



# Reproductive Health Indicators

Guidelines for their generation,  
interpretation and analysis  
for global monitoring



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## I About these guidelines

### 1 Introduction

At the Millennium Summit in September 2000, the members of the United Nations reaffirmed their commitment to working towards a world in which sustainable development and the elimination of poverty would have the highest priority. The Millennium Declaration, adopted by 187 countries at the Summit, led to the definition of the Millennium Development Goals (MDGs) and related targets. The MDGs were guided in part by agreements and resolutions of international conferences over the past decade, including the International Conference for Population and Development (ICPD), held in Cairo in 1994. The goals are commonly accepted as a framework for measuring progress towards development.

The MDGs focus the efforts of the world community on achieving significant and measurable improvements in people's lives (*see Annex 1*). The first seven goals are mutually reinforcing and aim to reduce poverty in all its forms. The eighth and last goal—global partnership for development—is about the means

Table 1. Shortlist of indicators for global monitoring of reproductive health

1	Total fertility rate
2	Contraceptive prevalence
3	Maternal mortality ratio
4	Antenatal care coverage
5	Births attended by skilled health personnel
6	Availability of basic essential obstetric care
7	Availability of comprehensive essential obstetric care
8	Perinatal mortality rate
9	Prevalence of low birth weight
10	Prevalence of positive syphilis serology in pregnant women
11	Prevalence of anaemia in women
12	Percentage of obstetric and gynaecological admissions owing to abortion
13	Reported prevalence of women with genital mutilation
14	Prevalence of infertility in women
15	Reported incidence of urethritis in men
16	Prevalence of HIV infection in pregnant women
17	Knowledge of HIV-related preventive practices

to achieve the first seven. In the years following the ICPD, international agencies agreed on a shortlist of 17 indicators for monitoring the reproductive health goals (*Table 1*). Selection of these indicators included a comprehensive review process, and this document contains a brief description of and justification for each of these 17 indicators.

The MDGs include a number of targets in the area of sexual and reproductive health. MDG 5 concerns maternal health and aims to reduce by three quarters the maternal mortality ratio between 1990 and 2015. Estimates by WHO, UNICEF and

between rich and poor even within countries). This calls for disaggregation of indicators by relevant factors such as place of residence (urban versus rural), educational or economic status and age group, so that local realities are not obscured and MDG targets can be monitored independently of national averages.

In general, the shortage of reliable data represents a long-standing barrier towards monitoring reproductive health and MDG indicators. The report of the Ad Hoc Committee of the Whole of the Twenty-first Special Session of the United

Box 1. The ICPD reproductive health goal on universal access

Universal access by 2015 to the widest possible range of safe and effective family planning methods, including barrier methods, and to the following related reproductive health services: essential obstetric care, prevention and management of reproductive tract infections including sexually transmitted infections (2).

UNFPA for the years 1990, 1995 and 2000 indicate that more than half a million women die every year from complications of pregnancy and childbirth, of which more than 50% occur in Africa and 40% in Asia (1). Because maternal mortality is difficult to measure and, in general, trend comparisons are not reliable, efforts have been made to identify appropriate process indicators to assess reproductive health (*Box 1*). This has shifted the emphasis from indicators of health to indicators of access and use of health care systems. In addition, the recognition that some women need specialist obstetric care if they are not to die in childbirth has led to indicators for assessing the availability of basic and comprehensive essential obstetric care.

Furthermore, the reduction and elimination of poverty need to be considered within the framework of reducing inequality and enhancing equity. Goals ought to be achieved by reaching the poorest (i.e. reducing differences

Nations General Assembly(3) prompted governments, organizations and the international community to strengthen national information systems to produce reliable statistics in a timely manner, including indicators on access to sexual and reproductive health services. The 17 indicators presented here include indicators of outcome, access and use and they represent an attempt to focus efforts so that the gap in available data can be reduced.

There is relatively little experience so far in the use and interpretation of indicators of service use or need for obstetric care. These guidelines draw on the experience gained with the indicators over the past few years, and aim to provide a structured description of generation and interpretation for each of the shortlisted indicators at national level.

This document is intended for national public health administrators and health programme managers. It briefly reviews



theoretical and practical considerations of indicators, followed by a discussion of the definition, data sources, collection methods, periodicity of collection, disaggregation, use, limitations and common pitfalls for each of the shortlisted indicators. It is hoped that the document will contribute towards a consistent global monitoring and evaluation of reproductive health.

## References

1. *Maternal mortality in 2000: Estimates developed by WHO, UNICEF and UNFPA*. World Health Organization, Geneva, 2004.
2. United Nations. *Report of the International Conference on Population and Development*. New York, United Nations, 1994 (document A/CONF.171/13).
3. *Report of the Ad Hoc Committee of the Whole of the Twenty-first Special Session of the General Assembly*. New York, United Nations, 1999 (document A/S-21/5).



## 2. Indicators—an overview in the context of global monitoring

### 2.1 Purpose and limitations

Indicators are markers of health status, service provision or resource availability, designed to enable the monitoring of service performance or programme goals. Monitoring is a process of comparison, across populations or geographical areas, to highlight differentials or to detect changes over time (to measure progress) between reality and goals. Goals or objectives are an essential component in quantifying the aims of health-related policies, programmes and services. At the national and international levels, an indicator must be able to “measure progress” towards agreed goals.

Nevertheless, the measurement of progress raises theoretical and practical considerations. The theoretical considerations which are relevant and desirable regardless of the country or programme setting are briefly discussed below. Practical issues regarding the scope and quality of data, sources of data and collection methods, and presentation and interpretation of the indicator arise at global, national and programme levels. These practical issues form the body of these guidelines and are discussed for each of the shortlisted indicators.

An awareness of an indicator’s inherent limitations is crucial to ensuring its effective use. Most importantly, indicators should be regarded as indicative or suggestive of problems or issues needing action. In some cases, indicators are measurements that have the power to summarize, represent or reflect certain aspects of the health of persons in a defined population. In other cases, they may simply serve as indirect or proxy measurements for information that is lacking.

### 2.2 Providing an overview of reproductive health

Reproductive health affects the lives of women and men from conception to birth, through adolescence to old age, and includes the attainment and maintenance of good health as well as the prevention and treatment of ill-health (*see Box 2, page 6*).

Reproductive health services cover a wide range of programme areas.

Comprehensive reproductive health care includes:

- counselling, information, education, communication and clinical services in family planning;
- safe motherhood, including antenatal care, safe delivery care (skilled assistance for delivery with suitable referral for women with obstetric complications) and postnatal care, breastfeeding and infant and women’s health care;
- gynaecological care, including prevention of abortion, treatment of complications of abortion, and safe termination of pregnancy as allowed by law;
- prevention and treatment of sexually transmitted diseases (including HIV/AIDS), including condom distribution, universal precautions against transmission of bloodborne infections, voluntary testing and counselling;

## Box 2. The ICPD definition of reproductive health

Reproductive health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and to its functions and processes. Reproductive health therefore implies that people are able to have a satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so. It also includes sexual health, the purpose of which is the enhancement of life and personal relations.

- prevention and management of sexual violence;
- active discouragement of harmful traditional practices such as female genital mutilation; and
- reproductive health programmes for specific groups such as adolescents, including information, education, communication and services.

The aim of the shortlist is to provide a set of indicators that reflect all areas of reproductive health. While no single indicator was able to fulfil all the selection criteria outlined (*see Annex 2*), many of the indicators in the shortlist are complementary and, in combination, they encompass the measurement of outputs and impacts for a range of reproductive health programme areas. Supporting indicators and their complementary roles are outlined for many of the indicators listed. As more experience is gained and new or improved indicators emerge, the shortlist will be modified and these guidelines expanded to accommodate these developments.

### 2.3 Conceptual considerations

Since the shortlisted indicators are intended for use at national and global levels as markers of progress towards the specified goals, direct or proxy measures of impact are most appropriate. Thus, the majority of the indicators contained in the shortlist (*Table 1*) are measures of health status (impact indicators). Nevertheless, where serious difficulties are encountered in the collection of reliable data for impact measurement, output (process) indicators

are often more readily available and may be more sensitive to change.

Output indicators can, however, only act as valid proxies for impact when there is an established causal link with outcome. These links between possible programme inputs and outputs, and especially health impacts, vary greatly in terms both of the existence and strength of evidence for a causal connection, and of ease of measuring a connection. Therefore, in order to draw tenable conclusions regarding improved reproductive health status based on output indicators, it is crucial to have a clear understanding both of the goals themselves and the routes to achieving them, i.e. the association between the output (e.g. service utilization) and observed change in health status. Conclusions based on these measures will, however, always be open to challenge.

### 2.4 Contextual considerations

Contextual considerations primarily involve the source and method of data collection. Although it is commonly assumed that existing information systems should be used for international reporting, this ignores the lack or inadequacy of such systems in most developing countries. In these situations, providing timely and reliable information is often totally dependent on localized, one-off data collection activities such as household surveys. International comparability may be undermined, however, by variations in the representativeness, reliability and heterogeneity of the basic data. Also, such



approaches are, themselves, both costly for some parameters (e.g. maternal mortality) and unlikely to be sustainable because they do not set in place permanent health information structures. The most appropriate data sources and collection methodologies for each indicator contained in the shortlist are discussed in detail. Further contextual considerations covered by these guidelines include the degree of disaggregation and periodicity of collection.

Ideally, monitoring progress at national and international levels should involve the flow of information in at least two directions: “feed forward” to the highest levels of aggregation and “feed back” to the origin of the information, so that data can also be useful locally. Impact indicators of mortality, disease or fertility rates may not be useful at the local level if the numbers involved are too small to reliably detect change and if they do not provide specific information from which to plan follow-up action. Nevertheless, reviewing individual cases of a specific outcome such as maternal or perinatal death may still be helpful in identifying specific problems in care provision, leading to targeted recommendations for improvement at the local level.

## 2.5 Interpretation

The interpretation of reproductive health indicators is currently a challenge owing, to a large extent, to the variability with which the data have started to become available. The lack of reliable statistics for measuring progress means that lessons on interpretation are still emerging. Differences in the level of an indicator, over time or between areas or subgroups, may be attributed to many factors. The key is to distinguish between real and artificial differences. In most cases where health-effect indicators are the concern, it is by the elimination of the artificial difference that the real difference is worked out,

rather than having convincing proof of a change in health status. Nevertheless, it is important to bear in mind that explanations for change reflected by health indicators are usually multiple and interrelated.

Some of the errors that can lead to an artificial change are:

- low precision of sample
- changes in reporting bias over time
- differential non-response bias
- changes in procedures for data collection
- revisions in definitions and values related to health
- changes in the socioeconomic characteristics of the population
- long-term stability of aggregate levels of health statistics
- lack of data to control for confounding factors
- changes in the organization and delivery of health care.

These guidelines attempt to consolidate our current knowledge and to provide some clarity on the issues raised above for each of the indicators contained in the shortlist, specifically to ensure their appropriate use by highlighting common pitfalls and interpretational problems.

## 2.6 Structure of the guidelines

In general, the following structure is used for each of the 17 shortlisted indicators, although the structure may vary slightly.

- Definitions of important terms
- Generation of the indicator
  - data sources and collection methods
  - periodicity of data collection
  - disaggregation

- Analysis and interpretation
  - use
  - issues of interpretation
  - common pitfalls
  - limitations
  - causal pathway
  - supporting indicators
- References/further reading





## II

# Generation, interpretation and analysis of the shortlisted national reproductive health indicators

## 1 Total fertility rate

The number of births a woman would have by the end of her reproductive life if she experienced the currently prevailing age-specific fertility rates from age 15 to 49 years.

The age-specific fertility rate (ASFR) is derived as follows:

$$\text{ASFR} = \frac{\text{Births in year to women aged X}}{\text{No. of women aged X at mid-year}}$$

ASFRs are often expressed per 1000 women. Seven ASFRs are normally calculated, one for each five-year age group (15–19, 20–24, 25–29, 30–34, 35–39, 40–44 and 45–49 years). Single-year rates can also be computed. Assuming that ASFRs have been computed for each five-year age group and are expressed per 1000 women, the total fertility rate per woman can be computed as follows:

$$\text{TFR (per woman)} = \frac{\sum \text{ASFRs} \times 5}{1000}$$

**Numerator:** Sum of the ASFRs x 5

**Denominator:** 1000

## Definitions of important terms

*Age-specific fertility rates* are defined using the number of women in each age group and the number of births to women in that age group.

*Women of reproductive age* refers to all women aged 15–49 years. In some estimates from censuses and surveys, the upper age is taken as 44 years and the last age group is thus 40–44 years. More recently, it has been recommended that total fertility rates be shown both by age 15–44 and by age 15–49 years, especially when survey data are used. It is common to add births to girls under 15 years of age to the 15–19-year age group and those to women over 49 years to the 45–49-year age group.

Whereas ASFRs are expressed per 1000 women, the TFR is expressed per woman. Note that the TFR is occasionally called total period fertility rate (TPFR), because it is based on ASFRs prevailing at a particular time rather than those experienced by a cohort of women as it passes from age 15 to age

49 years. TFR thus refers to the number of births a woman would have if (a) she lived from age 15 to age 50 and (b) she experienced throughout her reproductive life exactly the ASFRs observed for the year in question.

### Generation of the indicator

The first step is to compute ASFRs by single- or five-year age groups. If they are computed by five-year age groups it is necessary to multiply by five. If, as is common, the ASFRs are expressed per

Table 2. Age-specific (ASFR) and total fertility rates (TFR) for Indonesia

Age group (years)	ASFR, 1990 census (1986–1989)	ASFR, 1997 DHS* (1995–1997)
15–19	71	62
20–24	178	143
25–29	172	149
30–34	128	108
35–39	73	66
40–44	31	24
45–49	9	6
	<b>TFR</b>	<b>TFR</b>
15–49	3.31	2.79
15–44	3.27	2.76

\*Demographic and Health Survey  
Source: Central Bureau of Statistics and Macro International (1).

1000 women, the summation of these rates (multiplied by 5) should be divided by 1000 to obtain the TFR per woman. The basic information required to generate ASFRs is (a) number of women by age and (b) number of births by age of mother. These data are generally expressed as five-year groupings from 15–19 to 45–49 years of age. Dividing (b) by (a) and multiplying by 1000 will give age-specific fertility rates. An example from Indonesia is shown in *Table 2*.

### Data sources and collection methods

As indicated above, TFRs are calculated from the ASFRs. Data for ASFRs may be derived from three main sources, namely vital registration (on births only), population censuses and population-based surveys.

