

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

Indicator Brief #3:
Proportion of all births in EmOC facilities

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 3: Proportion of births in EmONC facilities

This brief was written to describe the above indicator, the assumptions behind it, methodological issues that have arisen since it was included in *The Handbook*, what we have learned since the indicator was first described and ideas related to the indicator as we go forward.

Background

This indicator was originally proposed to determine whether women are using the EmONC-functioning facilities identified by Indicators 1 and 2. Indicator 3 provides insight into the volume of maternity services provided; it is interpreted as an indicator of service use.

Originally, the related recommendation was that at least 15% of births¹ occur in functioning EmONC facilities [1]; however, in the 2009 *Handbook*, the minimum acceptable level was removed, and countries are now advised to use their own targets [2]. Though the 2009 *Handbook* recommends calculating Indicator 3 among functioning EmONC facilities *and* among all facilities, most government reports and strategies tend to focus on the latter indicator, which is interpreted as an estimate of the country/sub-national area's institutional delivery rate (IDR). Many countries have targets for IDR, but there is little evidence that many have set targets for the proportion of deliveries occurring in EmONC facilities (EmONC delivery rate).

How to calculate

Facilities in the geographic area of interest must first be classified according to EmONC functioning based on the number of signal functions each facility has performed in the previous 3 months. The EmONC delivery rate is calculated thusly:

Numerator: Sum of annual deliveries occurring in health facilities classified as functioning EmONC (either basic EmONC or comprehensive EmONC).

Denominator: Total annual expected births in the population. This can be calculated by multiplying the total population of the geographic area of interest by the crude birth rate/1000 population for the same geographic area.

The indicator is typically expressed per 100 expected deliveries, or as a percentage. The time period for the numerator and denominator must align. Countries can either count deliveries over a 1-year period, or they can count over a 3-month or 6-month period and then multiply to estimate an annual total of

¹ Issues have been raised about using the term “birth” vs. “delivery”. From a measurement perspective, shifting language toward “births” would mean that the unit of analysis would be the same in both numerator and denominator. However, the indicator has always been calculated using deliveries (women giving birth) in the numerator and births in the denominator. The reasons for this decision relate to the ease of estimating expected births (multiplying the crude birth rate by the population) and the ease of counting deliveries over births. From a person-centered care perspective, “delivery” is a problematic term because it connotes a woman being delivered, traditionally by a doctor, rather than actively giving birth herself. The Re-Visioning EmONC project recognizes that debate will be needed to resolve how to address this issue in the revised guidance, and remains open to what terminology will be used moving forward.

deliveries, to align with the denominator, i.e., annual expected births. Alternatively, the denominator could be divided to align with the numerator, e.g., if you are using a 6-month total of deliveries in the numerator, the annual expected births could be divided by two to align with one half a year (6-months).

Assumptions

- Labor and Delivery registers are complete and accurately record the number of deliveries in a facility.
- Accurate data exist for the expected number of births in a population (denominator).
- Functioning EmONC facilities are accurately classified.
- The numerator serves to measure the facility caseload or volume, an important number for most planning.
- Most obstetric complications cannot be predicted and require facility-based intervention [3].
- For women and newborns with complications, facilities are safer places to give birth than at home.
- On average, 15% of pregnancies will present a complication that requires institutional care.

Methodological issues

- When estimated population/birth numbers are imprecise, the results for the IDR can become obviously unrealistic as more women seek facility services (e.g., resulting in institutional delivery rates >100%). Other indicators based on these imprecise population estimates are also skewed, but less obviously so.
- The EmONC functioning of each facility may not be assessed frequently, and it is dynamic, meaning that facilities may go in and out of EmONC functioning status over time (e.g., not performing one or more signal functions for a month or more), thus complicating attempts to track/interpret this indicator.
- Some HMIS systems capture both facility deliveries and estimates of non-facility deliveries; the latter is often inaccurately estimated/captured through postnatal care visits, for example. Properly counting only facility deliveries is critical for Indicator 3.
- There is often a challenge to get complete data from the private sector and thus the institutional delivery rate may be underestimated if births/deliveries that occur in private healthcare facilities are not included in the numerator.

