to detect changes over short periods of time unless the changes are quite large. Also, changes in neonatal mortality rates are usually a long-term phenomenon and thus occur slowly. Therefore, we recommend collecting estimates of the NMR every three to five years or longer.

One limitation is that the NMR is sensitive to changes in data quality. For example, a rise in the NMR may indicate deterioration in newborn health outcomes, or it may indicate an improvement in the reporting of neonatal deaths. Therefore, assessing data quality is essential to analysis.

Also, comparisons of facility-based estimates of the NMR should be interpreted carefully because the NMR in a facility is very sensitive to the case mix of deliveries and neonatal admissions. A higher NMR in one facility may not suggest poorer quality of neonatal care in that facility because the NMR may rise or fall with changes in the case-mix. Also, improvements in prenatal and intrapartum care and advances in medical technology may increase the NMR because babies who may otherwise have been stillbirths may survive delivery only to die in the neonatal period. For these reasons, we recommend that evaluators break down facility-based estimates of the NMR by birth weight (see **Birth Weight Specific Mortality Rate**) and by admission status (direct admission or transfer-in) as a proxy for case mix.



INFANT MORTALITY RATE (IMR)

Definition

The number of deaths to infants (children under one year of age) per 1,000 live births in a given period.

Numerator: Number of deaths to infants (children under one year of age) in a given period x 1,000.

Denominator: Total number of live births in the same period.

The infant mortality rate can also be expressed as a probability of a child born in a specified year dying before reaching the age of one year.

“*Infancy*” is regarded as the first year of life.

A “*live birth*” is described by the United Nations (2001) as “the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.”

Measurement Tools

Census; population-based surveys (e.g., DHS, MICS, KPC); vital registration system

What It Measures

The infant mortality rate measures death in the first year of life. It captures both deaths that are a result of genetic and structural malformations and birth delivery complications (most frequently in the first month of life) and those that are associated

more with external social or environmental conditions (in the remaining months of the first year of life)

How to Measure It

The infant mortality rate is calculated by dividing the number of infant deaths (i.e., the deaths of children under one year of age) in a given period by the total number of live births in the same period and multiplying the result by 1000. An infant death can be recorded only when a baby is born alive and when a baby born alive dies before reaching its first birthday. If there has been a still-birth, then it would be classified as a fetal death and not be included in either official birth statistics or death statistics.

The infant mortality rate can be calculated from a vital registration system – one covering at least 90% of vital events in the population. This level of completeness is not found in national vital registration systems in many developing countries. Delays in processing data and difficulties in estimating the appropriate denominators to calculate the rate may also limit the use of vital registration data for measuring this indicator.

In many countries, sample surveys such as the DHS and censuses are the primary sources of information for the calculation of the infant mortality rate. Censuses and surveys usually ask questions on the number of children ever born, the survivors by age, and the age of the mother. From these data, one can estimate infant mortality rates indirectly using the Brass Method, as in the MICS (see *United Nations Manual X* [UN, 1983] for a complete description of this technique). These estimates are generated in the form of a time series trend and not as single estimates for individual points in time. Indirect estimates are less appropriate for measuring program impact,

since the entire time series trend is reevaluated when new empirical data become available.

In the DHS, infant mortality is calculated directly from the birth histories of women. Women are asked questions about each live birth they have ever had. These questions cover the date of birth, current age, survival status of the child, and, if the child is dead, the age at death. From this information it is possible to construct life table estimates of mortality.

The Programme of Action of the International Conference on Population and Development encouraged countries with intermediate mortality levels to achieve an infant mortality rate below 50 deaths per 1,000 births by the year 2005, and all countries to achieve an infant mortality rate below 35 per 1,000 live births by 2015. The IMR can be calculated every year from a vital registration system – one covering at least 90% of vital events in the population. When data are derived from household surveys, the IMR should be measured every five years.

Strengths and Limitations

Changes in mortality rates are usually a long-term phenomenon and thus occur slowly. Therefore, for purposes of monitoring change, this indicator should be measured at least every five years. The indicator is not recommended for use at the local level as it may lead to unrealistic program expectations. When interpreting trends in mortality, it is important not to combine indirect estimates with direct estimates in order to form trends lines because of the possibility of spurious trends, which may be an artifact of the methodologies used to estimate the rates and differences in the reporting periods.

Sometimes, it is difficult to determine whether a fetus has been born live or dead. This determination is often based on a judgment by an attending physician, nurse, or midwife and has an influence of infant mortality measures. Ambiguity about whether a live birth has occurred has

consequences for whether the death is classified as a fetal death or death to a live-born.