When counts of births are derived from vital registration, population figures for the number of women in each reproductive age group could be obtained from, for example, census returns. Most developing countries have incomplete vital registration, and underreporting of births is a major problem. In addition, different sources of data for the numerator (births) and denominator (women) make the estimation of ASFRs difficult.

Population censuses provide information on both the numerator and the denominator. Estimates using censuses are derived from questions on births during a specified period preceding the census (usually 12 months). Age misclassification is a common problem with this method. More specifically, dates of birth are shifted backwards in time to show a spurious decline in fertility. It has therefore become common practice to use births in the previous 36 (instead of 12) months in calculating ASFRs.

When censuses or vital registration systems are lacking or incomplete, population-based surveys provide the most reliable fertility data. Survey estimates may be derived from questions on births within a specified period prior to the survey or from birth histories. One advantage of using survey data is that, when complete birth histories are obtained from women, it is possible to examine trends using a single survey. This is especially important in countries where vital registration is incomplete or a series of population censuses does not exist. The main disadvantage with birth history data is that they depend on complete and accurate



reporting by women of their own birth dates and those of their children. Birth history data are known to suffer from response bias and age misclassification. Demographic and Health Surveys ([www.measuredhs.com](http://www.measuredhs.com)) and similar surveys recommend using a window of three years before the survey to offset bias due to displacement of birth dates farther from or nearer to the survey date.

### ***Periodicity of data collection***

Periodicity depends on each country's plans for censuses or surveys; data collection explicitly for the determination of ASFRs is not generally carried out. TFRs thus depend on the periodicity of censuses or surveys that can yield the necessary information. In countries undergoing rapid fertility transition it is helpful to calculate TFRs every five years, while in others every 10 years may suffice.

### ***Disaggregation***

The ASFRs from which the TFR is derived provide a useful insight into the age pattern of fertility, especially in high-risk groups such as adolescents and older women. ASFRs are particularly sensitive to changes in fertility. For comparative purposes, ASFRs and TFRs are sometimes also presented for different socioeconomic conditions, such as level of education or place of residence.

## **Analysis and interpretation**

### ***Use***

The TFR is probably the most commonly used demographic indicator. It is closely associated with contraceptive prevalence and other indicators of reproductive health such as the maternal mortality ratio. It is a useful indicator of population momentum and a good proxy measure for the success (or failure) of family planning services. The TFR may also be used as a measure of poor physical reproductive health, since high parity (>5 births) represents a high risk of maternal morbidity and mortality.

The main strength of the TFR is that it is a single summary measure that is independent of age structure, unlike the general fertility rate that only partially controls for age structure and the crude birth rate that does not do so at all. It is thus useful for international comparisons and for monitoring trends over time. It should be emphasized, however, that the TFR is a hypothetical measure of completed fertility; in cases of rapid fertility transition its value is primarily illustrative.

As mentioned above, disaggregation of the ASFRs is useful in reflecting the age pattern of fertility, especially in high-risk groups such as adolescents and older women. TFRs are not useful in gauging the direct impact or success of family planning programmes. Family planning programmes can reduce total fertility only by reducing unintended as opposed to intended fertility. Nevertheless, there is strong empirical evidence that high contraceptive prevalence is associated with a low TFR and that increasing contraceptive prevalence is related to lowering the TFR (2).

### ***Issues of interpretation***

In general, the TFR is a good summary figure for comparing countries, major population subgroups or trends over time. Nevertheless, distinguishing between real and artificial changes in the TFR can be complicated. Observed differences or changes are not necessarily specific to changes in fertility behaviour. They could be due to numerous factors largely related to the data sources used, data quality, or shifts in the age-specific fertility distribution or incidence of early pregnancy loss.

### ***Common pitfalls***

#### **Reporting errors**

It is very important that data quality is assessed before ASFRs and TFRs are

calculated and interpreted. An awareness of biases resulting from common reporting errors in censuses or surveys and their impact on calculating ASFRs and TFRs is critical for their appropriate interpretation.

#### **Underreporting**

Underreporting of births is typically greater for older women and for births that occurred a relatively long time ago. This is a minor problem, however, if information only on births during the last three years is used to estimate ASFRs and TFRs.

#### **Displacement of births**

A more serious error commonly found in survey data is displacement of births. The typical pattern is a peak in the period 4–9 years prior to the survey and a trough in the five-year period immediately preceding the survey, showing a spurious decline in fertility. Displacement can also occur in the year prior to the survey. It is therefore recommended that births in the last three years be used to estimate ASFRs and TFRs. Census data are also prone to such biases.

#### **Misreporting of women's ages**

It is advisable to examine the possibility of misreporting of ages by survey or census respondents.

#### **Sampling errors**

Estimates derived from surveys are prone to large sampling errors. It is therefore essential to provide sampling errors and confidence intervals for the estimated TFRs.

#### **Limitations**

The TFR is a hypothetical measure of completed fertility. It is thus possible that women of reproductive age at any given point in time may have completed family sizes that are considerably different from that implied by a current TFR, should ASFR rise or fall in the future.

#### **References**

1. *Indonesia demographic and health survey 1997*. Calverton, MD, Central Bureau of Statistics and Macro International, 1998.
2. *Levels and trends of contraceptive use as assessed in 1998*. New York, United Nations, 2001 (document ST/ESA/SER.A/190).

#### **Further reading**

1. Pressat R. *Demographic analysis*. New York, Aldine-Atherton, 1972.
2. *World population prospects: the 1998 revision*. New York, United Nations, 1999.



## 2 Contraceptive prevalence

The proportion of women of reproductive age who are using (or whose partner is using) a contraceptive method at a given point in time

**Numerator:** Number of women of reproductive age at risk of pregnancy who are using (or whose partner is using) a contraceptive method at a given point in time

**Denominator:** Number of women of reproductive age at risk of pregnancy at the same point in time

### Definitions of important terms

*Contraceptive methods* include clinic and supply (modern) methods and non-supply (traditional) methods. Clinic and supply methods include female and male sterilization, intrauterine devices (IUDs), hormonal methods (oral pills, injectables, and hormone-releasing implants, skin patches and vaginal rings), condoms and vaginal barrier methods (diaphragm, cervical cap and spermicidal foams, jellies, creams and sponges). Traditional methods include rhythm, withdrawal, abstinence and lactational amenorrhoea. Surgical sterilization is usually considered to be contraception only if the operation is performed at least partly to avoid having more children (sterilization is also carried out solely for health reasons).

*Women of reproductive age* refers to all women aged 15–49 years.

*At risk of pregnancy* refers to women who are sexually active, not infecund, not pregnant and not amenorrhoeic. Technically speaking, the denominator should relate to the population at risk of pregnancy as cited above; in practice, however, information is generally obtained of women who are currently either married or in a stable relationship.

### Generation of the indicator

#### *Data sources and collection methods*

Population-based sample surveys provide the most comprehensive data on contraceptive practice since they show the prevalence of all methods,

including those that require no supplies or medical services. Estimates may also be obtained by smaller-scale or more focused surveys and by adding relevant questions to surveys on other topics (e.g. health programme prevalence or coverage surveys).

Records kept by organized family planning programmes are another main source of information about contraceptive practice. Such records are crucial to effective monitoring and management of programmes, and they have the potential to provide timely updates and detailed trend information about numbers and characteristics of programme clients. Programme statistics have the serious drawback, however, of excluding the use of contraception obtained outside the programme, including modern methods supplied through non-programme sources (the private sector) as well as methods that do not require supplies or medical services. Other problems relate to incomplete data, double counting of users who enter the service delivery system at more than one point, deliberate inflation of service statistics, and poor data quality owing to other activities competing for the attention of those recording the information.

Measures of contraceptive prevalence are usually derived from interviews with representative samples of women of reproductive age. In many surveys, questions on current contraceptive use are confined to married women, including those in consensual unions where such unions are common.

Most surveys use broadly similar questions to measure contraceptive use. Women (and men in some instances) are first asked what methods they know of, and the interviewer then names or describes methods that were not mentioned. Respondents are then asked about the use of each method that was recognized. This procedure helps make clear to the respondent which methods are to be counted as contraceptives. The contraceptive methods are usually listed in order of efficacy, starting with sterilization, the pill, IUD and condom (the supply methods) and followed by non-supply methods such as rhythm and withdrawal. If the respondent mentions more than one method, the method higher on the list is marked.

Most surveys ask about use “now” or within the past month, although some specify other time periods. There is usually no information about the regularity with which the method is used or about the respondent’s understanding of the correct means of use.

### ***Periodicity of data collection***

Most population-based surveys are conducted at intervals of at least five years or more. Given the costs of mounting a nationally representative survey, it is unlikely a shorter interval is feasible.

### ***Disaggregation***

The indicator should be disaggregated by type of contraceptive method and age of the respondent. In many cases, two broad groupings of modern and traditional methods are presented in reports, although details on type of method are collected in surveys. If women’s ages are recorded, then current use of contraceptives can be calculated for any age group of interest.

## **Analysis and interpretation**

### ***Use***

This indicator is useful for measuring utilization of contraceptive methods.

It is also relevant at all levels of the health system to assess the coverage of contraceptive services, which allows the quality of service to be assessed to some extent. Preferences for methods and sources can be tracked and related to continuation and contraceptive failure rates.

### ***Issues of interpretation***

The convention is to base this calculation on women who are married or in a sexual union. Nevertheless, in countries where sexual activity outside stable relationships is widespread, basing the prevalence estimate only on women in such relationships would ignore a considerable proportion of current users.

### ***Common pitfalls***

Estimates of current use of contraceptive methods from population-based surveys depend on respondents correctly reporting the use of different methods. Sometimes confusion may arise from what is considered current use. This would be the case particularly for long-acting methods such as IUDs, implants and injections, which would be considered as current use if protection was still ongoing.

### ***Limitations***

The current methods of obtaining information on contraceptive use do not allow for tracking the use of more than one method. Therefore, the data obtained in many Demographic and Health Surveys, for example those on condom use, should not be used as an indicator of condom use for disease prevention.

### ***Supporting indicators***

“Contraceptive prevalence” is a complementary output indicator to total fertility rate.



## Further reading

1. *Interviewer's manual for use with model "A" questionnaire for high contraceptive prevalence countries.* Calverton, MD, Macro International, 1997 (DHS-III Basic Documentation, No. 3).
2. Hatcher RA et al. *Contraceptive technology: international edition.* Atlanta, GA, Printed Matter, 1989.
3. Ross J, Stover J, Willard A. *Profiles for family planning and reproductive health programs.* Glastonbury, CN, Futures Group International, 1999.
4. *Levels and trends of contraceptive use as assessed in 1998.* New York, United Nations, 1999 (document ESA/P/WP.155).
5. *Contraceptive method mix: guidelines for policy and service delivery.* Geneva, World Health Organization, 1994.

### 3 Maternal mortality ratio

The number of maternal deaths per 100 000 live births

**Numerator:** All maternal deaths occurring in a period (usually a year)

**Denominator:** Total number of live births occurring in the same period

#### Definitions of important terms

*Maternal death* 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, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes (1).

*Direct obstetric death* is maternal death resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium), from interventions, omissions or incorrect treatment, or from a chain of events resulting from any of the above (1).

*Indirect obstetric death* is maternal death resulting from previously existing disease or disease that developed during pregnancy and that was not due to direct obstetric causes, but that was aggravated by physiological effects of pregnancy (1).

*Late maternal death* is the death of a woman from direct or indirect causes more than 42 days but less than one year after termination of pregnancy (1).

*Pregnancy-related death* is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of cause of death (1).

*Live birth* is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the 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 (1).

#### Generation of the indicator

Maternal deaths are difficult to measure owing to many factors, including their comparative rarity and context-specific factors such as reluctance to report abortion-related deaths, problems of memory recall and lack of medical attribution. There is thus no single source or data collection method adequate for investigating all aspects of maternal mortality in all settings.

#### Data sources and collection methods

For most countries, there are three main sources of data with which to calculate the maternal mortality ratio:

- vital registration
- health facility-based data
- population-based surveys or surveillance.

#### Vital registration

In the majority of developing countries, vital registration as the official notification of births and deaths is largely incomplete but is estimated to be adequate for about one third of the world's population (2). There are several factors that increase the tendency for underreporting and misreporting of maternal deaths.

- Owing to the suddenness of onset of some obstetric complications and the rapidity with which death can occur, in many settings only a proportion of all patients reach health services where they may be recorded officially.



- In the event of a home death, relatives may be reluctant to incur time and travel costs to register the death at the nearest registry office.
- Where there have been delays in seeking care, relatives may feel culpable or to blame and thus omit to report the death.
- In the absence of medical certification, deaths may be misclassified as non-maternal, especially for those occurring in early pregnancy or where the pregnancy or its termination had been disguised by the woman.
- Although in theory the vital registration system could provide data for both the numerator (maternal deaths) and the denominator (live births) needed to calculate the maternal mortality ratio, in practice the former is generally more prone to incompleteness than the latter, so seriously distorting the resulting estimate.

#### Health facility-based data

Health facilities can be a source for calculating the maternal mortality ratio, either through the routine reporting system or by providing health facility sites at which special studies are conducted. The main drawback in both cases relates to the selectivity of the health service-using population. Without detailed knowledge of the catchment population, it is difficult to gauge whether the maternal mortality ratio is an underestimate or an overestimate of the level for the general population (which also includes non-service-users). Where, for example, a facility is a major referral centre receiving a high proportion of complicated cases, then the figure produced may exaggerate the level in the wider community. Conversely, data from health centres may understate the situation, since these primarily deal with normal deliveries. Other problems related to the use of health service information

include inaccuracies in routine registers, omission of deaths other than those in maternity wards, incomplete or inaccurate case records, and difficulty in retrieving records for review.

#### Population-based surveys or surveillance

The problems of underreporting and selection bias in both vital registration and health services data mean that population-based surveys are the primary source of information for calculating the maternal mortality ratio in many developing countries today.

#### Recommended data collection methods

*RAMOS* (reproductive-age mortality surveys) seek to identify and classify all female deaths in the reproductive period, using both traditional and untraditional sources of information to find deaths, such as cross-sectional household surveys, continuous population surveillance, hospital and health-centre records and key informants.

*Direct estimation* relies on asking questions about maternal deaths in a household during a recent interval of time, say 1–2 years. These questions can be asked in the context of a household survey or a census of all households.

Although both *RAMOS* and direct estimation can provide up-to-date estimates of the maternal mortality ratio, they require large sample sizes and are usually both time-consuming and costly to conduct.