Issues that have emerged over time

Governments tend to focus on the IDR and not on the EmONC delivery rate

- Governments may have been more immediately concerned about raising the IDR (under global pressure), assuming it would be the most expedient strategy to reduce maternal and perinatal mortality.
- Governments may not have seen the EmONC delivery rate as very useful relative to the IDR, and/or its use may have been hampered by lack of clarity around interpretation, and targets.
- Governments and planners often conflate level of service with type of health facility, e.g., hospitals are CEmONC facilities, without consideration of performance.

National delivery rates and national EmONC delivery rates can mask sub-national differences

- At national level, use of facilities for delivery has increased substantially in most countries but those increases vary across sub-national levels. Sub-national analyses of the EmONC delivery rate

(and of IDR) are not difficult to conduct and are most informative for planners – for targeting resources/support where most needed, and for ensuring equitable access and use – but countries often focus on national indicators.

Countries struggle to interpret the EmONC delivery rate indicator without a clear target

- Whether obstetric services are decentralized or regionalized, the assumption is that countries should aim to increase the proportion of deliveries occurring in functioning EmONC facilities. But an outstanding question is whether the EmONC delivery rate should include a target, and if so, how this target would be set (see *Looking Forward* section below for more discussion of targets).

Calculating the IDR and EmONC delivery rate for non-administrative geographic areas is challenging, but useful for planners

- In some contexts, there may be a desire/need to calculate delivery rates (institutional and EmONC) for non-administrative units – e.g., for facility catchment areas or sub-districts. For example, an implementing partner/program attempting to track performance among the facilities which they are supporting may be interested in monitoring use of services among these facilities, separate from other facilities.
- Related to the above, the movement toward establishing and monitoring *networks of facilities* may necessitate some new indicators and guidance on ways to analyze, interpret and present results related to a network that are useful to health planners. For example, it is likely that rational networks of facilities will cross district boundaries or that a district may have more than one network within its borders. Guidance on how to define the denominator for these areas would be useful.
- Further, as countries are encouraged to monitor 2-hour access to functioning EmONC facilities (EPMM Target 4), approaches are needed that support sub-national health planning/management units to monitor this access for facility networks/non-administrative units.

Lessons learned from experience with the indicator: EmONC assessments

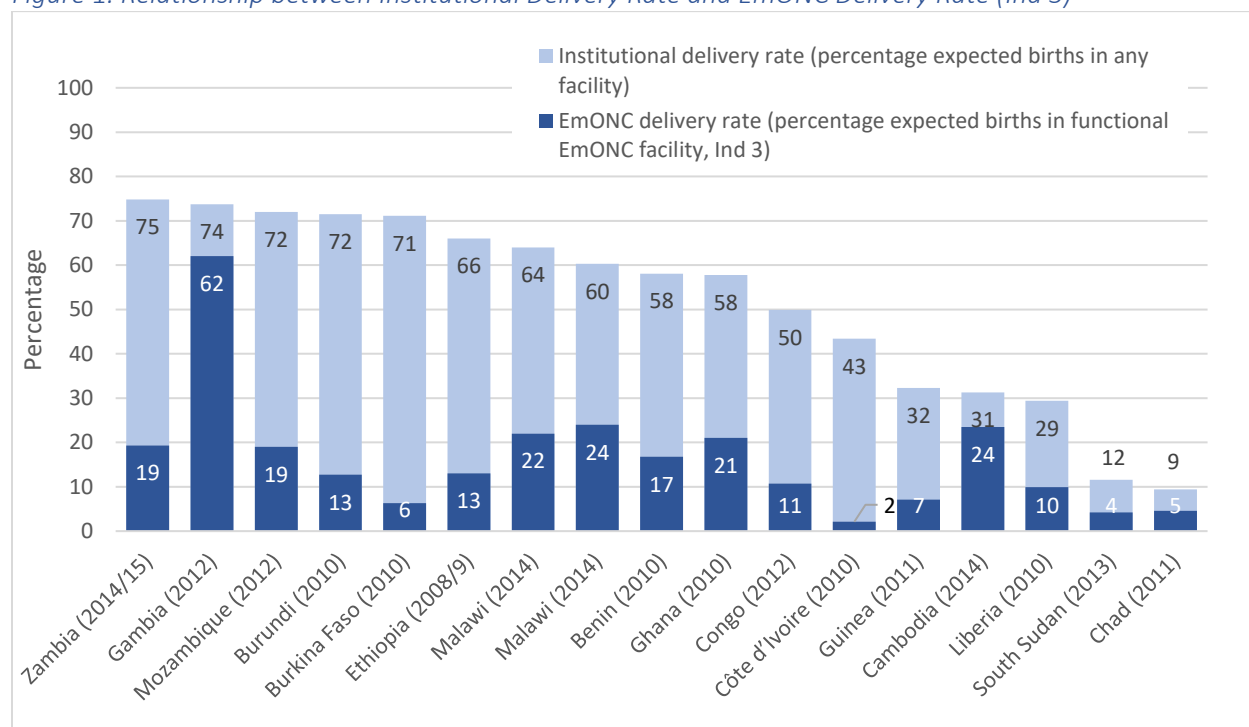
To reassert the usefulness of EmONC delivery rate, planners should understand and explain the relationship between it and other key indicators.

