

INDICATORS
for
DESIGN, MONITORING AND
EVALUATION
of
MATERNAL MORTALITY
PROGRAMS

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Note: These 5-6 indicators work well as a package, starting with the first in this list and following through to the last one (case fatality rate). They present a logical sequence of how program managers of a country's safe motherhood or maternal health program may want to prioritize their activities, beginning with coverage and moving on to performance. The first indicator 'number of facilities providing emergency obstetric functions' determines if the services exist. Once disaggregated it informs us about the distribution of those services. The 'proportion of women who deliver at EmOC facilities' and 'met need' tell us about the level of service utilization and if the women who truly need emergency services actually receive them. The 'C-section rate' indicates the level of use of a particular life-saving procedure, which is an element of quality of care. Finally, the 'case fatality rate' reflects quality of care and facility performance.

In addition to the logical sequence these indicators offer, the data collection required for all the indicators comes from facilities and outside sources (census, national surveys). In other words, the same simple data collection instrument is all that is necessary.

Number of Facilities Providing Emergency Obstetric Functions

DEFINITION

The number of facilities that provides emergency obstetric signal functions per 500,000 population,

Where:

- Emergency obstetric signal functions are defined as:
 - Administration of parenteral antibiotics;
 - Administration of parenteral oxytocic drugs;
 - Administration of parenteral anticonvulsants for pregnancy induced hypertension;
 - Performance of manual removal of placenta;
 - Performance of removal of retained products (e.g. vacuum aspiration);
 - Performance of assisted vaginal delivery (e.g. ventouse, forceps);
 - Performance of surgery (e.g. Cesarean section); and
 - Performance of blood transfusion.
- Facilities are divided into those that provide ‘basic’ emergency obstetric care (EmOC) and ‘comprehensive’ EmOC. If a facility has performed each of the first 6 functions *in the past three months*, it qualifies as providing basic EmOC. If it has provided all 8 of the functions, it qualifies as a ‘comprehensive’ EmOC facility.

DATA REQUIREMENTS

Count of the facilities that meet the requirements for ‘basic’ and ‘comprehensive’ EmOC.

DATA SOURCES

Ideally, the provision of the emergency obstetric signal functions should come from facility records. Personal interviews with knowledgeable staff who attend obstetric patients are a second, albeit, potentially more biased source of information than written records.

PURPOSE AND ISSUES

This indicator demonstrates the existence of life-saving obstetric care services. It distinguishes between ‘basic’ and ‘comprehensive’ care services to emphasize that maternal lives can be saved not only in hospitals that provide all the services listed above, but also at health centers or smaller hospitals that do not.

The list above was designed to be brief in order to facilitate assessment and monitoring; it was not intended to serve as a complete list of services that should be provided either at a basic or comprehensive EmOC facility. There are valuable services that are not included

in the definition of an EmOC facility. For example, use of anesthesia is not included, but is assumed necessary for obstetric surgery.

The existence of blood transfusions should be defined as a safe and secure blood bank with universally accepted screening tests and a supply of blood. Also, our goal is to have the signal functions available 24 hours a day, 7 days a week., at least in the comprehensive facilities.

Causality: The causal link between maternal deaths and this indicator, while logical, has not been demonstrated. Clearly, EmOC services must exist to save women's lives.

Feasibility: This indicator should not be difficult to produce, but it is important that the assessment be made based on how facilities are actually functioning and not on how they are supposed to function. For example, not all hospitals that are supposedly open 24 hours a day with specialists on call actually provide all the signal functions, especially at night or on weekends.

Responsiveness: This indicator should respond to changes within a fairly short period of time – e.g., 6-12 months.

Population – or Facility-Based: Population-based but requires facility-based data.

Interpretation: Generally, this indicator is applied to a large region or country. UNICEF/WHO/UNFPA recommend as a minimum acceptable level for every 500,000 population, one facility that provides comprehensive EmOC and 4 facilities that provide basic EmOC. If this overall minimum level is not reached, upgrading existing facilities, building new ones, or a combination of the two could be done. If the minimum level is met, the geographical distribution should be studied by looking at smaller divisions. Reliance on national summary measures may hide important subnational disparities. Disaggregation by geographic (urban/rural) and administrative (public/private) divisions is recommended.