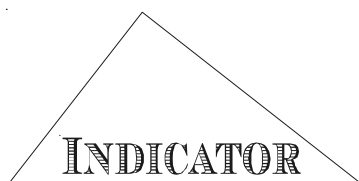
In developing countries, household surveys are essential to the calculation of this indicator, but there are some limits to their quality. Survey data on under-five deaths are subject to recall error, and require large samples, which may be costly. Therefore, when using household surveys it is important to take into account sampling errors. In addition, indirect estimates rely on estimated actuarial (“life”) tables that may be inappropriate for the population concerned.

The indirect technique for calculating infant mortality requires fewer and simpler questions resulting in substantial cost savings. It also requires the collection of birth histories, which may be difficult and time consuming. However, birth histories give the most robust estimates of infant mortality, short of actual birth and death registration. Vital registration data may suffer from a number of problems, including omission of some births and deaths, especially infants that died shortly after birth, and the misreporting of the date of birth and the age at death. Omission of infant deaths is usually most severe for deaths that occur early in infancy.

Clearly, risks of death to infants are greatest at the instant after birth and may decline subsequently. For this reason, it is useful to divide infant mortality into components, according to the time of death. The most frequently used distinctions are deaths in the first month or twenty-eight completed days of life (called neonatal mortality) and deaths in the remaining months of the first year of life (called postneonatal mortality). When this distinction is used, it recognizes the different patterns of causes of death in each period. While neonatal deaths frequently arise out of conditions originating in the prenatal period, postneonatal deaths are more likely to reflect the socioeconomic conditions of the home (e.g., quality of care and nutrition), as well as infectious diseases and other causes. In calculating

the postneonatal mortality rates, the numerator is the number of deaths of children from 28 days up to, but not including, one year of age during a given time period and the denominator is the number of live births during the same period. The postneonatal mortality rate is usually expressed per 1,000 live births.

It is to be noted that in settings with high AIDS prevalence, estimates of infant and child mortality using the direct or indirect approach may be compromised. This bias is due to the fact that children whose mothers have died tend to have higher mortality, and in surveys, data on child deaths are collected retrospectively from living mothers.



CHILD MORTALITY RATE (CMR)

Definition

The number of deaths to children aged 12-59 months per 1,000 children in this age group in a given period.

Numerator: Number of deaths to children aged 12-59 months in a given period x 1,000.

Denominator: Total number of children aged 12-59 months in the same period.

The CMR may also be expressed as the probability (expressed as a rate per 1,000 live births) of a child born in a specified year dying between age one year and the fifth birthday if subject to current age-specific mortality rates. When the CMR is presented as the probability of dying between the exact age of one year and the fifth birthday, it is expressed as ${}_4q_1$.

Measurement Tools

Census; population-based surveys (e.g. DHS); vital registration system

What It Measures

The child mortality rate measures the risk of death in the first several years of life. It captures deaths that are associated more with external, social, or environmental conditions, such as nutrition, sanitation, communicable diseases of childhood, and accidents occurring in and around the home. The child mortality rate also reflects the level of poverty and is consequently a sensitive indicator of the level of socioeconomic development. While this indicator is less responsive to rapid changes in the health status of infants and children, it is indicative of the broader range of socioeconomic conditions that affect overall health.

How to Measure It

Child mortality is measured by relating deaths to children aged 12-59 months (in the numerator) to the total population of children aged 12-59 months and then multiplying by a constant, usually 1,000. CMR is usually calculated for a specific period of time. The period may be as short as one year, though a longer period of three to five years is typically used. In most surveys, including DHS, estimates are often for five-year periods.

Child mortality data can be derived directly from vital registration systems – one covering at least 90% of vital events in the population. These are often not available in developing countries and may not be a valid source of information in locations where the coverage of vital registration systems is low. Delays in processing data and difficulties in estimating the appropriate denominators to calculate the rate may also limit the use of vital registration data for measuring this indicator.

In many countries, sample surveys such as the DHS and censuses are usually the primary sources of information for the calculation of the infant mortality rate. Censuses and surveys usually ask questions on the number of children ever born, the survivors by age, and the age of the mother. From these data, one can estimate child mortality rates indirectly using mathematical modeling. These estimates are generated in the form of a time series trend and not as single estimates for individual points in time (see *United Nations Manual X* [UN, 1983] for a complete description of this technique). Indirect estimates are less appropriate for measuring program impact, since the entire time series trend is reevaluated when new empirical data become available.

In the DHS, child mortality is calculated directly from the birth histories of women. Women are asked questions about each live birth they have ever had. These questions cover the date of birth, current age, survival status of the child, and, if dead, age at death. From this information, it is possible to use life table analysis to construct direct estimates of child mortality.