*The sisterhood method* may overcome large sample size requirements by interviewing adult respondents about the survival of all their sisters, thereby yielding information on many woman-years at risk for each household visit. There are two variants of this method—the original indirect method (3) and the variant direct method (4). While the former involves posing fewer questions to respondents and is thus easier to apply

in the field, a major disadvantage is that the pooled estimate derived from using data from all respondents relates statistically to a point around 10–12 years prior to the survey. The method also relies on a number of assumptions that restrict its use in settings with very low fertility and/or major migration flows to or from the population. The direct approach, on the other hand, provides a more current estimate at about 3–4 years prior to the survey, but this comes at the cost of larger sample sizes and more complex questions and is thus more costly and time-consuming to gather and analyse. Without sufficiently large sample sizes to avoid overlapping confidence intervals, the direct sisterhood method cannot be used to monitor time trends. Both the indirect and direct methods provide estimates rather than precise figures for the maternal mortality ratio.

*Confidential enquiries* into maternal deaths identify the numbers, causes and avoidable factors associated with maternal deaths. Through the lessons learnt from each woman's death, and through aggregating the data, they provide evidence of where the main problems in overcoming maternal mortality lie and an analysis of what can be done in practical terms, and highlight the key areas requiring recommendations for health sector and community action as well as guidelines for improving clinical outcome. Confidential enquiries work better in countries where there is a functioning statistical infrastructure of vital records, and disadvantages include that they provide only the numerator (maternal deaths), that they require more resources than other methodologies, and that they do not include interviews with relatives or others in the community, with the result that they focus on clinical or health factors (5).

#### ***Periodicity of data collection***

Where routine information systems allow maternal mortality to be tracked nationally and with minimal extra cost, and where the number of deaths is sufficiently

large to produce stable estimates, then it is realistic to consider annual figures. However, where population surveys are needed because routine systems are weak or nonexistent, then sample sizes and thus field costs are likely to be too great to justify producing precise estimates more frequently than every 5–10 years.

#### ***Disaggregation***

Although it would be helpful to countries to produce estimates disaggregated at a subnational level, for example into rural vs urban or administrative regions, this should not be encouraged unless the data are of sufficient quality and scope to yield a reliable picture. The same would apply to other covariates, such as maternal age and parity.

#### **Analysis and interpretation**

The currently available data sources and collection methods described above have very different strengths and weaknesses and yield estimates of varying reliability. This variation needs to be remembered when using and interpreting estimates of the maternal mortality ratio.

#### ***Use***

The maternal mortality ratio is the most widely used measure of maternal death. It measures obstetric risk—in other words, the risk of a woman dying once she is pregnant. It does not therefore take into account the risk of being pregnant (i.e. fertility) in a population, which is measured by the maternal mortality rate or the lifetime risk.

Maternal mortality is widely acknowledged as a general indicator of the overall health of a population, of the status of women in society and of the functioning of the health system. It is therefore useful for advocacy purposes, in terms both of drawing attention to broader challenges faced by governments and of safe motherhood. This indicator can show the magnitude of the



problem of maternal death in a country as a stimulus for action. Where estimates can be reliably produced at a subnational level, these may help to set priorities. For example, a ratio of 50–250 per 100 000 may point to problems of quality of care for labour/delivery, while higher ratios (>250) may suggest problems of access as well (6).

### ***Issues of interpretation***

To facilitate the interpretation of estimates of the maternal mortality ratio it is also helpful to consider:

- the absolute numbers of maternal deaths and live births, in order to calculate the precision of the estimate;
- the definition of the numerator;
- the reference year and time period for the estimate;
- the delimitation of the area or population subgroups to which the data refer;
- the data sources used, and whether these are the same for the numerator and the denominator; and
- the quality of the data.

Some countries have systems in place that routinely ensure the quality of health information. In others, ad hoc studies are needed to check reliability, such as comparing deaths reported at national level against figures available for the component regions.

### ***Common pitfalls***

#### **Maternal mortality ratios are rarely precise**

The sources and methods currently available and feasible in most developing countries yield broad estimates of magnitude rather than precise point figures. It is important to encourage users to indicate the confidence intervals around these estimates, rather than report one figure and convey spurious accuracy.

#### **Possible non-sampling errors**

As well as sampling errors, it is important to consider the other sources of bias in the estimates, as mentioned above. Changes over time or between districts or populations in the accuracy of reporting or classification of maternal deaths can, for example, distort trends or regional differences. Many of these non-sampling errors tend to be associated with underestimation rather than overestimation of the maternal mortality ratio (4).

#### **Specify the denominator**

This helps to avoid confusion between the maternal mortality ratio, which uses live births as the denominator, and the maternal mortality rate, which uses women in the reproductive age group.

#### **Check the definition used for the numerator**

Changes in the definition of a maternal death between ICD-9 and ICD-10 have created some difficulties in studying temporal changes or making comparisons between countries. Presentation of the maternal mortality ratio should thus clearly state which version has been used. In the case of ICD-10, it is also important to specify which of the three categories (direct and indirect maternal deaths up to 42 days postpartum, late maternal deaths, pregnancy-related deaths) the numerator includes.

#### **Aggregate levels may hide wide differentials**

Obstetric risk is not evenly distributed among all pregnant women in all areas. Thus a single national figure may disguise major differences between regions or particular subgroups. Although there may not be sufficient numbers of deaths to draw reliable conclusions at the subnational level, these differentials can help to draw attention to issues requiring further follow-up.

**Check for consistency with estimates from other sources**

It is important to compare the figures with those obtained from other sources, either from within the country or using model estimates.

**Interpret patterns or trends in relation to possible confounding factors**

For example, apparent major differences in the maternal mortality ratio between rural and urban areas could simply reflect differences in the pattern (rather than the level) of fertility, with more rural women who are grand multiparous and for whom the risk of death can be expected to be higher. Other possible confounders include general health status, such as levels of anaemia or malaria, and socioeconomic factors.

**Limitations**

The maternal mortality ratio reflects the level of obstetric risk in a population. By itself, this indicator cannot reveal the reasons for the level, or indeed how to reduce maternal mortality. Additional information, using different sources and methods—quantitative and qualitative—is needed in order to take effective action. The currently available sources and methods for estimating maternal mortality all have strengths and weaknesses, and in many developing countries the figures produced should be regarded as broad indications of level rather than precise statistics.

**Supporting indicators**

Supporting indicators are “maternal mortality rate”, “lifetime risk of maternal death”, “antenatal care coverage”, “births attended by skilled health personnel” and “perinatal mortality rate”.

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## 4 Antenatal care coverage

The proportion of women attended, at least once during their pregnancy, by skilled health personnel for reasons relating to pregnancy

**Numerator:** Number of pregnant women attended, at least once during their pregnancy, by skilled personnel for reasons related to pregnancy during a fixed period

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

### Definitions of important terms

*Skilled health attendant* (sometimes referred to as skilled attendant) is defined as an accredited health professional—such as a midwife, doctor or nurse—who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns (1). This definition excludes traditional birth attendants whether trained or not, from the category of skilled health workers.

*Live birth* is the birth of a fetus after 22 weeks' gestation or weighing 500 g or more that shows signs of life—breathing, cord pulsation or with audible heart beat (2). This cut-off point refers to when the perinatal period commences and aims at confining the definition for pragmatic purposes.

### Generation of the indicator

#### *Data sources and collection methods*

For most countries, the main sources of information on antenatal care (ANC) are routine health service data and household survey data.

#### **Vital registration**

Vital registration data have the advantage of being collected on a regular basis at most levels of the health system. The disadvantage is that they do not provide information on the numbers of pregnancies

and births in the total population, which are required for the denominator.

A further disadvantage is that health services may not collect data in an appropriate format for constructing the indicator. Frequently, the data are episode—rather than woman-based (i.e. the number of consultations performed by the provider is recorded but not the number of times a specific woman is seen). Since women attend for care several times, and may also present at different facilities, this creates the potential for double counting and therefore overestimating ANC coverage (3). Health service data may also be poor quality and records may be incomplete or missing (4).

#### **Population-based survey data**

Many countries increasingly rely on national population-based (household) surveys to provide data on maternity care. The information collected through household surveys has the advantage of providing an estimate of all live births for the denominator. Since women are interviewed directly about their experience of care, information on other demographic variables such as age, socioeconomic status and education can also be collected. Furthermore, it is possible to calculate confidence intervals to facilitate interpretation. The disadvantage of such surveys is that they are expensive to implement, and therefore data are available only on an ad hoc basis. Data are usually not available for low-level administrative units such as districts.

**Denominator**

The denominator comprises the number of live births. Although in theory all births should be included, in practice only live births are used owing to difficulty in obtaining information about non-live births. The exclusion of non-live births such as stillbirths, spontaneous and induced abortions and ectopic and molar pregnancies underestimates the need for ANC in the population. In practice, however, this potential for underestimation is reduced because in most surveys only women giving birth to live offspring are included in the numerator.

In the absence of survey data, the denominator may be estimated from the vital registration system where birth registration is thought to be virtually complete. Since only 52% of countries report virtually complete birth registration (5), however, other countries must derive an estimate of the denominator from census data (crude birth rate multiplied by total population). Health facility data should not be used to estimate denominators unless utilization is very high (3).

***Periodicity of data collection***

This indicator is responsive to change in the short term. Some sources recommend constructing the indicator on a yearly basis, but annual monitoring is feasible only when the data are derived from routine data sources. For international comparisons, periods of 3–5 years are recommended (6). More frequent surveys are probably not desirable because sampling error makes it difficult to assess whether small changes are real or are due to chance variation.

***Disaggregation***

Where appropriate, the ANC indicator may be disaggregated by geographical and administrative strata and demographic and care characteristics. If the main purpose of the indicator is to monitor progress towards international targets, the data should be disaggregated by urban and rural areas.

If the indicator is to be used for district level planning and management purposes, however, the data should be further disaggregated to assess equity of service provision and use.

**Analysis and interpretation*****Use***

The main purpose of an indicator of antenatal care 1-visit coverage is to provide information on proportion of women who use antenatal care services. The finding that women who attend ANC are also more likely to use skilled health personnel for care during birth (7) and that ANC may facilitate better use of emergency obstetric services (8) is also further support for the use of this indicator in combination with the indicator “skilled attendant at delivery”.

ANC visits have been proposed as a proxy measure to assess progress towards reducing maternal mortality. Although epidemiological studies tend to show an association between improved maternal health outcome and ANC, most fail to control for selection biases that would positively influence the outcome (9) and this potential link remains uncertain.

Women’s use of ANC is more strongly associated with improved perinatal survival (10), and measuring ANC coverage therefore has a greater role in the monitoring and evaluation of programmes that address newborn health and survival (3).

***Issues of interpretation***

When comparing data from multiple sources it is important to be aware of how subtle variations in the definition of terms, in the construction of the indicator and in the reliability or representativeness of the data can limit the drawing of any meaningful conclusion.

***Common pitfalls*****Who is included in the category of skilled health personnel?**

Differences in the categorization of skilled



health personnel, in particular whether auxiliary staff or traditional birth attendants have been included, may also account for discrepancies between countries. Although the WHO definition of skilled health personnel (1) is widely used, this only includes a qualitative measure—the need for training to result in proficiency.

**Does the indicator relate to all antenatal visits or only to visits for “reasons related to pregnancy”?**

Discrepancies may arise because the estimate relates either to all antenatal visits or only those that occur “for reasons related to pregnancy”. This qualification was added to the indicator to clarify the definition of care and to strengthen the causal relationship with maternal health outcomes. In practice, information on women’s motives for seeking care is rarely collected.

**Does the denominator relate to live births or to pregnant women?**

It is important to know whether the denominator used is all births, the most recent birth or all women. Including all births will overrepresent women who have more than one birth. These women are also more likely to have other risk factors for adverse pregnancy outcome, such as high parity, lower levels of education and lower rates of health service use. Including all births will thus result in a lower ANC coverage than using a woman-based analysis. This difference will be greater the longer the survey period used. A woman-based estimate can be obtained by using ANC coverage for the most recent birth. Since programmes target women, using a woman-based denominator may be conceptually more appealing to programme managers.

**Overrepresentation of positive outcomes**

A birth-based analysis is essential for determining the impact of ANC on pregnancy outcomes. Nevertheless, surveys normally include women who

give birth to a live child and exclude fetal deaths and stillbirths, which will give a false positive outcome in terms of ANC.

This indicator is a measure of antenatal care use and not a measure of the adequacy of care received. ANC is a package of services whose content and quality vary widely between settings. In this indicator, the overall number and timing of visits, the reasons for seeking care, the skills of the provider and the nature or quality of care are not specifically defined. Therefore, similar rates of ANC coverage should not be interpreted to imply similar levels of care.

***Limitations***

ANC coverage for one visit should be used in combination with other indicators to derive a better understanding of the situation. Disaggregation by important differentials can provide insights into disparities of service provision in countries where there is variation in rates of ANC coverage. In high-coverage countries, ANC coverage can be further described in terms of the number and timing of ANC visits and the proportion of women with no ANC.

***Supporting indicators***

ANC coverage is one of four mutually supportive indicators in the minimum list measuring maternal health service coverage. The other three indicators are “births attended by skilled health personnel”, “availability of basic essential obstetric care” and “availability of comprehensive essential obstetric care”. As mentioned above, ANC coverage is also associated with newborn health and survival, and is weakly associated with maternal mortality. Thus, this indicator can also be interpreted in conjunction with perinatal mortality rates, but should be interpreted with caution in relation to maternal mortality rates.

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## 5 Births attended by skilled health personnel

The proportion of births attended by skilled health personnel

**Numerator:** Births attended by skilled health personnel during a specified period

**Denominator:** Total number of live births during the specified period

### Definitions of important terms

*Skilled health attendant* (sometimes referred to as skilled attendant) is defined as an accredited health professional—such as a midwife, doctor or nurse—who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns (1). This definition excludes traditional birth attendants whether trained or not, from the category of skilled health workers.

*Live birth* is the birth of a fetus after 22 weeks' gestation or weighing 500 g or more that shows signs of life—breathing, cord pulsation or with audible heart beat (2). This cut-off point refers to when the perinatal period commences and aims at confining the definition for pragmatic purposes.

### Generation of the indicator

#### *Data sources and collection methods*

For most countries, the main sources of information on skilled health personnel at delivery are routine health service data and household survey data.

#### **Health facility-based data**

As a point of contact with women, health services are the main and most obvious routine source of information for the numerator. Nevertheless, routine health service information used on its own constitutes a poor source of statistics on coverage of care as it often excludes private sector information. In addition,

when the utilization of health services is low, using health facility information for the denominator will create major selection biases because many pregnancies or births take place outside the health system. This would cause an overestimation of the proportion of women receiving care.