Where geographical terrain is particularly challenging and transportation precarious (such as the mountains of Nepal or Bhutan), the ratio of facilities to population may require adjustment for local use, but for reasons of comparability across space and time, maintaining the original ratios is recommended.

Sources of information:

Indicators for Reproductive Health Program Evaluation. Final Report of the Subcommittee on Safe Pregnancy. 1995. Editors: Koblinsky M, McLaurin K, Russell-Brown P, Gorbach P, The Evaluation Project.
Maine D, McCarthy J, Ward VM. 1992. Guidelines for Monitoring Progress in the Reduction of Maternal Mortality: A Work in Progress. New York: UNICEF.
Guidelines for Monitoring the Availability and Use of Obstetric Services, 1997. UNICEF, WHO, UNFPA.

Geographical Distribution of EmOC Facilities

DEFINITION

The number of facilities that provide emergency obstetric functions per 500,000 population. It is the same indicator for the 'amount of EmOC facilities,' but applied to smaller geographical areas.

Note to MEASURE: I would propose combining the two indicators. We know the importance of estimating the C-section rate at subnational areas such as urban and rural areas. The 'amount of EmOC facilities' should be treated similarly and should be disaggregated to show the distribution of EmOC facilities. In fact, it is likely that the indicator is used at this level more often than it is at the national level.

Proportion of all Births in Basic and Comprehensive EmOC Facilities

DEFINITION

The proportion of births delivered in EmOC facilities.

This is calculated as:

Number of births delivered in EmOC facilities in a specified time period

Estimated number of live births in a specified time period in the geographical area served by the EmOC facilities

Where:

- EmOC facilities include both 'basic' and 'comprehensive' levels of emergency obstetric care. Basic care includes the provision of parenteral antibiotics, oxytocic, and sedatives; manual removal of placenta; removal of retained products of conception (vacuum aspiration); and assisted vaginal (ventouse or forceps) delivery. Comprehensive care includes all of the basic functions, plus obstetric surgery and blood transfusions.

DATA REQUIREMENTS

- Numerator: the number of births delivered in EmOC facilities during a specified time period.
- Denominator: an estimate of all live births in the population during a specified time period and geographical area

DATA SOURCES

- Numerator: facility records.
- Denominator: demographic surveys for crude birth rates; census for total populations. Multiplying the two gives an estimate of the number of live births.

PURPOSE AND ISSUES

The proportion of all births that take place in an EmOC facility serves as a crude indicator of the utilization of EmOC facilities. This indicator is useful because the data are readily available. Furthermore, it is useful in conjunction with other indicators such as 'met need' to gauge internal consistency. For example, if this indicator does not change, but 'met need' increased substantially, a deeper look at the facility and the community it serves would be warranted.

The ultimate goal is to increase utilization of EmOC among women with obstetric complications to 100 per cent. This indicator is not intended to promote the delivery of all births in EmOC facilities. Many countries could not meet this theoretical demand. Thus, women with normal deliveries may be better off delivering at home or at facilities with fewer services.

Causality: This indicator has a link of causality with maternal mortality, but it is not as strong as ‘met need’ or the ‘case fatality rate.’

Feasibility: Virtually all facilities record the number of deliveries they attend.

Responsiveness: This indicator is responsive to change within 6 –12 months.

Population – or Facility-Based: Population-based but requires facility data.

Interpretation: UNICEF/WHO/UNFPA recommends at least 15 per cent of all births in the population take place either in basic or comprehensive EmOC facilities, based on the estimate that 15 per cent of pregnant women will develop an obstetric complication requiring medical care (WHO, 1994). If the number of women delivering in an EmOC facility is not at least 15 per cent of all births, then it is certain that some women with complications are not being treated.

If the per cent exceeds 15 per cent, we should not presume that many or most of these deliveries occur to women with obstetric complications. The indicator does not inform the user about the kinds of deliveries occurring in facilities and will likely measure not only complicated births but also normal deliveries.