How is the demand for facility-based services (institutional delivery rate) related to the use of services in functioning EmONC facilities (Ind 3)?

In most countries, the proportion of women receiving care in an EmONC-functioning facility lags substantially behind the proportion of women delivering in any healthcare facility. In 12 of 18 countries included in the analysis below (Figure 1), the gap between IDR and EmONC delivery rate is more than 30 percentage points. The smallest gaps are seen in Cambodia (gap of 7 percentage points) and Gambia (12 percentage points), and in countries with very low IDRs (South Sudan and Chad). In Gambia, the smaller gap could be explained by the number of EmONC-functioning facilities relative to the recommended minimum per population (Indicator 1) – during the period of the assessment, Gambia had achieved 50% of the recommended minimum number of EmONC facilities, which was relatively high (more on this in the next section). Cambodia, on the other hand, was assessing their EmONC network, comprised of public facilities designated and prioritized by the government, and which tend to be higher performing facilities.

Tracking the gap between IDR and EmONC delivery rates, particularly at sub-national levels, can identify geographic areas with the largest disparities – which could result from lack of availability of functioning EmONC facilities and/or indicate that women prefer to deliver in other, non-EmONC facilities. Investigating those dynamics and their causes can help planners align availability, client preferences, and use to reach targets.

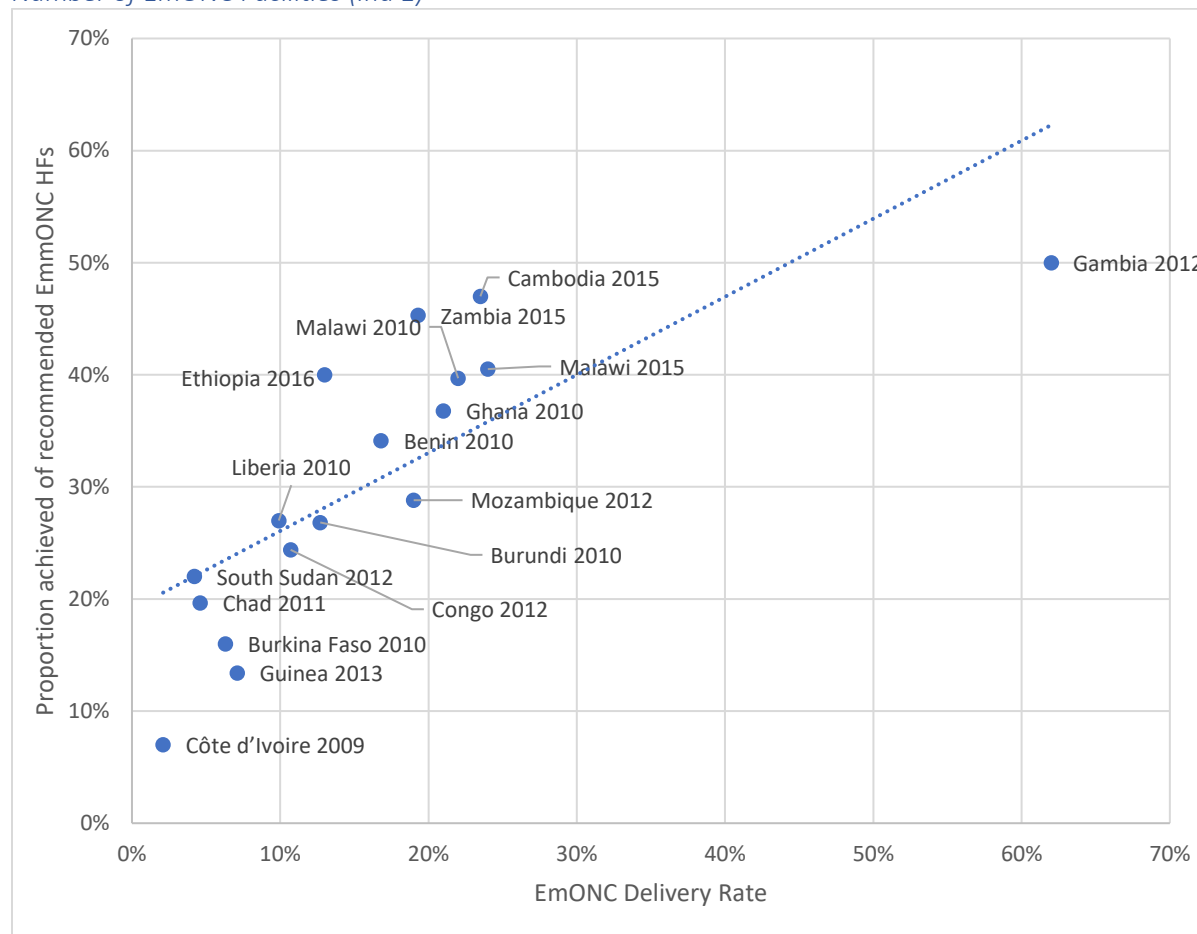
Figure 1. Relationship between Institutional Delivery Rate and EmONC Delivery Rate (Ind 3)