#### **Population-based survey data**

Population-based (household) surveys are becoming an increasingly important source of information on maternity care (3). While data from health services can be gathered annually, however, household surveys are only available on an ad hoc basis. When using survey data, absolute numbers and confidence intervals should be reported to indicate the reliability of the data and facilitate interpretation of trends and differentials.

In the absence of survey data, the denominator may be estimated from the vital registration system where birth registration is thought to be virtually complete. Since only 52% of countries report virtually complete birth registration (4), however, other countries must derive an estimate of the denominator from census data (crude birth rate multiplied by total population).

#### *Periodicity of data collection*

This indicator is responsive to change in the short term. Some sources recommend constructing the indicator on a yearly basis, but annual monitoring is feasible only when the data are derived from routine data sources. For international comparisons, periods of 3–5 years are recommended (5). More frequent surveys

are probably not desirable because sampling error makes it difficult to assess whether small changes are real or are due to chance variation.

### ***Disaggregation***

Disaggregation by place of delivery, type of skilled health personnel, urban/rural and socioeconomic characteristics is recommended where appropriate.

### **Analysis and interpretation**

To aid the interpretation of maternal health care indicators, it is useful to separate health service coverage into three elements:

- availability of services—potential coverage
- accessibility and acceptability of services
- utilization of services—actual coverage.

Both births attended by skilled personnel and antenatal care coverage are measures of health care utilization; they provide information on actual coverage (the effective population that receives the care). If analysed in conjunction with the two indicators measuring availability of obstetric care, they can provide a more complete picture of the utilization–provision synergy (3).

### ***Use***

The indicator helps programme management at district, national and international levels by indicating whether safe motherhood programmes are on target in the availability and utilization of professional assistance at delivery. In addition, the proportion of births attended by skilled personnel is a measure of the health system's functioning and potential to provide adequate coverage for deliveries. On the other hand, this indicator does not take account of the type and quality of care.

“Skilled attendant at birth” has been proposed as an intermediary, process or proxy indicator for monitoring progress towards the reduction of maternal mortality. This indicator is highly correlated with maternal mortality levels, although such a correlation does not provide levels of causality (6).

### ***Issues of interpretation***

The key steps to a meaningful interpretation of levels of births attended by skilled health personnel are (a) to address the strengths and weaknesses of the data and (b) to identify any inconsistencies in definitions and changes in the numerator and/or denominator.

### ***Common pitfalls***

#### **Ambiguities in the categorization of “skilled personnel”**

Ambiguities and differences in the categorization of “skilled personnel”, and in particular whether traditional birth attendants have been included or not, often help explain wide discrepancies between statistics from different sources for the same population. It is important to state the definition of skilled attendant used in order to make valid comparisons across time or between countries. Nevertheless, even where the definition is clearly stated, levels of training and skills of health care providers may vary between countries.

#### **Does the denominator relate to live births or to pregnant women?**

The most commonly used denominator is the number of live births, which acts as a proxy for the number of pregnant women. This, however, underestimates the total number of pregnancies by excluding those that end in stillbirth or spontaneous or induced abortion, as well as ectopic and molar pregnancies. Observed differences in coverage may thus be due not to true changes in coverage of all pregnancies but to differences in the stillbirth and abortion



rates. It has been suggested that applying a raising factor of 15% to the total number of live births would provide the approximate number of pregnant women in need of care (7). Issues of data availability and international comparability clearly influence the choice of the denominators, and the consequences of this choice in terms of accuracy and representativeness of the indicator should be acknowledged.

#### **Overrepresentation of women with short birth intervals**

It is important to know whether the denominator used is all births, the most recent birth or all women. Including all births will give a birth-based analysis that overrepresents women with short birth intervals. These women are also more likely to have other risk factors for adverse pregnancy outcome, such as high parity, lower levels of education and lower rates of health service use. This approach will result in a lower than actual “skilled attendant at delivery” coverage. Therefore, survey studies should include only the most recent birth for the survey period.

#### **Limitations**

The pitfalls discussed above are also the limitations of this indicator. For example, in some settings there is ambiguity over the definition of skilled health personnel, and births attended by trained traditional birth attendants and private health providers are included in the numerator. It is therefore essential to state which definition is used in each instance, since a change in definition may create difficulties in comparability over time.

With regard to data obtained from surveys, the validity of such data depends on the correct identification by the women of the credentials of the person attending the delivery, which may not be obvious in certain countries.

#### **Supporting indicators**

This indicator is one of four mutually supportive indicators in the minimum list measuring maternal health service coverage. The other three indicators are: “antenatal care coverage”, “availability of basic essential obstetric care” and “availability of comprehensive essential obstetric care”. In combination, these indicators measure progress towards the goal of providing all pregnant women with antenatal care, trained attendants during childbirth, and referral facilities for high-risk pregnancies and obstetric emergencies.

#### **References**

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## 6-7 Availability of basic essential obstetric care and availability of comprehensive essential obstetric care

Two process indicators related to the availability of essential obstetric care are recommended as assessment tools to gauge national and global progress in reduction of maternal mortality:

### Availability of basic essential obstetric care (BEOC)

The number of facilities with functioning basic essential obstetric care per 500 000 population

**Numerator:** Number of facilities with functioning basic care X 500 000

**Denominator:** Total population

### Availability of comprehensive essential obstetric care (CEOC)

The number of facilities with functioning comprehensive essential obstetric care per 500 000 population

**Numerator:** Number of facilities with functioning basic care X 500 000

**Denominator:** Total population

### Definitions of important terms

A *basic essential obstetric care (BEOC) facility* is one that performed all of the following six services (known as signal functions) at least once in the previous three months: administration of parenteral antibiotics, oxytocics and anticonvulsants; manual removal of the placenta; removal of retained products (e.g. manual vacuum aspiration); and assisted vaginal delivery (vacuum extraction or forceps)(1). The recommended minimum acceptable level is four BEOC facilities per 500 000 population.

A *comprehensive essential obstetric care (CEOC) facility* is one that has performed surgery (caesarean section) and blood transfusion, in addition to all six BEOC services, at least once in the previous three months (1). The recommended minimum acceptable level is one CEOC facility per 500 000 population.

It is important to notice that these definitions explicitly impose the condition of “functioning” facilities. Distinction is made between facilities that are actually functioning and those that may have the

equipment but nevertheless may not be performing as such.

### Generation of the indicator

#### *Data sources and collection methods*

Data sources include routine service statistics from all public and private facilities (or a random sample of all facilities) for the numerator and population census data (preferably adjusted for a best estimate of population growth rate since the date of the last census) for the denominator. Service statistics (patient records and/or registers) are used to determine whether each of the six signal functions (for BEOC) or eight signal functions (for CEOC) have been performed at least once in the past three months (1).

These indicators may also be estimated through facility-based assessments if these assessments provide sufficient information on the functioning of the facilities. These assessments may provide accurate information, but are rarely conducted on a national basis. Some, such as the service provision assessment, are conducted on a sample generalizable at the national level.



More frequently, facility-based assessments are conducted on a group of facilities in a programme area (1,2).

### ***Periodicity of data collection***

It is recommended that data on availability of EOC services be collected annually to monitor trends. Some countries collect these data routinely, and report quarterly (3).

### ***Disaggregation***

These indicators should be disaggregated by the availability of urban and rural services, since aggregated data may hide major concentrations of services in urban areas. Data may also be disaggregated by province or state to determine whether services are distributed equitably in all areas. For more information on geographical distribution of EOC services, mapping may be useful.

## **Analysis and interpretation**

### ***Use***

These indicators are recommended (in conjunction with others, particularly the geographical distribution of EOC facilities) because management of life-threatening obstetric conditions requires available EOC services. If such services are of good quality and are utilized by women who need them (which are parameters not measured by these particular statistics) then maternal deaths should be reduced.

These process indicators have been used most extensively in needs assessment at national and subnational levels to determine the need for upgrading of facilities to meet minimum recommendations for availability of EOC. More recently, they have proven useful at the local level for programme planning and monitoring trends (4–7).

### ***Issues of interpretation***

It is generally agreed that a continuum of care is required to reduce maternal

mortality, from recognition of the obstetric problem in the community or primary care facility (BEOC) to referral and care at the secondary care level (first referral, CEOC facility) (8). The reduction in maternal mortality observed in the Matlab quasi-experiment indicates that multiple factors were responsible—improved community-based referral, access to transportation, primary care services and, most importantly, the availability of CEOC services to ultimately manage life-threatening obstetric conditions (9,10). A quasi-experimental study in Viet Nam demonstrated that improving diagnosis of life-threatening obstetric conditions did not improve referral or management of these conditions at the primary health facility level but did improve management at the referral level (11). It is believed that women who have obstetric complications often seek care directly from CEOC facilities, bypassing BEOC facilities. A third quasi-experimental study undertaken in Bangladesh with a focus on facility improvements and better recognition of the “social aspects” of emergency obstetric services demonstrated a doubling of the women with obstetric complications using services (12). As depicted in the theoretical pathway shown on the next page, availability of services is one of many factors influencing health service utilization and, as such, is a necessary but possibly insufficient factor in reducing maternal mortality (13).

### ***Common pitfalls***

A common pitfall for both indicators results from data being collected on theoretically available services instead of actual service provision during a defined (three-month) period. This, of course, leads to an overestimation of the availability of functioning EOC facilities. Another data collection problem relates to difficulties in collecting data from all private facilities. These difficulties may be related to lack of access to these facilities and their

### Causal pathway

Theoretical pathway associating the availability of EOC services with maternal mortality



records or lack of full enumeration of them. If private facilities are not included, the availability of EOC for the population will be underestimated, although information on the extent to which the national public health system meets women's needs for obstetric care will still be provided.

#### Limitations

The estimation of CEOC coverage (available and functioning, seven days a week, 24 hours a day) may be more accurate than that of BEOC coverage in some countries, if private primary care facilities are common. It is difficult to enumerate private EOC facilities without special surveys or complete facility registration, although private CEOC services are generally provided by hospitals or large polyclinics and are easier to identify.

The recommended minimum acceptable coverage of four BEOC facilities and one CEOC facility per 500 000 population in a variety of settings merits validation. It should be remembered that these are minimum requirements, and that individual countries should determine their own needs. For example, higher standards might be set for sparsely populated areas where access is difficult. Nevertheless, for purposes of international comparison, countries should always report according to the standard definition.

#### Supporting indicators

A supporting indicator is "births attended by skilled health personnel", to the extent

that the skills of these birth attendants approximate the skills required to perform the six BEOC or eight CEOC functions.

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## 8 Perinatal mortality rate

The number of perinatal deaths per 1000 births

**Numerator:** Number of perinatal deaths (fetal deaths and early neonatal deaths) × 1000

**Denominator:** Total number of births

### Definitions of important terms

On the basis of the International Statistical Classification of Diseases and Related Health Problems, 10th edition (ICD-10), WHO provides the following definitions (1).

The *perinatal period* commences at 22 completed weeks (154 days) of gestation (the time when birth weight is normally 500 g), and ends at seven completed days after birth.

*Perinatal mortality rate* is the number of deaths of fetuses weighing at least 500 g (or, when birth weight is unavailable, after 22 completed weeks of gestation or with a crown–heel length of 25 cm or more), plus the number of early neonatal deaths, per 1000 total births. Because of the different denominators in each component, this is not necessarily equal to the sum of the fetal death rate and the early neonatal mortality rate.

*Live birth* is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the 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.

*Fetal death* is death prior to 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 definite movement of voluntary muscles.

The *duration of gestation* is measured from the first day of the last normal menstrual period. Gestational age is expressed in completed days or completed weeks (e.g. events occurring 280 to 286 completed days after the onset of the last normal menstrual period are considered to have occurred at 40 weeks of gestation). Less mature fetuses and infants not corresponding to the criteria should be excluded from perinatal statistics unless there are legal or other valid reasons to the contrary, in which case their inclusion must be explicitly stated. Where birth weight, gestational age and crown–heel length are not known, the event should be included in, rather than excluded from, mortality statistics of the perinatal period.

The definitions of live births and stillbirths in force in different countries and criteria for including live births and fetal deaths in published statistics may differ from those recommended by WHO.

Countries should present statistics in which both the numerator and the denominator of all ratios and rates are restricted to fetuses and infants weighing 1000 g or more (weight-specific ratios and rates); where information on birth weight is not available, the corresponding gestational age (28 completed weeks) or body length (35 cm crown–heel) should be used. These statistics should be used for international comparisons.



## Generation of the indicator

### *Data sources and collection methods*

#### **Vital registration**

The data required for this indicator can be compiled as vital statistics, providing a description of the frequency and characteristics of the vital events tabulated by calendar year (2).

The law requires that the mother, father or nearest relative of the mother reports to the local registrar the occurrence of a birth or death within a determined period of time, together with proof of the occurrence (e.g. medical certificate). National laws and regulations for recording and reporting vital events differ widely. To bring about greater uniformity, international efforts have been directed towards establishing standard definitions and classifications for civil registration and vital statistics.

Some 150 countries or areas in the world have a system of civil registration and vital statistics. About half of those countries are considered to have complete registration of births, deaths and marriages according to United Nations definitions (i.e. at least 90% of the events that occur each year are registered). Nevertheless, countries' definitions for reporting births and deaths and tabulating statistics may differ from those recommended by WHO. Recording and reporting of stillbirths is frequently not included in the civil registration system.

#### **Notification of birth**

Some countries may have separate systems for collecting information on pregnancy and childbirth and thus require that all births, both live and still, be notified to the local health authorities. Data from those systems are usually reported and tabulated for a birth cohort.

#### **Health facility-based data**

Normally, data predominantly reflect hospital births, and information is provided by health workers delivering babies. This

information includes pregnancy and childbirth history and postnatal period until discharge, which is frequently before the first week after delivery. Some systems include the follow-up data on mothers and babies transferred to different institutions, and on deaths at home in the first week of life. They may also routinely publish annual statistics on their obstetric departments. Hospital mortality data may not be representative of a birth cohort when hospitals specialize in care for women and/or babies with complications.

#### **Population-based survey data**

Where vital registration systems are not complete, population-based surveys are an important source of information about pregnancy and birth outcomes, as they include women who have not been in contact with the health system. Perinatal mortality is derived from interviews with representative samples of women of reproductive age. To estimate perinatal mortality, standardized survey questions must be used to obtain reliable data about the history of pregnancy and time of death of the stillborn or liveborn infant.

#### **Censuses**

Census data may include information on stillbirths and details of time of death. Nevertheless, the information may not become immediately available and may be out of date by the time it is published.

#### **Confidential enquiries into perinatal and infant deaths**

In some developed countries, independent confidential inquiries into perinatal and infant deaths are organized to collect information on the cause of death.