Sources of information:

Indicators for Reproductive Health Program Evaluation. Final Report of the Subcommittee on Safe Pregnancy. 1995. Editors: Koblinsky M, McLaurin K, Russell-Brown P, Gorbach P, The Evaluation Project.

Maine D, McCarthy J, Ward VM. 1992. Guidelines for Monitoring Progress in the Reduction of Maternal Mortality: A Work in Progress. New York: UNICEF.

Guidelines for Monitoring the Availability and Use of Obstetric Services, 1997. UNICEF, WHO, UNFPA.

WHO, 1994. Indicators to Monitor Maternal Health Goals: Report of a Technical Working Group, Geneva, 8-12 November 1993. Geneva: WHO, WHO/FHE/MSM/94.14.

Met Need for Emergency Obstetric Care (EmOC)

DEFINITION

The proportion of all women with major obstetric complications who are treated in EmOC facilities.

This is calculated as:

Number of women with a major obstetric complication treated in EmOC facilities
in a specified time period

Estimated number of women with obstetric complications in the same specified
time period from the geographical area served by the EmOC facilities

Where:

- The direct or major obstetric complications include:
 - hemorrhage: antepartum, intrapartum or postpartum;
 - prolonged/obstructed labor;
 - postpartum sepsis;
 - complications of abortion;
 - pre-eclampsia/eclampsia;
 - ectopic pregnancy; and
 - ruptured uterus.
- “In EmOC facilities” includes both women admitted with the complication and women who develop the complication in the facility.
- EmOC facilities include both ‘basic’ and ‘comprehensive’ levels of emergency obstetric care. Basic care includes the provision of parenteral antibiotics, oxytocic, and sedatives; manual removal of placenta; removal of retained products of conception (vacuum aspiration); and assisted vaginal (ventouse or forceps) delivery. Comprehensive care includes all of the basic functions, plus obstetric surgery and blood transfusions.

DATA REQUIREMENTS

- Numerator: the number of women with a major obstetric complication treated in EmOC facilities during the specified time period.
- Denominator: an estimate of the number of women with major obstetric complications in the population during a specified time period.

DATA SOURCES

- Numerator: facility records.

- **Denominator:** The estimated number of pregnant women who develop obstetric complications that require medical care to avoid death or disability is considered to be 15 per cent (WHO, 1994). The number of live births is frequently used as a proxy for all births or pregnancies, which theoretically is a more appropriate denominator. The number of live births is estimated by multiplying the crude birth rate by the total population.

PURPOSE AND ISSUES

The purpose of this indicator is to gauge the level of use of EmOC services by women experiencing a major obstetric complication in a specified time period and geographical area.

Causality: Access to and prompt utilization of good quality EmOC among women who need it is directly and strongly related to the level of maternal mortality in the population.

Feasibility: In some facilities it will be necessary to revise the record keeping system in order to have data on complicated cases routinely gathered in a way that makes them readily accessible. A useful system would have major complications recorded in the patient register or maternity logbook. It is also important to ensure that information is gathered not just from the maternity ward, but from all relevant parts of the facility (e.g., gynecology ward, surgical ward, abortion ward, morgue, etc.). However, it is critical that complications from all EmOC facilities in the area under study be included in the numerator if that number is relatively small. If there is a large number of EmOC facilities (especially health centers) in the area under study, a random sample of facilities could be used.

Responsiveness: This indicator should respond quickly to changes in availability and quality of services, and in service utilization.

Population – or Facility-Based: Population-based but requires facility-based data.

Interpretation: UNICEF/WHO/UNFPA has set the minimum acceptable level of ‘met need’ to be 100 per cent, but in most developing country settings, 100 per cent is not a realistic target. If less than 100 per cent is found, the conclusion is that some women with complications are not receiving the medical care they need. The indicator does not describe what needs to be done and if ‘met need’ is low, there is no way of knowing where the problem lies. It may lie in the availability, accessibility, quality of care being provided, or other factors such as cultural factors that determine the utilization of services. Small short-term studies could fill this gap with information related to low utilization of services, for example, observations at hospitals or discussion groups in the community.