Goal 4, Target 5 of the Millennium Development Goals (MDG) is to reduce by two-thirds the mortality rate among children under five by 2015. The CMR can be measured annually where vital registration systems cover at least 90% of vital events in the population. When data are derived from household surveys, the CMR should be measured every five years.

Strengths and Limitations

Changes in mortality rates are usually a long-term phenomenon and thus occur slowly. Therefore, for purposes of monitoring change, this indicator should be measured at least every five years. The indicator is not recommended for use at the local level as it may lead to unrealistic program expectations. When interpreting trends in mortality, it is important not to combine indirect estimates with direct estimates in order to form trends lines because of the possibility of spurious trends, which may be an artifact of the methodologies used to estimate the rates and differences in the reporting periods.

The indirect technique for calculating child mortality requires fewer and simpler questions, resulting in substantial cost savings. Collecting birth histories may be difficult and time consuming. However, information from birth histories provide the most robust estimates of infant mortality, short of actual birth and death registration. Vital registration data may suffer from a number of problems, including omission of some births and deaths, especially infants that died shortly after birth, and the misreporting of the date of birth and age at death. Omission of infant deaths is usually most severe for deaths that occur early in infancy.

In developing countries, household surveys are essential to the calculation of this indicator, but there are some limits to their quality. Survey data are subject to recall error, and surveys estimating under-five deaths require large samples, which may be costly. Therefore, when using household surveys it is important to consider sampling errors. In addition, indirect estimates rely on estimated actuarial (“life”) tables that may be inappropriate for the population concerned.

In settings with high AIDS prevalence, estimates of child mortality using the direct or indirect approach may be compromised. This bias is due to the fact that children whose mothers have died tend to have higher child mortality, and in surveys, data on child deaths are collected retrospectively from living mothers.

MDG Indicator**Definition**

The number of deaths to children aged 0-4 years in a given period per 1,000 live births in the same period.

Numerator: Number of deaths to children aged 0-4 years in a given period x 1,000.

Denominator: Total number of live births in the same period.

The U5MR may also be expressed as the probability (expressed as a rate per 1,000 live births) of a child born in a specified year dying before reaching the age of five if subject to current age-specific mortality rates. When under-five mortality is presented as a probability of dying before age five, it is expressed as ${}_5q_0$. This is the definition typically used when calculating U5MR from household surveys. Strictly speaking this is not a rate (i.e., the number of deaths divided by the total population at risk during a given period of time), but a probability of death derived from a model life table and expressed as the rate per 1,000 live births.

A “live birth” is described by the United Nations (2001) as “the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.”

Measurement Tools

Census; population-based surveys (e.g., DHS, MICS); vital registration system

What It Measures

This indicator is a composite of the risks of dying in infancy and early childhood. It also reflects the social, economic, and environmental conditions in which children (and others in society) live, including their health care. The under-five mortality rate captures more than 90% of global mortality among children under the age of 18. The indicator may be used, therefore, as a measure of children’s well-being and the level of effort being made to maintain child health.

How to Measure It

At the national level, the best source of data is a complete vital statistics registration system – one covering at least 90% of vital events in the population. Such systems are uncommon in developing countries, so estimates are also obtained from sample surveys or derived by applying direct and indirect estimation techniques to vital registration, census, or survey data.

A wide variety of household surveys, including the MICS and DHS, are used in developing countries to estimate under-five mortality rates. In the DHS, birth histories are collected from women aged 15-49 years. Each eligible woman is asked the dates of birth and, where relevant, the age of death of every live-born child she has had. Using life-table analysis, this approach produces direct estimates of under-five mortality.

A second survey method is called the Brass method, which asks each woman surveyed simple questions such as her age, the total number of children she has borne, and the number of those

children who have died. The age of the mother and the proportion of children that died, in conjunction with assumption of fertility and other factors, allow an estimation of under-five mortality. This approach is used by the MICS and produces indirect estimates of under-five mortality (for a complete description of this technique, see *United Nations Manual X* [UN, 1983]). Longitudinal or prospective surveys following a sample of babies born in a specified year over a number of years may also be used to estimate under-five mortality. However, this approach is relatively uncommon in developing countries.

Vital statistics are typically available once a year, but they are unreliable in most developing countries. Household surveys that include questions on births and deaths are generally conducted every three to five years. Target 5 of the Millennium Development Goals (MDG) is to reduce the under-five mortality rate by two-thirds between 1990 and 2015. The U5MR can be measured annually where vital registration systems cover at least 90% of vital events in the population. When data are derived from household surveys, the U5MR should be measured every five years.

