

Current Set of Emergency Obstetric Care (EmOC) Indicators:
From “Monitoring emergency obstetric care: A Handbook” (WHO, 2009)

Indicator Brief #6:
Direct obstetric case fatality rate

INDICATOR	ACCEPTABLE LEVEL
1. Availability of EmOC: basic & comprehensive facilities	At least 5 EmOC facilities (including at least 1 comprehensive facility) for every 500,000 population
2. Geographic distribution of EmOC facilities	All subnational areas have at least 5 EmOC facilities (including at least 1 comprehensive facility) for every 500,00 population
3. Proportion of all births in EmOC facilities	Minimum acceptable level to be set locally
4. Met need for EmOC: proportion of women with major direct obstetric complications who are treated in EmOC facilities	100% of women estimated to have major direct obstetric complications are treated in EmOC facilities
5. Caesarean sections as a proportion of all births	The estimated proportion of births by caesarean section in the populations is not less than 5% or more than 15%
6. Direct obstetric case fatality rate	The case fatality rate among women with direct obstetric complications in EmOC facilities is less than 1%
7. Intrapartum and very early neonatal death rate	Standards to be determined
8. Proportion of maternal deaths due to indirect causes in EmOC facilities	No standard can be set

Indicator 6: Direct Obstetric Case Fatality Rate (DOCFR)

This brief was written to describe the above indicator, the assumptions behind the indicator, methodological issues, what we have learned since the indicator was first described and a few ideas related to the indicator as we go forward.

Background

Since the 1997 *Guidelines for monitoring the availability and use of obstetric services*, the case fatality rate for direct obstetric complications has been included in the set of EmOC indicators to shed light on the quality of facility-based maternity care [1]. In the 2009 *Monitoring emergency obstetric care: a handbook*, this indicator was renamed from “case fatality rate” to the “direct obstetric case fatality rate” (DOCFR) to highlight the type of obstetric complications the indicator addressed [2]. Technically the indicator was not modified and has been part of the original set of EmOC indicators for 25 years.

In the sequence of indicators, the DOCFR is the first indicator that is not population-based but entirely facility-based where both the numerator and the denominator are captured at each facility of interest. Thus, the indicator does not take into account maternal deaths that occur outside the formal health system.

The DOCFR was inspired by cause-specific case fatality rates (CFRs) that measure the lethality of disease or condition. However, this aggregated form was a solution to the instability in cause-specific CFRs caused by small numbers usually found among maternal deaths at individual facilities. The DOCFR has also been called an indicator of facility performance [1].

Definition and calculation of the Indicator

The DOCFR is the proportion of women admitted to a facility with a major direct obstetric complication, or who develop such a complication after admission, who die before discharge [2]. Typically, we include the seven major obstetric complications that are also included in met need for EmOC. They include antepartum and postpartum hemorrhage (and retained placenta), severe pre-eclampsia and eclampsia, postpartum sepsis, severe abortion complications, uterine rupture, prolonged/obstructed labor and ectopic pregnancy.

Numerator: Number of maternal deaths due to major obstetric complications in specified health care facilities in a specified time period.

Denominator: Number of women who were treated for or experienced major direct obstetric complications in specified health facilities in the same time period.

Generally, users of this indicator express it as a percentage (multiplying the ratio of deaths to complications by 100), given that the benchmark, or maximum acceptable level, is stated as <1%. In high income countries the DOCFR is generally lower than 1%. But in low and middle income countries it often exceeds 1%. However, when facilities achieve rates of less than 1%, ending all preventable deaths becomes the new goal.

Like indicators 3-5 (the proportion of births in EmOC facilities, met need for EmOC and cesarean sections

as a proportion of all births), the DOCFR is typically calculated for EmOC facilities, as well as all facilities surveyed or being assessed. For evaluation purposes it is often calculated across facilities representing characteristics of interest such as project support [3].

In general, the denominator for the DOCFR is the numerator for met need for EmOC. Thus, many of the assumptions and lessons learned from met need apply to this indicator as well.

Assumptions

- The indicator was designed to shed light on the quality of facility-based care but has always been considered an imperfect proxy for quality for several reasons (see methodological issues). The guidance given for this indicator has always been to encourage the use of additional indicators to assess quality of care [1,2].
- Data are reasonably easy to collect from registers at admission and discharge, in the maternity, operating theatre, other relevant wards, the morgue and maternal death reviews or audits.
- Facilities routinely and accurately record obstetric complications and the causes of maternal deaths.
- Restricting the indicator to the seven above mentioned direct obstetric complications aligns the indicator with the most frequent causes of maternal death.
- The monitoring of facility-specific DOCFRs will lead to facility and district management to seek out more in-depth information to improve the quality of obstetric services and outcomes.