How is the availability of EmONC facilities (Ind 1) related to the proportion of deliveries occurring in EmONC facilities (Ind 3)?

Looking further at the relationship between availability and use of EmONC facilities, we present the same countries as included in Figure 1 in a scatterplot (Figure 2) to assess the relationship between availability of functioning EmONC facilities (Ind 1) and the proportion of all deliveries that occur in these facilities (Ind 3). The relationship is not perfectly linear, but it appears to be positive so that as availability increases, use of EmONC facilities for delivery increases.

Figure 2. Relationship between EmONC Delivery Rate (Ind 3) and Proportion of Minimum Recommended Number of EmONC Facilities (Ind 1)



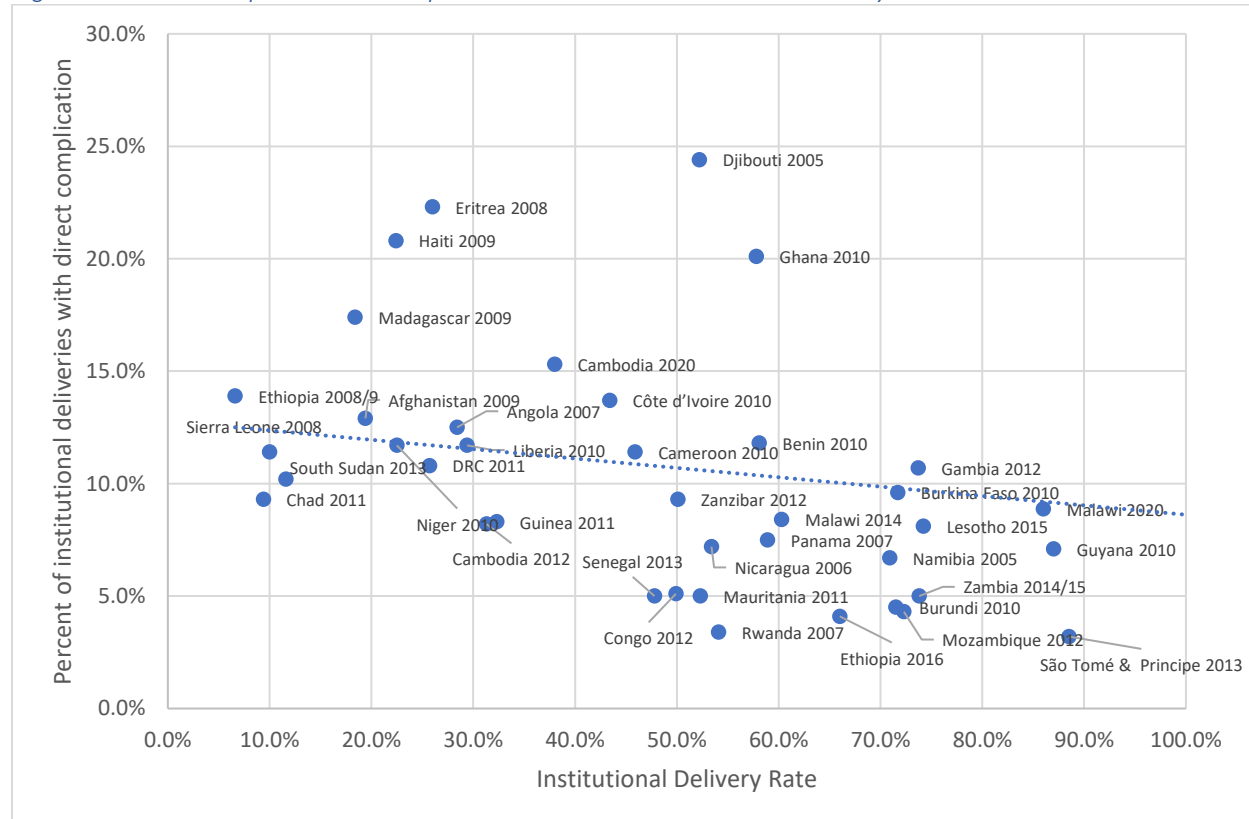
What is the relationship between the proportional caseload of direct obstetric complications and IDR?