#### **Recommended data collection methods**

All live births are normally recorded, regardless of birth weight or gestational age. To calculate perinatal mortality, information on live births and stillbirths must include gestational age or birth weight, and time

of death for the liveborn infant. In vital registration, the certificate provided by the health worker delivering the infant provides this type of information. When registration is done without the medical/birth certificate, however, the information is less precise and reliable. In surveys, a set of questions on pregnancy history and number and age at death of live and stillborn infants is used in calculating perinatal mortality.

### ***Periodicity of data collection***

Vital registration systems, notification systems and hospitals provide routine annual reports. There is no general rule about the periodicity of perinatal mortality by population surveys. It is, however, helpful to have perinatal mortality estimated every five years.

### ***Disaggregation***

It is useful to report perinatal mortality by geographical and administrative subdivision, urban/rural residence, mother's socioeconomic status, place of birth, birth attendant, private/public provider, and singleton and multiple births. Information on prepartum and intrapartum stillbirths, early neonatal deaths (deaths in the first week) and birth-weight-specific mortality provides an insight into the quality of childbirth and neonatal services.

## **Analysis and interpretation**

### ***Use***

The perinatal mortality rate is an important impact indicator that measures the outcome of pregnancy in terms of the infant. The idea of combining data on stillbirths and early neonatal deaths stems from times when perinatal mortality was high everywhere, and was based on observations that deaths in the early neonatal period have more in common with stillbirths than with childhood deaths (3). Another advantage of combining them is that it avoids misclassification of early deaths of liveborn infants as stillbirths,

which would result in underreporting of early deaths.

Perinatal mortality is associated with poor maternal health. It provides useful insight into the quality of intrapartum and immediate postnatal care and may be used as a good proxy measure of the quality of those services. It has been suggested as an alternative and more sensitive measure of maternal health status, since the ascertainment of perinatal death is less difficult than that of maternal morbidity.

### ***Issues of interpretation***

In general, perinatal mortality is a good summary measure for comparing pregnancy and childbirth outcomes across countries, populations or institutions and over time. As in many other indicators such as maternal mortality ratio, observed differences in the perinatal mortality rate may not, however, reflect improved health status but may be due to changes in the reporting system. Distinguishing between real and artificial changes in perinatal mortality requires good knowledge of the data and methodology. Some of the factors, largely related to the data sources, definitions and quality, are discussed below.

### ***Common pitfalls***

#### **Definition**

Different statistical criteria (e.g. including or excluding extremely low birth weight/very preterm infants) have an important effect on the magnitude of the value since the perinatal mortality in this subgroup is very high. It is essential to specify the criteria used.

Some developed countries include the entire neonatal period in the definition of perinatal mortality. Modern technology shifts early neonatal deaths caused by perinatal complications to later in infancy (good rates of immediate survival but more deaths due to failure or complications of treatment) and thus fetoneonatal mortality



is a better measure of perinatal care for these countries.

In surveys, it is often not possible to adhere to internationally agreed definitions. For example, the woman may decide whether a stillbirth was a birth or an abortion.

### Reporting errors

Experiences from many countries show that vital registration systems systematically underreport early deaths. Since the law usually requires a birth to be reported within a month and a death within three days of the event, many early births and deaths are not reported and thus not included in statistics. According to validation studies, stillbirths are even less frequently reported than live births (4).

In some cultures it is not acceptable to weigh a stillborn baby and small stillborn babies are not reported as stillbirths. Stillbirths and early infant deaths may be difficult to identify, as many pregnancy losses are not admitted at all and many infant deaths are not acknowledged until the infant has reached a certain age. A possible reason is simple avoidance of an administrative procedure that does not seem to be useful to the family. The same problems may contribute to underreporting by institutions. It is therefore advisable to validate the quality of vital registration of perinatal deaths.

Surveys underestimate perinatal deaths by not including the death of infants born to women who die in childbirth or soon after. Thus, where the maternal mortality ratio is high, a substantial number of perinatal deaths may not be counted for. In addition, it is advisable to examine the possibility of misreporting of the exact day of death; experience shows heaping of deaths around the age of 7 days (one week).

### Sampling error

Estimates derived from surveys are prone to large sampling errors. It is therefore essential to provide sampling errors and

confidence intervals for the estimated perinatal mortality rate.

### Limitations

At the programme and institutional levels, it may not be useful to measure the effectiveness of interventions targeted specifically to reduce either stillbirths (improving emergency obstetric care) or neonatal deaths (care of preterm babies).

### Supporting indicators

“Births attended by skilled health personnel” and “proportion of institutional deliveries” (deliveries occurring in medical facilities among all deliveries) are important supporting indicators. Where skilled care for pregnancy, childbirth and early postnatal care is lacking, perinatal mortality is expected to be high.

When no data are available, historical and current experience shows that early neonatal deaths represent half of infant deaths, and one can estimate by assuming that the perinatal mortality rate is as high as the infant mortality rate. Probably just under half of deaths occur before or during birth and the remainder in the first week of life.

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## 9 Prevalence of low birth weight

The percentage of liveborn babies who weigh less than 2500 g

**Numerator:** Number of liveborn babies who weigh less than 2500 g x 100

**Denominator:** Total number of live births

### Definitions of important terms

*Birth weight* is the first weight of the infant obtained after birth (1). For live births, birth weight should preferably be measured within the first hour of life before significant postnatal weight loss has occurred, with measurement accuracy of at least 10 g, and a correct reading technique. While statistical tabulations include 500 g groupings for birth weight, weights should not be recorded in those groupings but to the degree of accuracy to which it is measured.

*Low birth weight (LBW):* less than 2500 g (up to and including 2499 g) (1).

*Very low birth weight:* less than 1500 g (up to and including 1499 g) (1).

*Extremely low birth weight:* less than 1000 g (up to and including 999 g) (1).

The definitions of low, very low and extremely low birth weight do not constitute mutually exclusive categories. Below the set limits they are all-inclusive and therefore overlap (i.e. “low” includes “very low” and “extremely low”, while “very low” includes “extremely low”) (1).

### Generation of the indicator

#### *Data sources and collection methods*

The main sources of information on LBW are derived from routine service-based data or population-based surveys. Birth weight is usually not collected through the vital registration system or at census (2).

#### Health facility-based data

Birth weight is commonly recorded in hospitals and in local authority records.

Results are presented as the percentage of infants born with a birth weight less than 2500 g, or in birth weight groupings as recommended for statistical tabulation.

#### Population-based survey data

In surveys, mothers are asked to report their babies’ weight at birth. In a common approach, irrespective of whether the birth weight is known, all mothers are then asked a series of questions regarding the size of the infant at birth. In some surveys only the mother’s assessment of size at birth is recorded, which does not permit the percentage LBW to be estimated.

Seasonal variations in rates of LBW have been observed owing to availability of food, disease epidemics and social and other causes. For this reason, LBW data should be collected for the whole year rather than for one point in time.

#### *Periodicity of data collection*

On a population basis, data on this indicator can be collected every five or ten years, since the incidence in the population changes slowly. Where a system for data collection, analysis and reporting is in place, the LBW rate can be reported annually. All babies should be weighed at birth regardless of the requirement to report.

#### *Disaggregation*

It is useful to report LBW rates by geographical and administrative subdivision, urban/rural residence, place of birth and the mother’s age and socioeconomic status. At the institutional level, further division of LBW into very low birth weight and extremely low



birth weight, or the presentation of birth weight distribution by 500 g groupings, by singleton and multiple births and by gestational age (before 37 weeks and 37 and more weeks) may provide useful insight into those components that are associated with adverse outcomes in terms of health and costs. There is no need to report by sex.

## Analysis and interpretation

### Use

Although duration of pregnancy is the most important determinant of weight at birth, many other factors contribute. The rate of LBW is a rough summary measure of many factors, including maternal nutrition (during childhood, adolescence, pre-pregnancy and pregnancy), lifestyle (e.g. alcohol, tobacco and drug use) and other exposures in pregnancy (e.g. infectious diseases and altitude). LBW is strongly associated with a range of adverse health outcomes, such as perinatal mortality and morbidity, infant mortality, disability and disease in later life, but is not necessarily part of the cause. The main strength of LBW data is that they are relatively easy to measure.

LBW is a strong predictor of an individual baby's survival. The lower the birth weight, the higher the risk of death. Groups with lower mean birth weights show higher infant mortality rates. Examples are twins and infants of mothers with lower socioeconomic status. Efforts should focus on measuring birth weight close to birth, on its accuracy and on appropriate care after birth, including growth monitoring.

LBW as a risk factor has long been described as an important measure of infant health and is used as a surrogate indicator of infant morbidity and risk of mortality in the population. Nevertheless, the multifactorial nature of LBW makes certain associations difficult to interpret, such as relationships between maternal nutrition and the size and survival of the fetus and infant. Populations with a high incidence of LBW also have higher rates

of perinatal and infant mortality. Although a decrease or increase in the incidence of LBW in the population is often associated with a corresponding change in perinatal mortality, the incidence may change without change in mortality and vice versa.

### Common pitfalls

#### Use in populations with high proportions of home births

When a high proportion of births occur outside health facilities, survey methods are the main (and frequently only) sources of population-based information on birth weight. Surveys rely on records of birth weight or maternal recall. Where there are no written records, mothers may not remember the exact weight and rounding upwards is common. Babies with unknown birth weight tend to be those with a lower birth weight; thus the indirect method of assessing the rate of LBW in a population through surveys is prone to underestimate its incidence and is highly dependent on careful execution (3).

Birth weight is routinely measured and recorded in institutions. Nevertheless, the incidence of LBW based on such data may not be representative of the general population and may overestimate or underestimate the true levels.

- Where institutional deliveries are rare, the LBW rate in hospitals may be high because of a high incidence of preterm and other complications.
- Women who deliver in hospitals may come from higher socioeconomic strata than those who deliver at home. In this case, hospital data underestimate the population rate of LBW.

Data on LBW from such health facilities should therefore be used with caution.

#### Measuring and recording errors

Accurate weighing requires regularly calibrated scales with a measurement accuracy of at least 10 g, together with a

correct reading technique. Digit preference is frequently observed in birth weight data, especially around 500 g values. Heaping at these values can substantially affect the actual incidence of LBW. Digit preference can only be improved by regularly analysing and presenting data to those who weigh babies.

Where spring scales and especially categorical spring scales (<1500 g, 1500–<2500 g, 2500 g and more) are used, adequate measures should be taken to ensure accurate reading. “Reading up and down” (whereby the scale is not at eye level) is very common in the use of such scales and may considerably distort the actual LBW rates.

#### Reporting errors

LBW is defined as a birth weight of less than 2500 g (i.e. up to and including 2499 g). Rates are sometimes erroneously reported that include weights of 2500 g. This can substantially affect the rate, mostly because of the digit preference at 2500 g.

#### Proxy measures

Proxy measures of LBW (e.g. chest circumference) have been recommended for assessing birth weight at home, but are not a good substitute for growth.

#### Limitations

##### Using LBW to make inferences about preterm birth

It is not possible to make inferences about the rate of preterm birth in a population using the LBW rate. Methods have been developed for making inferences about preterm births based on birth weight distributions but they have not been tested in different populations.

##### Using LBW to make inferences about fetal growth restriction

The use of a dichotomous measure of LBW as a proxy measure for impaired fetal growth has two disadvantages: first, it does

not distinguish between preterm birth and restricted fetal growth and second, it does not permit assessment of the entire range of gestation and fetal growth. Birth weight and its mean and standard deviation comprise a better summary measure of size at birth in a population. Optimal birth weight may differ according to maternal size, parity, age and number of babies born, as it is assumed that maternal growth constraint may limit the fetal growth to protect the health of the mother and baby.

#### Using data to monitor trends in low birth weight

Where most births (>90%) occur in institutions such data can reflect population trends. Where substantial numbers of births occur at home, drawing conclusions from institutional data should be avoided. Furthermore, simple assessment of comparative size at birth may not be adequate to assess trends.

#### Supporting indicators

Prevalence of low birth weight is complementary to the perinatal mortality rate as a measure of newborn risk.

#### References

1. *ICD-10. International statistical classification of diseases and related health problems: 10th revision.* Geneva, World Health Organization, 1992.
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## 10 Prevalence of positive syphilis serology in pregnant women

The percentage of pregnant women aged 15–24 years attending antenatal clinics with a positive serology for syphilis

**Numerator:** Number of pregnant women aged 15–24 years attending antenatal clinics, whose blood has been screened for syphilis, with a positive serology for syphilis during a specified period x 100

**Denominator:** Total number of pregnant women aged 15–24 years attending antenatal clinics, whose blood has been screened for syphilis during the specified period

### Generation of the indicator

#### *Data sources and collection methods*

Ideally, sentinel surveillance approaches as described in the second-generation surveillance (SGS) guidelines (1) should be followed. Some countries have been following the SGS HIV sentinel-surveillance sampling method and conduct both HIV and syphilis serology, based on rapid plasma regain confirmed by *Treponema pallidum* haemagglutination assay. The rationale, methodology and limitations of this approach are discussed in detail in the SGS guidelines.

Pregnant women attending antenatal clinics are routinely tested for syphilis in many countries. For example, pregnant women may be routinely screened for syphilis within a congenital syphilis elimination plan, or testing for syphilis may be carried out during antenatal care. Although these data may be useful, the quality of reporting and testing can not always be ensured.

Another potentially useful method is community-based surveys of syphilis prevalence (2,3). These require large sample sizes with random sampling, however, and the need for voluntary testing may lead to participation bias.

#### *Periodicity of data collection*

Owing to the low prevalence of syphilis in most areas, it is recommended that surveys be conducted every 3–5 years (2,3). Where existing programmes routinely screen pregnant women for syphilis, data could be

made available annually.

#### *Disaggregation*

Disaggregation by geographical area, age and socioeconomic group would be desirable. Disaggregation by parity may also be useful, as first pregnancy is also a proxy indicator for the beginning of sexual activity, particularly in areas with a high level of fertility (1).

### Analysis and interpretation

#### *Use*

At the national and international levels, this indicator is useful as a proxy of the burden of sexually transmitted infections (STI) in the general population, and also as a marker of progress towards reducing the burden of STI. The group selected, i.e. 15–24 year olds, consists mainly of those individuals just beginning sexual activity. As a result, infections in this group represent incident (new) sexually transmitted infections (STI).

Nevertheless, its use as a proxy indicator may be limited where a targeted campaign specifically against syphilis has been carried out (but still could be used as an impact indicator for the target population) or where the prevalence of syphilis is low (in low-prevalence countries it may be useful as an early indicator of the spread of HIV infection, as well as a biological marker for high-risk sexual practices).