Red flags that the indicator raises

- High rates suggest:
 - o Inappropriate/poor quality obstetric care and the need to look at contributing factors such as the well-known three delays and processes of care.
 - o The need to disaggregate the indicator into cause-specific CFRs to better understand which complications are the most lethal, which are the most common, and what to prioritize.
 - o The need to ask what skills require additional support and training, e.g. diagnosis, clinical management and treatment, readiness, etc.
 - o Facilities will benefit from additional QI efforts such as near miss investigations or audits and chart reviews of severe morbidity and deaths.
 - o Hotspots can be identified (depending on how the DOCFR is stratified), i.e., by facility, facility type/level of care, sector, subnational areas.
- Unexpected low rates could stimulate QI efforts focused on improving reporting and data quality (more complete and accurate data).

Methodological issues

This indicator has not been particularly controversial or the target of much criticism.

- **Undercounting major obstetric complications:** see brief on Met Need for EmOC.
- **Undercounting maternal deaths due to direct causes:** maternal deaths are historically under-reported and/or miscoded or misclassified as non-maternal deaths, especially when

facilities/districts are under pressure to reduce maternal mortality. However, as Maternal and Perinatal Death Surveillance and Response (MPDSR) initiatives mature and strengthen, better quality data (assignment of cause of death) and safer and more transparent reporting environments will follow. Long-term strengthening of vital registrations systems and standardization of the completion of death certificates will also reduce undercounting of maternal deaths due to direct causes. We know that maternal deaths can occur on many floors or wards of a facility and consulting multiple sources is critical.

- **Using the indicator**
 - The stability of any rate depends on a large enough number in the numerator and accurate denominators. WHO cautions the use of case fatality rates when the numerator is small; this will affect the frequency of calculation, whether monthly, quarterly or annually.
 - The indicator functions well as a red flag but more in-depth analysis is needed to identify corrective actions.
- **Interpretation of the indicator** (validity and reliability of the indicator to assess quality of care):
 - Critics of the indicator know that the medical condition of some women on admission at a healthcare facility can be precarious, leaving providers little opportunity to save a woman's life. Thus, not all deaths can be attributed to poor quality of facility-based care, but rather to weaknesses in the larger health system such as a poorly performing/ineffective network of services for referral, "dumping" practices (when one facility takes a critically ill woman to another facility in order to keep casualties low at the first facility), where trust in the health system is low or where other barriers to timely care exist. Sometimes these circumstances are beyond the control of facility managers. If few facilities provide basic and comprehensive EmOC, women with complications are likely to arrive at the hospital after a long journey, reducing the likelihood of survival.
 - When a facility or region begins to track the DOCFR, one of the early signs of improved data quality is the increased reporting of obstetric complications as well as an increase in the reporting of maternal deaths. This can lead to changes in a DOCFR that is attributable to improved reporting. If monitoring is persistent and data quality improves, the impact of improved reporting diminishes.
 - It is important to interpret this indicator in the context of the other indicators in the set. If the DOCFR is low but utilization of EmOC services is also low this may mean that maternal mortality may be occurring outside the health system. If it is low but the availability of EmOC is high and utilization is high, then one might expect that the health system is working reasonably well for women.

Lessons learned from experience with the indicator: EmONC assessments & program evaluation

- Most countries doing an EmONC assessment take this indicator a step further and produce cause-specific case fatality rates if the numbers are sufficiently large to make the rate stable and meaningful. Cause specific rates help program planners identify which obstetric complications are the most lethal and prevalent, and allow more focused corrective actions such as ensuring facility readiness to perform certain interventions and review clinical protocols.

- Evidence clearly points to reliable patterns, which also raise the question of whether this indicator, like indicator 7 (Intrapartum and very early neonatal death rate), is very useful aggregated at national level. Results tend to vary across levels of care and characteristics of the catchment area. In the two examples below (Tables 1 & 2), we see consistent differences across levels of care. In the first table based on periodic national EmONC assessments, we see: 1) lower DOCFRs at lower levels of care (non-hospitals) compared to higher levels of care (hospitals), the exception being Zambia, and 2) higher levels of DOCFRs among EmOC facilities compared to all facilities. These results likely reflect the patient mix at different levels of care and referral (or by-passing) patterns. Women with the most severe complications are most likely to be found at the end-points of the referral hierarchy.