Theoretically ‘met need’ could exceed 100 per cent. This could happen because more than 15 per cent of pregnant women in the population develop major obstetric complications. In developed countries, the proportion of women with complications

managed in EmOC facilities may be greater than 15 per cent of all births. Overdiagnosis of complications, which is seen in parts of Eastern Europe, could also cause this ratio to exceed 100 per cent.

'Met need' is particularly sensitive to the number of abortions included in the numerator. If the incidence of unsafe abortion is high, 'met need' is likely to be high. Thus, proponents of the indicator have discussed whether only septic abortions should be included or all women who present with complications of abortion. Those in favor of the latter argue that the distinction between a septic abortion and a relatively uncomplicated abortion cannot always be made, either because those filling out medical records are reluctant to call attention to an abortion that was probably illegally induced, or record keeping is poor and incomplete. Furthermore, although not all cases of abortion complications are life-threatening at the time they present at an EmOC facility, many would become life-threatening if not treated. The inclusion of all abortions can cause 'met need' to be twice or three times as high as it would be without the abortions. Given this inflation of 'met need' as a result of the inclusion of all abortion complications, a growing number of advocates for the indicator calculate it both ways, with and without all abortions. By excluding post-abortion complications, estimates may be more comparable.

The appropriateness of using 15 per cent of all births/pregnancies to estimate the number of women who experience obstetric complications is also open to discussion. WHO's estimates of births with complications may be higher than 15 per cent: hemorrhage 10 per cent of pregnancies; sepsis 8 per cent; hypertensive disorders of pregnancy 5 per cent; obstructed labor 5 per cent (Mother-Baby Package, 1994). However, prospective data from West Africa suggest that 6 per cent may be a more reasonable estimate of severe obstetric complications (Prual et al., 2000). The narrower the definition of what is considered a direct or major obstetric complication, the more reliable and comparable the estimates will be. However, birth records and registries are not likely to contain significant details on complications to allow much refinement in the severity of a complication.

The issue of double-counting a woman in the numerator, one who is admitted to the same facility more than once during her pregnancy or postpartum period, or one who is admitted to more than one facility, is not likely to seriously bias the results. If they were to bias the indicator, it would be to present a more positive view of the health system than merited, rather than to be unfairly negative.

Given the variability possible in defining the numerator or the denominator and the dependence on estimates for the denominator (CBR, population, 15 per cent), 'met need' is likely to be imprecise and could over or underestimate the true value. To make the indicator useful for comparisons across facilities, districts or over time, it is extremely important to use the same definitions and to document how each is defined.

Sources of information:

Indicators for Reproductive Health Program Evaluation. Final Report of the Subcommittee on Safe Pregnancy. 1995. Editors: Koblinsky M, McLaurin K, Russell-Brown P, Gorbach P, The Evaluation Project.

Maine D, McCarthy J, Ward VM. 1992. Guidelines for Monitoring Progress in the Reduction of Maternal Mortality: A Work in Progress. New York: UNICEF.

Guidelines for Monitoring the Availability and Use of Obstetric Services, 1997. UNICEF, WHO, UNFPA.

MotherCare *Matters*, Safe Motherhood Indicators – Lessons Learned in Measuring Progress. Vol. 8, No. 1, May 1999.

WHO, 1994. Indicators to Monitor Maternal Health Goals: Report of a Technical Working Group, Geneva, 8-12 November 1993. Geneva: WHO, WHO/FHE/MSM/94.14.

Mother-Baby Package: Implementing safe motherhood in countries, 1994. WHO.

Pruhal A, Bouvier-Colle MH, de Bernis L, & Bréart G, 2000. Severe maternal morbidity from direct obstetric causes in West Africa: incidence and case fatality rates. *Bulletin of the World Health Organization*, 78(5): 593-602.

Cesarean Sections as a Proportion of all Births

DEFINITION

The proportion of pregnant women who have a cesarean section in a specific geographical area and time period.