#### *Issues of interpretation*

Cross-country comparisons and assessment of trends over time are possible if the same

methodology is consistently adopted for data collection.

### ***Common pitfalls***

#### **Representativeness**

Conclusions on syphilis prevalence in the general population based on sample surveys of pregnant women attending antenatal clinics should be made with caution. First, the numerator is not representative of all pregnant and non-pregnant women. Second, the sample is not necessarily representative of all pregnant women, only of women who choose to attend for antenatal care. Third, syphilis serology may not correlate directly with STI prevalence. STIs are a major cause of infertility in developing countries, and infertile women are not effectively accessible through antenatal care. This may lead to an underestimation of the STI prevalence in all women. Conversely, since non-pregnant women include those who are not sexually active and therefore are not at risk of STI, the prevalence among pregnant women may be an overestimation of the prevalence in all women. Moreover, it is representative of this group of women only where all pregnant women are screened and not just those judged by medical professionals to be at high risk.

Another limitation to the representativeness of the indicator could be the contribution of private, semi-private or non-health-ministry public sector services (e.g. armed forces health services, university hospitals, social security hospitals) to overall antenatal care. Where their contribution to antenatal care is large, access to their data would be important as they may represent different population groups.

#### **Disaggregation**

Disaggregation of data will ensure that important differentials between geographical areas and social groups are acknowledged and the issues of equity addressed. Nevertheless, this may result in inadequate sample sizes and differentials across groups may not be apparent. The

main objectives of syphilis surveillance, such as to monitor trends in specific age groups and geographical areas, should therefore be clearly defined in advance and the sample size calculated accordingly.

#### ***Limitations***

Women attending antenatal clinics are a low-risk population for STI and the magnitude of changes in prevalence among 15–24-year-olds may thus be relatively small. Observed changes may not achieve statistical significance, even with a 3–5 year interval between surveys.

In some countries, or in certain areas within countries, a substantial number of women do not have antenatal care. Moreover, infertile and non-pregnant women are excluded when generating this indicator. Representativeness for the overall population and the proxy value for estimating STI prevalence are thus limited.

#### ***Supporting indicators***

“Perinatal mortality rate” (when disaggregated into fresh and macerated stillbirths) and “prevalence of low birth weight”, both as a measure of newborn risk, and “reported incidence of urethritis in men” are supporting indicators.

#### **References**

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## 11 Prevalence of anaemia in women

The percentage of women of reproductive age screened for haemoglobin levels who have levels below 110 g/l (pregnant women) and 120 g/l (non-pregnant women).

**Numerator:** Number of women of reproductive age screened for haemoglobin levels who have levels below 110 g/l (pregnant women) and 120 g/l (non-pregnant women) during a specified period x 100

**Denominator:** Total number of women of reproductive age screened for haemoglobin levels during the specified period

### Definitions of important terms

*Women of reproductive age* refers to all women aged 15-49 years.

*Anaemia* is a disorder characterized by a blood haemoglobin concentration lower than the defined normal level, and is usually associated with a decrease in the circulating mass of red blood cells. Nutritional anaemia is by far the most common type of anaemia worldwide, and mainly includes iron, folate and vitamin B12 deficiencies. Anaemia can cause death as a result of heart failure, shock or infection due to impaired capacity to support vital functions.

*Haemoglobin* is the red pigment present in solution in the red corpuscles of the blood; its primary function is to transport oxygen to all parts of the body. Iron, folic acid and other vitamins and trace elements are all required for the formation of haemoglobin.

There is no single haemoglobin value that will separate all anaemic from all non-anaemic, or all nutritionally deficient from all nutritionally sufficient individuals. The percentage below a certain cut-off point or index value can, however, identify the population that is likely to be deficient. For non-pregnant women this level is considered to be below 120 g/l, and for pregnant women below 110 g/l.

### Generation of the indicator

#### *Data sources and collection methods*

##### **Health facility-based data**

The facility must carry out routine screening of haemoglobin levels for all women and not just those at risk. There are potential problems with unrepresentativeness of samples and incomplete record keeping.

##### **Population-based survey data**

Special population surveys can be conducted to assess the anaemia rate pre- and post-intervention with, for example, iron supplementation. Specific groups could include schoolgirls and mothers of children below 24 months of age (pregnant, non-pregnant, lactating, non-lactating).

The gold standard for assessing haemoglobin concentration is the direct cyanmethaemoglobin method (1). This method depends on the conditions under which the blood was collected, however, and also on access to proper laboratory facilities, which are not available or affordable in many settings. Others, such as the indirect cyanmethaemoglobin or the HemoCue methods, can be used in the field for large surveys in remote areas to analyse blood collected in a microcuvette (1,2). Nevertheless, in most antenatal clinics in developing countries where resources are lacking, anaemia screening is based on clinical examination (3). For these settings, WHO has developed a haemoglobin colour

scale, which compares the colour shade of blood with defined hues of red (4,5).

### ***Periodicity of data collection***

Rapid assessments are carried out each year, population-level surveys every five years.

### ***Disaggregation***

Ideally, prevalence of anaemia should be disaggregated by severe (haemoglobin levels under 70 g/l), moderate (70–90 g/l) and mild (90–110 g/l). Focusing on severe anaemia may provide a more valid reflection of poor health status. Data can also be disaggregated by pregnant, lactating and non-pregnant, non-lactating women and by age, parity, trimester of pregnancy and geographical location.

## **Analysis and interpretation**

### ***Use***

The initial use of the indicator is to identify women with iron deficiency and who require iron supplementation and other care. Action should be taken at the case level, normally by the care providers who detect the deficiency. It can be used as a proxy measure of general nutritional status or as a direct measure of health status, since anaemia is directly injurious to health and is an important contributor to morbidity and mortality.

Population-based assessments may be made for the purpose of:

- determining the prevalence of anaemia and iron deficiency in the community;
- identifying high-risk or highly affected populations for intervention;
- monitoring and evaluating progress in an iron-deficiency prevention or treatment programme; and/or
- advocacy for and support of food fortification and iron supplementation programmes.

Data should be provided with an indication of their source (e.g. clinical records, surveys) and the method of haemoglobin assessment, in order to allow comparisons when necessary. Conventionally, mean and standard error should be reported.

### ***Common pitfalls***

Atmospheric oxygen levels decrease with increasing altitude and haemoglobin levels rise to compensate. Haemoglobin values should thus be adjusted for altitude.

Low haemoglobin levels may be due to short birth intervals, blood loss or illness unrelated to poor nutrition. Moreover, those attending antenatal care constitute a self-selected group not representative of all pregnant women; if the source of the data is routine screening during antenatal care, such data should be treated with caution.

### ***Limitations***

There is no single haemoglobin value that will separate all anaemic from all non-anaemic or all nutritionally deficient from all nutritionally sufficient individuals. The percentage below a certain cut-off point or index value can, however, identify the population that is likely to be deficient.

### ***Supporting indicators***

An indicator on prevalence of anaemia complements other indicators such as “maternal mortality ratio”, “perinatal mortality rate” and “prevalence of low birth weight”.

## **References**

1. Sari M et al. Estimating the prevalence of anaemia: a comparison of three methods. *Bulletin of the World Health Organization*, 2001, 79:506–511.
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4. Gies S et al. Comparison of screening methods for anaemia in pregnant women in Awassa, Ethiopia. *Tropical Medicine and International Health*, 2003, 8:301–309.
5. *Haemoglobin Colour Scale. A practical answer to a vital need.* Geneva, World Health Organization, 2001 (document WHO/BCT/DCT/02.01).

## 12 Percentage of obstetric and gynaecological admissions owing to abortion

The percentage of admissions for (spontaneous or induced) abortion-related complications to service delivery points providing inpatient obstetric and gynaecological services, among all admissions (except those for planned termination of pregnancy)

**Numerator:** Admissions for abortion-related complications x100

**Denominator:** All admissions, except those for planned termination of pregnancy

### Definitions of important terms

*Abortion-related complications* may derive from spontaneous or induced abortion. Induced abortion may be attempted by women themselves (self-induced), by clandestine/illegal providers or by licensed providers offering routine services within the health care system of a country. Specific diagnoses following abortion may include haemorrhage, local and systemic infection, injury to the genital tract and internal organs, and toxic or chemical reactions caused by agents used to induce the abortion.

*Abortion* is the termination of a pregnancy before the fetus has attained viability, i.e. become capable of independent extra-uterine life (1,2).

*Induced abortion* is the deliberate termination of a pregnancy before the fetus has attained viability, i.e. become capable of independent extra-uterine life (1,2).

*Spontaneous abortion* is the spontaneous termination of a pregnancy before the fetus has attained viability, i.e. become capable of independent extra-uterine life. This is often referred to as a miscarriage (1,2).

### Generation of the indicator

#### *Data sources and collection methods*

This indicator requires complete data on all women admitted for abortion and obstetric complications. If data are to be reported for a geographical area, it is important to avoid double-counting of referral cases. Reporting for a particular

facility or set of facilities seems more feasible, although definition of the total facilities to be studied would also be important.

Although routinely kept and maintained hospital records may provide information, there are essentially no existing sources of routinely collected data that can be used to construct this indicator. In many countries, abortion is restricted and stigmatized; neither the women themselves nor those providing the abortion may report the true origins of the medical condition, making ascertainment of the numerator difficult and subject to the problems outlined below.

#### *Periodicity of collection*

No specific periodicity is recommended.

#### *Disaggregation*

Although it would be useful, it is probably not possible or wise to attempt to disaggregate the numerator into complications caused by spontaneous and those caused by induced abortion (3). There is no methodology adequate to the task and any attempt to distinguish between them is frequently unpleasant for the woman, who may feel forced to “confess” to illegal or stigmatized behaviour.

### Analysis and interpretation

#### *Use*

This indicator can be used to describe conditions at one point in time only.



The best use of the indicator is as a measure of case-load (or cost or resource demand) imposed on the medical system by complications of abortion. It can be conceived as a process indicator for measuring utilization of services in cases of abortion complications.

### ***Issues of interpretation and common pitfalls***

Several attempts to validate the numerator for this indicator (3–5) demonstrate the difficulty in managing record reliability. It is probably naive to assume that the exact numbers collected correspond closely to reality.

The work of Huntington et al. (6) makes clear that special data collection was necessary to derive both numerator and denominator. Binkin et al. (4) suggest that routinely collected data could be used to generate the denominator, at least in part, especially where service statistics are thought to be fairly reliable.

In addition, using locally derived diagnostic categories for the numerator and denominator will make the indicator non-comparable across studies and countries. Local medical practice may differ from place to place in its propensity to admit patients with specific problems (e.g. spontaneous early abortion, hyperemesis gravidarum), thus increasing non-comparability. On the other hand, using complex standardized diagnostic criteria will mean that special studies can be carried out only with much (and potentially expensive) effort and in few places. The problem is particularly complex for the denominator, because of the variety of conditions that could be included.

To compound the problem, the numerator and denominator both suffer from imprecise definition and the difficulty to obtain reliable information. Trends in fertility rates, quality of medical care, legality of abortion and availability

of abortion services may all affect the numerator and the denominator, but not necessarily in consistent or predictable ways. Thus, the two parts of the indicator can change quickly, both in an absolute sense and in relation to each other. In addition, the forces that cause change in the numerator (e.g. legality of abortion, availability and quality of services and local standards of medical treatment for induced abortion) and denominator (e.g. total number of pregnancies and pregnancies per woman) are different and may operate independently of each other.

In extreme situations, women may suffer severe, even fatal, effects from poorly performed abortion and would therefore never be admitted to an obstetric/gynaecological service; they may instead end up in general medical services, emergency rooms or mortuaries. Thus, this indicator does not address the severity of the impact of abortion on women's health. It also does not indicate the prevalence of clandestine or illegal procedures. Where clandestine abortion services are rather well developed, many women may undergo clandestine procedures with few ill effects and not appear in hospital for treatment of complications.

Furthermore, it is not clear how "low" the indicator needs to be in order to conclude that abortion is not a health problem. In Bamako (4), abortion admissions represented only 0.5% of all obstetric/gynaecology admissions—but still presented a serious public health problem. With such a tiny percentage (to be expected in large institutions that handle a heavy load of births), change in the denominator is much more likely than change in the numerator to affect the rate. Thus, this indicator would represent trends in obstetric complications generally, but not necessarily changes specific to abortion complications.

**Limitations**

The indicator cannot be used to document trends or changes. It cannot be used to compare places or countries with each other. To derive the “indicator” it is necessary to collect data in large institutions with big caseloads, of which there may be only a handful in certain countries.

Reasonable attempts to derive this indicator should focus on the few large obstetric/gynaecological service provision centres and should construct careful case definitions for “abortion complication” and “obstetric complication”. The results will nevertheless not be generalizable, even within the same country.

Indicators based on resources or costs instead of admissions could be developed for some places, and these might be more policy-relevant.

**References**

1. *Spontaneous and induced abortion. Report of a WHO Scientific Group.* Geneva, World Health Organization, 1970 (WHO Technical Report Series, No. 461).
2. *Medical methods for termination of pregnancy. Report of a Scientific Group.* Geneva, World Health Organization, 1997 (WHO Technical Report Series, No. 871).
3. Figa-Talamanca I et al. Illegal abortion: an attempt to assess its cost to the health services and its incidence in the community. *International Journal of Health Services*, 1986, 16:375–389.
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5. Jewkes RK et al. Methodological issues in the South African Incomplete Abortion Study. *Studies in Family Planning*, 1997, 28:228–234.
6. Huntington D et al. The postabortion caseload in Egyptian hospitals: a descriptive study. *International Family Planning Perspectives*, 1998, 24:25–31.



## 13 Reported prevalence of women with genital mutilation

The percentage of women interviewed in a community survey who report having undergone genital mutilation

**Numerator:** Number of women interviewed in a community survey who report having undergone genital mutilation x100

**Denominator:** Total number of women interviewed in the survey

### Definitions of important terms

*Female genital mutilation* (FGM) is the result of all procedures that involve the partial or total removal of external female genitalia or other injury to the female genital organs, whether for cultural or any other non-therapeutic reason. These include:

- Type I - excision of the prepuce, with or without excision of part or all of the clitoris;
- Type II - excision of the clitoris with partial or total excision of the labia minora;
- Type III - excision of part or all of the external genitalia and stitching/narrowing of the vaginal opening (infibulation);
- Type IV - pricking, piercing or incising of the clitoris and/or labia; stretching of the clitoris and/or labia; cauterization by burning of the clitoris and surrounding tissue;
- scraping of tissue surrounding the vaginal orifice (angurya cuts) or cutting of the vagina (gishiri cuts);
- introduction of corrosive substances or herbs into the vagina to cause bleeding or for the purpose of tightening or narrowing it; and any other procedure that falls under the definition given above (1).