Strengths and Limitations

Changes in mortality rates are usually a long-term phenomenon and thus occur slowly. Therefore, for purposes of monitoring change, this indicator should be measured at least every five years. The indicator is not recommended for use at the local level as it may lead to unrealistic program expectations. When interpreting trends in mortality, it is important not to combine indirect estimates with direct estimates in order to form trends lines because of the possibility of spurious trends, which may be an artifact of the methodologies used to estimate the rates and differences in the reporting periods.

Sometimes, it is difficult to determine whether a fetus has been born live or dead. This determination is often based on a judgment by an attending physician, nurse, or midwife and has an

influence of infant mortality measures. Ambiguity about whether a live birth has occurred has consequences for whether the death is classified as a fetal death or a death to a live born.

The indirect technique for calculating infant and child mortality requires fewer and simpler questions resulting in substantial cost savings. Collecting birth histories may be difficult and time consuming. However, information from birth histories gives the most robust estimates of infant mortality, short of actual birth and death registration. Vital registration data may suffer from a number of problems, including omission of some births and deaths, especially infants that died shortly after birth, and the misreporting of the date of birth and age at death. Omission of infant deaths is usually most severe for deaths that occur early in infancy.

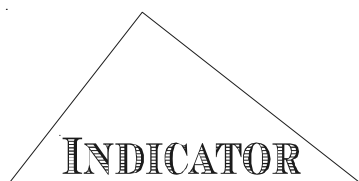
In developing countries, household surveys are essential to the calculation of this indicator, but there are some limits to their quality. Survey data are subject to recall error, and surveys estimating under-five deaths require large samples, which may be costly. Therefore, when using household surveys it is important to consider sampling errors. In addition, indirect estimates rely on estimated actuarial (“life”) tables that may be inappropriate for the population concerned.

In settings with high AIDS prevalence, estimates of under-five mortality using the direct or indirect approach may be compromised. This potential bias is due to the fact that children whose mothers have died tend to have higher child mortality, and in surveys, data on child deaths are collected retrospectively from living mothers.

Under five mortality rates based on household surveys can be calculated by different dimensions of equity: sex of the child, geography (urban-rural residence, major regions, or provinces), or socio-economic position (mother’s education, wealth quintile). Often, disaggregated under-five mortality rates are presented for ten-year periods, because of the rapid increase in sampling errors if

multiple categories are used. Censuses can also provide such detail but are typically conducted every ten years. Vital registration data do not often have the socioeconomic background variables, but can provide great geographic detail disaggregated by age and sex.

The U5MR has been recommended as an indicator for determining the extent of vitamin A deficiency (VAD) in a population. This is because populations with high U5MR invariably tend to have significant VAD. An U5MR > 50 per 1,000 live births is considered to indicate a high likelihood of VAD problems at the country level (IVACG, 2002). Under-five mortality rates are also frequently used to compare levels of socioeconomic development across countries. Comparisons between countries should be made with caution as the data used to arrive at estimates of under-five mortality come from a wide variety of sources of disparate quality and may refer to different reporting periods.



CAUSE-SPECIFIC MORTALITY RATE

Definition

The mortality rate from a specified cause during a given period.

Numerator: Number of deaths attributed to a specific cause in a given age group (e.g., 0-11 months, 12-59 months) during a specified time interval x 1,000 (or 10,000, 100,000).

Denominator: Total population of that age group at the midpoint of the interval.

Key illness groups for child survival include:

- ARI/Pneumonia
- Diarrhea
- Febrile illness (Malaria)
- Malnutrition
- Neonatal tetanus
- Measles

Measurement Tools

Community/demographic surveillance; vital registration; verbal autopsy

What It Measures

This indicator measures deaths from specific causes among children under the age of five years. Measurement of cause-specific mortality among children is important for several reasons, including the following: (1) to establish the relative public health importance of the different causes of death; (2) to evaluate trends over time in the major killer diseases; (3) to evaluate health interventions aimed at reducing mortality from specific causes of death, when these interventions are being introduced in a limited geographic area on a trial basis; (4) to investigate the circumstances surrounding the deaths of children in order to identify ways to

reduce unnecessary death; and (5) to facilitate research into factors associated with mortality from specific causes of death.

How to Measure It

In calculating cause-specific mortality rates, the numerator is the number of deaths attributed to a specific cause during a specified time interval in a population, and the denominator is the size of the population at the midpoint of the time interval. Cause-specific death rates can be calculated separately for children aged 0-11 months and those aged 12-59 months.