This is calculated as:

$$\frac{\text{Number of cesarean sections performed in a specified time period and area}}{\text{Number of live births in the same specified time period and area}}$$

DATA REQUIREMENTS

- Numerator: the number of cesarean sections performed in a defined population during a specified time period.
- Denominator: the total number of live births in the same area and time period.

DATA SOURCES

- Numerator: facility records, surgery log books
- Denominator: demographic surveys for crude birth rates; census for total populations. Multiplying the two gives an estimate of the number of live births.
- Household demographic surveys often produce national and disaggregated estimates of the C-section rate.

PURPOSE AND ISSUES

This indicator demonstrates the extent to which a particular life-saving obstetric service is being performed in EmOC facilities. It reflects the availability, accessibility and utilization of services as well as the functioning of the health service system. The appropriate use of a cesarean section leads to a decrease in maternal mortality and morbidity, as well as decreasing perinatal morbidity and mortality. While cesarean sections may be performed solely for the health of the fetus or newborn, in developing countries the vast majority will be done for maternal indications.

Causality: Many of the major pre- and intrapartum causes of maternal mortality and morbidity require the use of this procedure to save the woman's life or prevent serious morbidity.

Feasibility: Of all the procedures used to treat the major obstetric complications, C-sections may be the easiest to study because record-keeping for C-sections is more reliable than that of other procedures or obstetric complications. However, it is critical

that information for all facilities performing C-sections in the area under study be included in the numerator.

Responsiveness: Changes in the ability of the health care system to provide cesarean sections can have an impact within 6-9 months.

Population – or Facility-Based: Population-based but requires facility-based data.

Interpretation: UNICEF/WHO/UNFPA recommend a C-section rate between 5 and 15 per cent of all births, based on estimates from a variety of sources. Rates less than 5 per cent may indicate inadequate availability and/or access to EmOC. Rates above 15 per cent suggest overuse use of the procedure for non-emergency reasons. Excessive use unnecessarily exposes women to anesthesia and surgery with its concomitant risks. It is also expensive and utilizes scarce health care resources. Most of the countries with excessively high C-section rates are also highly litigious societies such as the United States where 22 per cent of all births are cesareans (Lancet, 2000). However, Brazil has a rate of at least 36 per cent of all live births (BEMFAM, 1996).

Disaggregation of the rate allows an assessment of access to the procedure. Rates are often not consistent between urban and rural environments, public or private sectors, different payment schemes, or across regions. Thus, subnational estimates are encouraged.

Crude birth rates produce estimates of live births only and some cesarean sections are performed on pregnancies that result in stillbirths. If the number of c-sections performed for stillbirths is low, the use of live births should be acceptable as the denominator.

Another indicator, the ‘proportion of facility deliveries that are C-sections,’ will vary by the case-mix of patients and will be biased by referral patterns of women with complications requiring the procedure. It is not possible to specify an appropriate range of target percentages within a facility.

The procedure of cesarean section usually occurs at the end of a complex series of events, possibly including pre-existing and pregnancy-specific medical factors, identification of complications, transportation to health care facilities and availability of necessary technology. When using this indicator, managers and scientists may also want to employ more in-depth techniques such as case audits to investigate what indicators are being used for cesarean section and if the appropriate women are receiving this service. By itself, the indicator reveals nothing about the appropriateness of the procedure.

At no time should this indicator be interpreted as promoting C-sections for any purpose.

Sources of information:

Indicators for Reproductive Health Program Evaluation. Final Report of the Subcommittee on Safe Pregnancy. 1995. Editors: Koblinsky M, McLaurin K, Russell-Brown P, Gorbach P, The Evaluation Project.

Maine D, McCarthy J, Ward VM. 1992. Guidelines for Monitoring Progress in the Reduction of Maternal Mortality: A Work in Progress. New York: UNICEF.

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The Lancet, 2000. Caesarean section on the rise. The Lancet, Volume 356, Number 9243, p. 1697.

BEMFAM. *Pesquisa Nacional sobre Demografia e Saúde, 1996*. Sociedade Civil Bem-estar Familiar no Brasil and Macro International. Calverton, MD, 1997.