### Generation of the indicator

#### *Data sources and collection methods*

Prevalence at national level can be obtained by incorporating FGM modules

into existing community surveys or census questionnaires. Repeated surveys would be able to detect trends.

Health records, such as antenatal and child health cards, do not usually contain information on FGM. WHO is promoting the recording of such information in the health card where FGM is being practised.

The age range of women to be included in the data collection needs careful consideration; inclusion of those of reproductive age (15–49 years) is preferable.

#### *Periodicity of collection*

The periodicity of collection is 3–5 years.

#### *Disaggregation*

Disaggregation by age, urban/rural residence and ethnic group is recommended.

### Analysis and interpretation

#### *Use*

There is little reliable information on the prevalence, incidence and recurrence of the different forms of female genital mutilation. Reliable and accurate data are essential to provide a baseline of information for policy-makers, and for subsequent monitoring and evaluation.

#### *Issues of interpretation*

FGM has a direct injurious effect on reproductive health (1,2). Reducing its prevalence is thus a marker of progress towards improved reproductive health.

**Common pitfalls**

FGM is a traditional practice that is deeply rooted in the culture and beliefs of the communities where it is practised. It is a sensitive issue and often shrouded in secrecy and taboo. For this reason, getting information about it may not be easy; women may not feel comfortable in revealing their FGM status. FGM is sometimes performed on babies, and in such instances women may not even know that they have undergone FGM or the type of FGM that has been performed. Interviewers must keep this in mind, and formulate questions in such a way that they do not make women or parents feel that they are being blamed.

Information and data from community surveys on FGM may not be regarded as ethical if adequate safeguards are not in place to preserve confidentiality during the collection process.

This indicator is valid only as a measure of the reported prevalence of genital mutilation in women.

**Limitations**

Collecting data on FGM may not be relevant in many parts of the world where FGM is not practised.

Used definitions are not universally the same. Terms such as “female genital cutting” or “female circumcision” are also used.

The representativeness of this indicator depends on the representativeness of the sample used in the community survey, and of the women willing to respond to the question on FGM.

**References**

1. *Female genital mutilation (Fact sheet No 241)*. Geneva, World Health Organization, June 2000 (<http://www.who.int/mediacentre/factsheets/fs241/en/print.html>), accessed December 2005).
2. *A systematic review of the health complications of female genital mutilation including sequelae in childbirth*. Geneva, World Health Organization, 2000 (document No WHO/FCH/WMH/00.2).

**Further reading**

1. *Female genital cutting: findings from the Demographic and Health Surveys Program*. Calverton, MD, Macro International, 2003 (CD-ROM).
2. *Female genital mutilation. Report of a WHO Technical Working Group, Geneva, 17–19 July 1995*. Geneva, World Health Organization, 1996 (document WHO/FRH/WHD/96.10).
3. *Management of pregnancy, childbirth and the postpartum period in the presence of female genital mutilation. Report of a WHO Technical Consultation, Geneva, 15-17 October 1997*. Geneva, World Health Organization, 2001 (WHO/FCH/GWH/01.2 and WHO/RHR/01.13).



## 14 Prevalence of infertility in women

The percentage of women of reproductive age (15–49 years) at risk of becoming pregnant (not pregnant, sexually active, not using contraception and not lactating) who report trying for a pregnancy for two years or more

**Numerator:** Number of women of reproductive age (15–49 years) at risk of becoming pregnant (as defined above) who report trying unsuccessfully for a pregnancy for two years or more x100

**Denominator:** Total number of women of reproductive age at risk of becoming pregnant (as

### Definitions of important terms

*Women of reproductive age* refers to all women aged 15–49 years.

*Women at risk of becoming pregnant* refers to those who are not pregnant, sexually active, not using contraception and not lactating.

### Generation of the indicator

#### **Data sources and collection methods**

Collecting data for this indicator requires a community survey, in which women and their partners are asked specifically about sexual practices, contraceptive use, previous births, lactation, etc. The Demographic and Health Surveys ([www.measuredhs.com](http://www.measuredhs.com)) remain one of the main sources of data for this indicator, but the questions used to assess infertility have not been adequate. There is a potential problem with response bias, as there is a great difference between self-perceived involuntary childlessness or infertility and voluntary childlessness that does not cause a social problem.

#### **Periodicity of data collection**

No specific periodicity is recommended.

#### **Disaggregation**

It is useful if data can be disaggregated by women's age group, by "ever been pregnant" and by "length of time trying for pregnancy".

### Analysis and interpretation

#### **Use**

This indicator measures the level of infertility in a community. Infertility can be caused, among other things, by genital tract infections, congenital errors of reproduction and hormonal factors. In all populations, less than 5% of infertility can be expected to be due to inherent reproductive abnormalities. Nevertheless, many countries have high secondary infertility rates due to complications and sequelae following sexually transmitted infections (STI). Thus, the level of secondary infertility is useful as a proxy measure of the long-term sequelae of STI.

Affected couples are often willing to invest in investigation and treatment. However, proper diagnosis and management of infertility are not easily accessible in poorer settings or countries. In particular, high-technology infertility treatments are prohibitive in cost and may be unavailable or inaccessible in developing countries. Moreover, STI screening and treatment are more complicated in women than in men, since the former experience fewer symptoms associated with STI. Large-scale STI control programmes can reduce the overall burden of infectious agents such as *Neisseria gonorrhoeae* and *Chlamydia trachomatis*, which are largely responsible for secondary infertility.

The prevalence of infertility as a measure of reproductive morbidity is a useful

marker of progress towards improved reproductive health, defined as “the capability to reproduce and the freedom to decide if, when and how often to do so” 1).

### **Issues of interpretation**

While infertility and its emotional and social consequences can have a serious negative effect on reproductive health status, appropriate treatment may be unavailable or expensive. Effective safe motherhood and STI prevention programmes can significantly reduce secondary infertility. In developing countries with inherent early onset of reproduction and high total fertility rates, primary infertility may not be as frequent as secondary infertility. In countries with a high prevalence of contraceptive use and postponement of childbearing, primary infertility may be the main problem.

Most normally fertile couples will conceive within the first 12 months of having unprotected intercourse, and a few more within the following 12 months. A clinical diagnosis of infertility can be made if a couple has had regular unprotected intercourse for 12 months without the woman becoming pregnant. Demographers, however, more often use a 24-month period or even longer.

Another measure that is sometimes used in surveys, for all couples/women, is “time to pregnancy”, i.e. the time it has taken or takes before a pregnancy is confirmed after exposure to unprotected intercourse. This continuous variable allows one to analyse differences in time to pregnancy between groups of women (survival-type data analysis), for example in measuring environmental factors affecting fertility. It needs to be noted that a woman’s natural fertility decreases with age, although a substantial loss does not occur until after the age of 40 years.

Regularity of sexual intercourse and timing of intercourse may vary considerably between different cohorts and groups of

people. Cultural, marital, migratory and cohabiting patterns influence the timing and frequency of sexual contact.

### **Common pitfalls**

The reliability of the indicator may be compromised by misclassification of early pregnancy loss as “no pregnancy”.

### **Limitations**

Both the numerator and denominator of this indicator may be difficult to assess because detailed information is needed about the woman’s actual chance of becoming pregnant (the “risk” of pregnancy). Since the information that needs to be collected involves questions that are culturally sensitive, response bias needs to be evaluated. Another denominator that could be used is “all women of reproductive age”, which is more appropriate in countries with high levels of fertility and almost universal marriage than in countries with a high proportion of periodic voluntary childlessness and unmarried people.

This indicator addresses only a woman’s failure to conceive. Nevertheless, this failure of conception is used as a measure of a couple’s infertility, which comprises inability to conceive by both the male and the female partner. The cause of the couple’s infertility could be female, male or both. From a cultural point of view, “infertility” is often a diagnosis, and blame may be attached to the woman. Using this indicator, and therefore failing to address the male factor in infertility, may contribute to a further stigmatization of women.

### **Reference**

1. *Programme of Action adopted at the International Conference on Population & Development, Cairo, 5-13 September 1994*. New York, United Nations Population Fund, 1996 (<http://www.iisd.ca/Cairo/program/p07002.html>, accessed 27 October 2004).



## 15 Reported incidence of urethritis in men

The percentage of men aged 15–49 years, interviewed in a community survey, who reported having one or more episodes of urethritis in the previous 12 months

**Numerator:** Number of men aged 15–49 years who reported having one or more episodes of urethritis in the previous 12 months x 100

**Denominator:** Number of men aged 15–49 years interviewed in the survey

### Definitions of important terms

*Urethritis* is discharge from the penis, with or without a burning sensation or pain while passing urine.

*Discharge* can be thick or thin and either clear (like mucus) or coloured (green, yellow or white). Any discharge that contains blood is usually not indicative of urethritis.

An *episode* is the occurrence of symptoms, either for the first time ever or at least five days after the disappearance of previous symptoms.

The recall period of *12 months* refers to the last 12 months and not the previous calendar year.

### Generation of the indicator

#### *Data sources*

The indicator requires collection of data at a population or subpopulation level. The most appropriate source of data is a community survey, such as the Demographic and Health Surveys ([www.measuredhs.com](http://www.measuredhs.com)), or a study undertaken for this specific purpose. Community surveys can be conducted either at national level or in specific population groups or specific geographical areas. Routine health facility records should not be used because of the difficulties of establishing the denominator.

#### *Data collection methods*

A two-stage cluster sampling survey with a 12-month recall period is recommended.

At the first stage, survey areas are selected with probability proportional to size. At the second stage, households are selected with probability inversely proportional to the area size. All males aged 15–49 years are interviewed if they are usual residents of the selected household or if they have spent the night before the interview in the household. Regular household members who are temporarily away from home are included as household members.

Data collection methods will involve questions that may be culturally sensitive and that need to be asked in privacy. Ideally, the interviews should be conducted by male interviewers. Confidentiality of men's reports needs to be assured in order to obtain reliable data.

#### *Periodicity of data collection*

Data should be collected at 4–5-year intervals.

#### *Disaggregation*

The results should be disaggregated by age, urban/rural residence and geographical area.

### Analysis and interpretation

#### *Use*

This indicator is useful as a measure of the impact of preventive services for sexually transmitted infections (STI). It also provides an indication of the perceived burden of STI on the adult male population, as it measures the reported prevalence of a major STI symptom in men.

***Issues of interpretation***

Self-reported incidence of STI raises a number of problems regarding definitions and recall of events. Moreover, respondents may not differentiate among the terms used in the investigation. Symptoms in men are usually more easily recognizable, and gonorrhoea/chlamydia (penile discharge) can be distinguished from syphilis (sores, ulcerations). Nevertheless, even in males many infections are known to be asymptomatic.

***Limitations and common pitfalls***

The most important limitation is the interpretation and validity of the reported symptoms. Some studies have demonstrated considerable discrepancies between reported and observed symptoms (1) and there might well be recall bias, leading to underreporting. More importantly, the presence of asymptomatic gonococcal or chlamydial infection in males seriously limits the usefulness of this indicator, even as a proxy for STI prevalence or incidence (2). Therefore, self-reported symptoms should be used with caution in assessing the impact of preventive and treatment services.

***Supporting indicators***

This indicator is complementary to “prevalence of positive syphilis serology in pregnant women”.

**References**

1. Klouman E et al. Asymptomatic gonorrhoea and chlamydial infection in a population-based and work-site based sample of men in Kilimanjaro, Tanzania. *International Journal of STD & AIDS*, 2000, 11:666–674.
2. Watson-Jones D et al. High prevalence of trichomoniasis in rural men in Mwanza, Tanzania: results from a population based study. *Sexually Transmitted Infections*, 2000, 76:355–362.



## 16 Prevalence of HIV infection in pregnant women

The percentage of blood samples taken from women aged 15–24 years that test positive for HIV during routine sentinel surveillance at selected antenatal clinics

**Numerator:** Number of HIV-positive blood samples taken from pregnant women aged 15–24 years\* at selected antenatal clinics (sentinel surveillance sites) x 100

**Denominator:** Total number of blood samples taken from pregnant women aged 15–24 years from selected antenatal clinics that were tested for HIV

\*In the immediate post-pubertal age group (i.e. the age group just beginning sexual activity virtually all prevalent infections could be used as proxy for incident (new) infections.

### Definitions of important terms

**Positive HIV test.** The standard screening test for HIV is enzyme-linked immunosorbent assay (ELISA). ELISA is performed on unlinked anonymous samples of blood drawn for other purposes during antenatal screening. A sample is considered positive when, on single application of the test, evidence of past HIV infection is determined.

### Generation of the indicator

#### *Data sources and collection methods*

##### **Routine sentinel surveillance data**

Sentinel surveillance methodology aims to collect information on specific aspects of the health situation and services as a complement to the data produced by regular information systems. Sentinel HIV surveillance tracks HIV infection levels in populations that are likely to give blood for other purposes in specific settings (sentinel surveillance sites) that provide service to these populations and routinely draw blood. Leftover serum samples are stripped of all identifying markers and tested for HIV (unlinked anonymous HIV testing).

For most countries, data on HIV prevalence may be obtained from various sources, including blood banks, sexually transmitted infection (STI) clinics and military recruitment programmes. Most of these sources, however, involve highly selected populations. In areas of

developing countries with high fertility and high HIV prevalence, and where the principal mode of HIV transmission is through heterosexual contact, antenatal clinic (ANC) attendees are the preferred population for routine surveillance of the general population of sexually active adults.

##### **Population-based seroprevalence surveys**

There is an increasing recognition that, even under the best conditions, ANC-based HIV prevalence estimates may be difficult to interpret (see below) owing to limited generalizability to the overall adult population. Technologies and other resources are now available that allow low-cost HIV testing in the context of periodic household surveys. Using household surveys for data collection permits conventional probability sampling and much better overall population coverage than ANC-based data collection. Whether this approach will become an integral component of HIV monitoring, or will simply be used to periodically “calibrate” an ANC-based system, is not yet apparent. In countries where even the simplest ANC-based system is not yet in place, a population-based seroprevalence survey will produce a baseline estimate of HIV prevalence. However, despite the availability of low-cost tests, these surveys are expensive to conduct. Moreover, ANC-based HIV testing and testing in the context of household surveys must include

an informed consent procedure and may therefore lead to non-participation bias.

### ***Periodicity of data collection***

ANC-based data are usually reported annually. The period (duration) of data collection within each sentinel site should not exceed 4–6 weeks, so as to minimize the inclusion of women more than once in any single site's annual data. A single estimate of HIV prevalence, whether based on testing of blood samples from single or multiple sites, should involve analysis of results from no fewer than 500 pregnant women aged 15–24 years.