Table 1: DOCFRs by EmOC status of facility and type of facility

	All facilities	EmOC facilities	Non-hospitals	Hospitals
Mozambique 2012	2.0% [188/9,357]	2.4% [104/4,394]	1.0% [46/4,686]	3.0% [142/4,671]
Ethiopia 2016*	0.5% [412/78,852]	0.8% [290/38,196]	0.3% [95/37,248]	0.6% [317/41,604]
Malawi 2020	1.0% [450/47,180]	1.4% [369/26,646]	0.4% [64/16,617]	1.3% [386/30,563]
Zambia 2014**	2.7% [629/23,585]	2.9% [283/9,751]	3.1% [310/10,059]	2.4% [319/13,551]
Ghana 2010	1.3% [486/38,437]	1.6% [315/19,741]	0.3% [15/4,456]	1.4% [471/22,981]

*52% of all maternal deaths had no associated cause of death and excluded from this exercise, suggesting problems of validity and reliability of these estimates.

** Percentages based on weighted numbers; brackets for non-hospitals show weighted numbers. Weighting used because sampling of non-hospitals was done.

In Table 2, the DOCFRs come from a program evaluation for the Thamini Uhai project to decentralize emergency obstetric and newborn care in Kigoma region, Tanzania. The program, with assistance from CDC, carried out multiple health facility assessments of all facilities in the region that delivered more than 90 births a year. They also undertook pregnancy outcome surveys of all women giving birth in the preceding months to each survey. The complex multi-faceted program enjoyed strong external financial support for more than 10 years but intense monitoring and data collection was initiated only in 2013 [3].

The results show a significant decline in the DOCFR from 1.8% to 1.4% between 2013 and 2018. Project supported facilities also showed a significant 33% decline from 2.1% to 1.4% while non-supported facilities showed no change. The authors concluded that “the direct obstetric CFR declined significantly, indicating facilities improved ability to identify and provide timely and appropriate treatment of obstetric complication.” The study included an array of other indicators in addition to the CFR: “project supported facilities treated most obstetric complications in the region and were able to decrease their direct obstetric CFRs, facility-based MMR, and stillbirth rates.”

Table 2: DOCFRs in Kigoma Region in 2013 and 2018 by level of facility and project support

	2013		2018		Z-statistic
Kigoma Region	1.8%	[102/5,769]	1.4%	[129/9,217]	p < 0.05
Hospitals	2.0%	[79/3,869]	1.6%	[78/4,837]	NS
Health centers	1.1%	[20/1,793]	1.1%	[39/3,482]	NS
Dispensaries	2.8%	[3/107]	1.3%	[16/898]	NS
Kigoma Region Project Support					
Yes	2.1	[85/3,997]	1.4	[88/6,200]	P < 0.01
No	1.0	[17/1,712]	1.4	[41/3,017]	NS
Hospitals					
Projected supported	2.2	[69/3,096]	1.7	[58/3,390]	NS
Not supported	1.3	[10/773]	1.4	[20/1,447]	NS

Adapted from Dominico et. al. (reference 3) and tables 5 & 6; NS = not significant

- The DOCFR is most useful when estimated over time (especially at individual facilities or aggregated with other like facilities) to monitor progress as the authors of the Kigoma study did. Other indicators and MPDSR reports can help to interpret the extent to which a reduction of the DOCFR can be attributed to improvements in the quality of care.

Going forward – thoughts and recommendations

- Some researchers rightly argue that the aggregated statistic fails to identify which facilities are contributing most to the DOCFR.
 - o One solution is to calculate the rate stratifying by levels of care or EmOC status, if facility specific DOCFRs are not available.
 - o Another possibility is to estimate the DOCFR only at hospital level (grouping referral/teaching hospitals together and district/rural hospitals together) since the majority of maternal deaths tend to occur at this level. Instead of facility typology, caseload may serve as a rationale for grouping.
 - o Showing the range of DOCFRs for each level of care helps unpack the aggregate form.
 - o Another alternative is to set different benchmarks according to level of care.
- Do we continue to recommend this indicator but provide more nuanced guidance about how it should be analyzed? For example:
 - o Whenever possible (numbers permitting) we recommend estimating case-specific CFRs.
 - o At the facility, we strongly recommend each facility estimate its own DOCFR over time.
 - o We also recommend that the DOCFRs be estimated by similar levels of care – at the very least by whether the facility provides surgery and/or EmONC status.
- Do we have any good alternatives such as a composite maternal + fetal outcome indicator that has been proposed elsewhere? The Better Birth researchers proposed a composite indicator that looked equally at 1) maternal death, 2) maternal severe morbidity, 3) stillbirth and 4) early neonatal death (<7 days). In their experience in Uttar Pradesh, evaluating the impact of the WHO Safe Childbirth Checklist among more than 157,000 mother-infant dyads, the indicator found no differences between the intervention and control groups [4], but the indicator still is still attractive as an integrated option for measuring impact
- Rather than call the DOCFR a measure of quality, should we reframe it as an impact indicator?

References

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