Case Fatality Rate (CFR) – All complications

DEFINITION

The proportion of women with major obstetric complications who die in a facility.

This is calculated as:

Number of deaths from specified obstetric complications in a facility during a specified time period

Number of women with specified obstetric complications attended in the facility during the same time period

Where:

- Deaths from the following complications are included:
 - hemorrhage: antepartum, intrapartum or postpartum;
 - prolonged/obstructed labor;
 - postpartum sepsis;
 - complications of abortion;
 - pre-eclampsia/eclampsia;
 - ectopic pregnancy; and
 - ruptured uterus.
- All cases in the numerator also appear in the denominator.
- All complications specified in the list above are included in both the numerator and denominator. By definition, a CFR is cause-specific, but in this case a single facility may not see but a small number of women with any one complication.

DATA REQUIREMENTS

- Numerator: a count of the deaths from the specified complications in the facility during the specified time period.
- Denominator: a count of women diagnosed with one or more of these complications attended at the EmOC facility during the specified time period.

DATA SOURCES

- Numerator: facility records.
- Denominator: facility records.

PURPOSE AND ISSUES

This indicator is used to measure facility performance, in particular quality and promptness of care. It is most useful when comparisons are made over time for the same facility. It is not useful for comparisons across facilities of different types because of the different services they offer. Women with more severe complications are more likely to present at referral hospitals while women with less severe complications may access district hospitals or health centers. Even comparisons among 'same level' or 'like' facilities may be difficult to interpret as the population profile can vary dramatically due to socio-cultural factors or other circumstances outside the control of the health sector, like transportation and road systems.

Causality: Clearly the CFR has an extremely strong causal link to maternal mortality at the facility level. Its relationship to maternal mortality in the general population depends on the proportion of women with obstetric complications who are managed in facilities. The higher the number of these women who are managed in facilities, the closer the relationship between CFRs and the level of maternal mortality in the general population.

Feasibility: If the facility treats obstetric complications and data on obstetric complications and maternal deaths are collected, this indicator is easy to calculate.

Responsiveness: This should respond to changes within a fairly short period of time – e.g., 6-12 months.

Population – or Facility-Based: Facility-based.

Interpretation: Whether a woman dies in hospital will depend not only on the quality and readiness of the hospital's response to a woman with an obstetric emergency, but her survival will also be affected by her condition on admission to the hospital. Thus, the hospital could be functioning well and still have a high CFR because women in need of EmOC arrive in such poor condition. Where a facility's CFR is low, this does not necessarily mean that the quality of care is high. It may mean that few women with obstetric complications access services. For these reasons, it is highly advisable to have other indicators of quality of care, such as the time interval between admission and treatment for women with complications, or more in-depth information on the woman's status at admission (e.g., pulse, blood pressure and temperature).

Finally, it is helpful to use this indicator together with the other 4-5 'process indicators' that UNICEF/WHO/UNFPA recommend. For example, if the 'proportion of all births in EmOC facilities' or 'met need' is low, the CFR may not be particularly meaningful.

UNICEF/WHO/UNFPA recommends a maximum acceptable level of less than 1 per cent, however, it should be pointed out that a study of US hospitals showed a CFR of 0.03 per cent in 1978 (Petitti et al., 1982). Certainly countries meeting even a level of 1 per cent should strive to reduce the rate.

Where the number of maternal deaths or complicated cases is small, the CFR will not be sufficiently robust to be meaningful. However, when there is a large number of cases, CFRs can be calculated for individual complications.

Sources of information:

Indicators for Reproductive Health Program Evaluation. Final Report of the Subcommittee on Safe Pregnancy. 1995. Editors: Koblinsky M, McLaurin K, Russell-Brown P, Gorbach P, The Evaluation Project.

Maine D, McCarthy J, Ward VM. 1992. Guidelines for Monitoring Progress in the Reduction of Maternal Mortality: A Work in Progress. New York: UNICEF.

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Petitti AB et al., 1982. In-hospital maternal mortality in the United States: Time trends and relation to method of Delivery. *Obstetrics and Gynecology*, 59(1):6-12.