To allow for periodic assessment of the ANC profile, some information should be collected from women on their place of residence and other social characteristics such as education and ethnicity.

### ***Disaggregation***

Both aggregation and disaggregation of ANC-based data will be problematic because of the use of non-probability sampling in existing HIV sentinel systems. To minimize bias, the sample of ANC facilities should as far as possible be stratified to include those with both high and low patient flow (i.e. not just large health centres and hospitals) and to allow for representation of important populations based on age and urban/rural residence. The focus of monitoring efforts should be on estimating changes in prevalence within the major surveillance strata.

A single national estimate, while useful for policy, may not be helpful in monitoring trends over time. Within a single country, there is typically more than one underlying epidemic at play, each with a different dynamic. An understanding of the national picture requires an understanding of the patterns and trends in HIV prevalence occurring in subpopulations. This necessitates

disaggregation of data according to age, geography and some other characteristics such as occupation and mobility.

## **Analysis and interpretation**

### ***Use***

This indicator is used as a proxy for HIV incidence. The incidence of HIV infection is the preferred indicator to monitor the course of the HIV epidemic and the impact of interventions; prevalence data are of limited value since they reflect infections acquired over a number of years. In the case of this indicator, incidence is estimated from prevalence data in young women; prevalence in this age group is likely to reflect infections that have occurred recently (1).

### ***Issues of interpretation and limitations***

#### **Male/female prevalence**

Sentinel data for males in the general population are rarely available. It is understood that the relationship of prevalence in young men to that in young women will vary dramatically depending on the type and trajectory of the epidemic. For instance, in mature generalized epidemics, infection rates in young women are expected to be higher—sometimes much higher—than those in young men. It is therefore inadvisable to extend interpretation of ANC-based prevalence estimates to the general “both sexes” population.

#### **Pregnancy status**

Women who are pregnant (and might attend antenatal clinics) are those who are recently sexually active, are fecund and do not use contraception (including regular condom use) that affects both pregnancy and HIV status. These factors would operate to bias ANC-based HIV estimates upwards (i.e. overestimate prevalence).



The fact that fecundity falls increasingly with length of HIV infection operates in the other direction to bias prevalence estimates downwards (2). This is unlikely to have an important biasing effect on prevalence in the 15–24-year age group, however, since most infections will be recent.

#### **General antenatal clinic attendance**

In many settings, the percentage of all pregnant women who visit fixed ANC facilities at least once is quite high. Typically, however, access to ANC services is unevenly distributed in a population. Poorly educated and more remote populations are generally underrepresented in ANC-based data.

#### **Sentinel facility use (“population coverage”)**

The HIV-risk profile of ANC attendees at a particular site selected for surveillance within a surveillance stratum (e.g. rural area of district X) may not represent all pregnant women who use ANC services in that stratum. In this regard, the differential use of private vs public facilities and high vs low patient-flow facilities will complicate the interpretation of the results. Moreover, the differential mobility of the population will influence the relationship between residence of ANC attendees and the location of the site. These potentially large “population coverage” biases will vary unpredictably in direction and size.

#### **Geographical coverage**

Even where all of the above potential biases have been considered, there is the issue of geographical coverage. Even if ANC attendees were to represent all women in geographically defined catchment populations around sentinel sites, most sentinel systems are not designed to capture important subnational variations in HIV prevalence. In a generalized epidemic, if a large number of areas are excluded from surveillance

(typically hard-to-access rural populations), ANC-based estimates of the level of HIV in the population will be biased. Over a period when the epidemic is penetrating into previously untouched or less affected rural areas (i.e. geographical differentials are changing), trends in HIV prevalence will be very difficult to evaluate.

This indicator is understandable if applied appropriately according to the definitions and methodology cited, and if interpreted within the context of the specific definition and not beyond. In other words, this indicator should be used to track trends in HIV prevalence in pregnant women aged 15–24 years at selected ANC sites, and should not be used to evaluate trends in incidence or prevalence in the overall adult population.

#### ***Supporting indicators***

“Prevalence of positive syphilis serology in pregnant women” is another indicator that might be useful as an early warning indicator for HIV spread, as well as a biological marker for high-risk sexual practices.

To provide a broader and more current view of epidemiological trends, monitoring of trends in high-risk behaviour in the population should accompany and complement surveillance of HIV prevalence. To this aim, the following behavioural indicators may be useful:

- median age at first intercourse (among women and men age 15–24 years);
- percentage of women/men who have had sex with a non-marital, non-cohabiting partner in the previous 12 months; and
- percentage of women/men who used a condom when last having intercourse with a non-marital, non-cohabiting partner.

To facilitate comparison between epidemiological and behavioural data,

surveys to collect behavioural data should be conducted in populations broadly representative of the catchment populations used for HIV sentinel surveillance.

### References

1. *Reproductive health indicators for global monitoring. Report of the Second Interagency Meeting, Geneva, 17–19 July 2000.* Geneva, World Health Organization, 2001 (document WHO/RHR/01.19).
2. Zaba B, Gregson S. Measuring the impact of HIV on fertility in Africa. *AIDS*, 1998, 12(Suppl. 1):S41–S50.

### Further reading

1. *Second-generation surveillance for HIV: the next decade.* Geneva, World Health Organization, 2000 (document WHO/CDS/CSR/EDC/2000.5).



## 17 Knowledge of HIV-related preventive practices

The percentage of survey respondents who correctly identify all three major ways of preventing sexual transmission of HIV, and who also reject all three major misconceptions about HIV transmission or prevention

**Numerator:** Number of survey respondents (women and men) who correctly identify all three major ways of preventing sexual transmission of HIV, and who also reject all three major misconceptions about HIV transmission or prevention x100

**Denominator:** Total number of respondents included in the survey

### Definitions of important terms

The *three major ways of preventing sexual transmission of HIV* are: (a) having no penetrative sex; (b) using a condom; and (c) limiting sexual activity to one faithful, uninfected partner.

The *three major misconceptions* about HIV transmission or prevention are: (a) not understanding that a healthy-looking person can carry the AIDS virus; and (b) and (c) two other major misconceptions to be determined in the local cultural context.

### Generation of the indicator

This indicator is a composite of two major sets of questions: those on correct knowledge and those concerning incorrect knowledge or misconceptions. In calculating the estimates (for women and men), all survey respondents age 15–49 years are included in the denominator; only those who satisfy the definitions for complete knowledge and lack of misconceptions are included in the numerator.

### Data sources and collection methods

The principal source of information on knowledge of HIV prevention has been population-based household surveys. Any well-designed and implemented population-based survey of sufficient size can potentially yield high-quality data on this subject. As part of a collaborative effort to standardize indicators and

instruments for monitoring and evaluating HIV prevention programmes and to provide uniform, internationally-consistent data using a conventional household-survey approach, the following instruments were created:

- UNAIDS/MEASURE Evaluation General Population Survey; and
- HIV/AIDS module of the Demographic and Health Surveys (1).

Currently, the most commonly available source of data on knowledge of HIV prevention for developing countries are the Demographic and Health Surveys (2). It is expected, however, that population-based household surveys similar to the UNAIDS/MEASURE Evaluation model will be increasingly conducted to satisfy HIV/AIDS programme data needs.

The sample should be designed to yield sex-specific national estimates and estimates for urban and rural areas, for major administrative divisions and across major socioeconomic strata. Furthermore, in view of the importance of adolescent knowledge and behaviour, care should be taken to ensure adequate representation of the age group 15–24 years (and, if feasible, also those aged 15–19 years) for both sexes and for all social and economic strata.

More recent HIV/AIDS programme monitoring and evaluation initiatives recommend enhanced data collection in geographical areas that are under

epidemiological HIV surveillance. This allows “triangulation” of data of different types from different sources but from the same base population. In appreciation of this, over-sampling of HIV sentinel surveillance areas should be considered.

A minimum of 500 interviewed individuals is required for a single point estimate of this indicator. Typically, to satisfy recommendations to disaggregate national survey data, a minimum sample of 3000 women and 3000 men would be required, which translates to approximately 2500–3500 households.

#### ***Periodicity of data collection***

Estimates for this indicator should be produced every 2–3 years.

#### ***Disaggregation***

Data should be disaggregated by sex and age group and by urban/rural residence, major administrative divisions and major socioeconomic strata. There is increasing emphasis placed on HIV/AIDS programmes for youth populations. For this reason, the indicator should be reported separately for the age group 15–24 years and, if feasible, also for the age group 15–19 years.

In-depth analysis of the two major components (correct knowledge and misconceptions) and the six individual components of the indicator will enhance understanding of trends.

#### **Analysis and interpretation**

##### ***Use***

Knowledge of preventive practices in HIV/AIDS is a prerequisite for behavioural change. Originally, the indicator consisted only in correctly identifying HIV prevention practices, with the underlying rationale that improved knowledge of such practices is a precondition to constructive behavioural change. However, the notion that correct knowledge on prevention would lead to constructive behavioural

change has proven overly optimistic. In many settings, indicators of correct knowledge have risen dramatically without corresponding declines in risk-taking behaviour. For this reason, the addition of the “misinformation” dimension was added in the hope that the indicator would be more discriminating in identifying individuals and populations who are susceptible to adopting behaviour that modifies the chance of HIV transmission. The indicator is newly developed; whether it will indeed be useful in tracking susceptibility to the adoption of high-risk behaviour remains to be assessed.

#### ***Issues of interpretation and limitations***

##### **Measurement challenges**

In an interview approach, there are generally two ways to obtain information on a person’s knowledge of certain important facts regarding HIV prevention: spontaneously reported responses and prompted responses. In the first instance, an open-ended question is asked: “What can a person do to avoid getting AIDS or the virus that causes AIDS?” The interviewer is trained to elicit all responses from the respondent, but experience shows this question generally does not produce an exhaustive list of a person’s knowledge. The completeness of knowledge information provided using this approach varies between interviewers and across time.

In the “prompted” approach, specific questions are asked of the respondent, for example: “Can people protect themselves from getting the AIDS virus by using a condom every time they have sex?” While this approach is better than the spontaneous approach from a standardization perspective, it is clearly a leading question and will tend to overestimate knowledge. On the other hand, it has also been suggested that the respondents who respond “no” to such a question are those with the most



knowledge (they wish to demonstrate their in-depth understanding that, in the example above, it is still possible to get HIV from a blood transfusion). In sum, it is recommended that prompted questions be used as a basis for this indicator. Nevertheless, experience indicates that available instruments are imperfect and much care should be taken in the training and supervision of interviewers so as to maximize comparability in repeated applications. Furthermore, the precise wording of the prompted questions must be given careful thought in each linguistic and cultural context.

### **Representativeness**

The indicator estimate will be representative of the target population of women and men to the extent that (a) probability sampling methods are correctly used in the survey design and implementation and (b) sample weights are calculated and used where necessary.

In view of the importance of adolescent knowledge and behaviour, care should be taken in interpreting estimates broken down for the youth population. In many settings, a significant percentage of those aged 15–19 years will be away at school, precluding their representation in the household population surveyed. If estimates for youth are a priority, a separate data collection exercise involving school-based data collection may be necessary.

### ***Supporting indicators***

Knowledge of the means of preventing HIV transmission is considered a precondition to constructive behavioural change. Trends in knowledge should thus be evaluated alongside trends in indicators of behaviour that are associated with increased risk of HIV transmission, namely:

- percentage of women/men who have had sex with a non-marital, non-cohabiting partner in the previous 12 months; and

- percentage of women/men who used a condom when last having intercourse with a non-marital, non-cohabiting partner.

### **References**

1. <http://www.measuredhs.com>, accessed 21 December 2005.





## Annex 1 Millennium Development Goals and associated targets

Goal	Target
1 Eradicate extreme poverty and hunger	1 Halve, between 1990 and 2015, the proportion of people whose income is less than \$1 a day
	2 Halve, between 1990 and 2015, the proportion of people who suffer from hunger
2 Achieve universal primary education	3 Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling
3 Promote gender equality and empower women	4 Eliminate gender disparity in primary and secondary education, preferably by 2005, and at all levels of education no later than 2015
4 Reduce child mortality	5 Reduce by two thirds, between 1990 and 2015, the under-five mortality rate
5 Improve maternal health	6 Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio
6 Combat HIV/AIDS, malaria and other diseases	7 Have halted by 2015 and begun to reverse the spread of HIV/AIDS
	8 Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases
7 Ensure environmental sustainability	9 Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources
	10 Halve, by 2015, the proportion of people without sustainable access to safe drinking-water and basic sanitation
	11 Have achieved, by 2020, a significant improvement in the lives of at least 100 million slum dwellers
8 Develop a global partnership for development	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)
	13 Address the special needs of the least developed countries (includes tariff- and quota-free access for exports enhanced programme of debt relief for heavily indebted poor countries and cancellation of official bilateral debt, and more generous official development assistance for countries committed to poverty reduction)
	14 Address the special needs of landlocked countries and small island developing states (through the Programme of Action for the Sustainable Development of Small Island Developing States and the outcome of the twenty-second special session of the General Assembly)
	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

Goal	Target
8 Develop a global partnership for development	16 In cooperation with developing countries, develop and implement strategies for decent and productive work for youth
	17 In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries
	18 In cooperation with the private sector, make available the benefits of new technologies, especially information and communications



## Annex 2 The selection criteria for the shortlist of indicators

Criterion	Explanation
Scientifically robust	An indicator must be a valid, specific, sensitive and reliable reflection of that which it purports to measure.
Valid	An indicator must actually measure the issue or factor it is supposed to measure.
Reliable	An indicator must give the same value if its measurement were repeated in the same way on the same population and at almost the same time.
Sensitive	An indicator must be able to reveal important changes in the factor of interest.
Specific	An indicator must reflect only changes in the issue or factor under consideration.
Useful	At national level, an indicator must be able to act as a “marker of progress” towards improved reproductive health status, either as a direct or proxy measure of impact or as a measure of progress towards specified process goals. Since computation of national-level indicators usually requires aggregation of data collected at a local level, the data should also be useful locally, i.e. follow-on action should be immediately apparent.
Representative	An indicator must adequately encompass all the issues or population groups it is expected to cover. For national-level indicators the group of interest is the population as a whole, including minority groups and adolescents.
Understandable	An indicator must be simple to define and its value must be easy to interpret in terms of reproductive health status.
Accessible	The data required should be available or relatively easy to acquire by feasible data collection methods that have been validated in field trials.
Ethical	An indicator must be seen to comply with basic human rights and must require only data that are consistent with the morals, beliefs or values of the local population.