This indicator can be measured at the community or health facility, district, and national levels. In areas where medical certification of cause of death is rare, verbal autopsy is used to identify the causes of death among infants and children. Demographic surveillance, where all deaths are reported on a regular basis throughout the year (often once every two weeks), can also be used for identifying deaths.

In verbal autopsy, two different methods can be used to obtain a verbal account of the cause of death: an open-ended history of the final illness and close-ended questions. In the open-ended history, the caregiver or next-of-kin is asked to tell about the events leading up to the child's death in their own words, and then probed to follow-up on particular aspects. The descriptive account is then reviewed by medical experts who code the interview in terms of cause of death. Close-ended questions ask whether specific symptoms and signs were present during the final illness.

Strengths and Limitations

It is difficult to assign causes of death. Misclassification of the cause of death not only affects the estimated level of cause-specific

mortality over time, but also differences in cause-specific mortality rates between population groups. In mortality surveys, the accuracy of the indicator depends on the ability of respondents to describe the final illness and on the way in which diseases are understood and described in the community.

At the community level, data collection is often retrospective and relies on verbal autopsy, rather than on a clinically-determined cause of death. These factors contribute to recall bias and make the validity and reliability of the data questionable. Failure to enumerate all deaths can lead to misleading results. In addition, very large sample sizes are required. In most sites, it will be impossible to generate a cause-specific mortality rate.

Vital registration systems in developing countries often do not have sufficient coverage to provide accurate data of cause-specific mortality. Demographic surveillance tends to cover limited geographic areas and underlying cause-specific mortality in these areas cannot necessarily be generalized to wider populations.

One limitation of this indicator is that the death of a child is commonly the result of more than one cause. Some verbal autopsy questionnaires, such as that developed by WHO, Johns Hopkins School of Hygiene and Public Health, and the London School of Hygiene and Tropical Medicine, allow for multiple causes of death, while others allow only one cause of death. When interpreting this indicator, it is important to know whether multiple causes of death are allowed for in the coding, since the expected proportions of death for each cause will generally be higher when multiple causes of death are allowed.

References

- Lawn J, McCarthy B, and Ross SR. (2001). *The Healthy Newborn: A Reference Manual for Program Managers*. CARE, Centers for Disease Control. CCHI and World Health Organization.
- Lumbignon P, Panamonta M, Laopaiboon M, Pothinam S, and Patithat N. (1990). Why Are Thai Official Perinatal and Infant Mortality Rates so Low? *International Journal of Epidemiology*, 19:997-1000.
- McCaw-Binns AM, Fox K, Foster-Williams KE, Ashley DE, and Irons B. (1996). Registration of Births, Stillbirths and Infant Deaths in Jamaica. *International Journal of Epidemiology*, 25:807-813.
- Rutstein SO. (1999). *Guidelines for the MEASURE DHS+ Main Survey Report*. Calverton, MD: Macro International, Inc. Demographic and Health Surveys.
- United Nations. (1983). *Manual X: Indirect Techniques for Demographic Estimation*. New York: United Nations.
- United Nations. (1994). *Report of the International Conference on Population and Development, Programme of Action of the International Conference on Population and Development, Cairo, Egypt, September 5-13, 1994*. New York: United Nations. A/CONF. 171/13.
- United Nations. (2001). *Principles and Recommendations for a Vital Statistics System Revision 2*. New York: United Nations. Sales No. E.01.XV11.10.
- WHO. (1992). *International Statistical Classification of Diseases and Related Health Problems, 10th Revision*. Geneva, Switzerland: World Health Organization.
- WHO. (1996a). *Mother-Baby Package: Implementing Safe Motherhood in Countries*. Maternal Health and Safe Motherhood Program, Division of Family Health. Geneva, Switzerland: World Health Organization. WHO/FHE/MSM/94.11.
- WHO. (1999a). *Indicators to Monitor Maternal Health Goals: Report of a Technical Working Group, Geneva, 8-12 November 1993*. Division of Family Health. Geneva, Switzerland: World Health Organization.
- WHO. (1999b). *Reduction of Maternal Mortality: A Joint WHO, UNFPA, UNICEF, World Bank Statement*. Geneva, Switzerland: World Health Organization.
- WHO and UNICEF. (1996). *Revised 1990 Estimates of Maternal Mortality: A New Approach by WHO and UNICEF*. Geneva, Switzerland: World Health Organization.
- WHO, UNICEF, and Wellstart International. (1999). *The Baby Friendly Hospital Initiative: Monitoring and Reassessment: Tools to Sustain Progress*. Geneva, Switzerland: World Health Organization.
- World Bank. (1993). *1993 World Development Report: Investing in Health*. New York, NY: Oxford University Press.