Another relationship that is worth understanding is the proportion of complicated deliveries that present at health facilities relative to the use of facility delivery services. That is, are the deliveries that take place at facilities more likely to be complicated when the use of facility services for delivery is low, and how does the proportional complication caseload change as the use of facility-based delivery services increases? The relations should be intuitive – that is, where women are unlikely to use facilities for routine services the IDR would be low and the proportion of complications higher; where women are using facilities for routine services (high IDR) the proportion of complications would be lower. The proportional caseload of direct obstetric complications does appear to decrease as the use of facility services (measured by IDR) increases. In countries where IDR is greater than 70%, the percentage of all institutional deliveries that are complicated is around 10% or lower. This question of whether women who most need emergency services – those with complications -- are using facility-based care is also captured in Indicator 4, Met Need for EmONC.

As countries work to strengthen their health system and are able to achieve higher institutional delivery rates, it may help planners understand this relationship of a decreasing proportion of deliveries with complications. Regions undergoing a shift from low to high IDRs may need to prepare their health

workforce to shift toward ensuring quality routine delivery services as well as managing complications. The proportional complication caseload may also help inform staffing needs, equipment/supply levels, and training needs.

Figure 3. Relationship between complication rate¹ and institutional delivery rate



1. Complications included only major direct obstetric complications (hemorrhage, severe pre-eclampsia/eclampsia, sepsis, prolonged/obstructed labor, severe abortion complications, ruptured uterus, ectopic pregnancy)

Looking forward

The Re-visioning participants have several questions to consider in relation to Indicator 3 moving forward.

Question 1: How should the primary indicator be defined?

To date, the most cited version of Indicator 3 uses the sum of deliveries occurring in *any facility* in the numerator, i.e., IDR. This may have made sense when institutional delivery rates were very low and delivery in any facility was the primary goal, thus driving the monitoring priority. However, as countries have made substantial progress on IDR, and many are now able to monitor IDR using routine HMIS data, it may be useful to reassert the original intention of this indicator: to measure the proportion of deliveries occurring in facilities that provide EmONC services.

This is particularly true as increases in IDR have not come with consistently commensurate decreases in maternal mortality. Thus, indicators that support health planners to monitor proxies for use of life-saving services (which the EmONC delivery rate could be but Met Need for EmONC certainly qualifies) along with the quality of those services (i.e., EmONC readiness), may have more appeal. Further, the EmONC delivery

rate could provide an indication of how close/far a geographic region is to achieving targets of service delivery redesign (e.g., regionalization of obstetric services), if (and as) that strategy is implemented at country-level.

However, the previously described methodological issue of facilities going in and out of EmONC functioning status over time raises concerns over focusing solely on the EmONC delivery rate, especially when EmONC status is not measured regularly. A temporary lapse in a facility's EmONC status, when only measured once every 1-5 years, could result in misguided health system planning. Plans to add a new set of newborn signal functions to the EmONC framework are likely to further complicate this issue.

If Indicator 3 becomes the IDR (with no recommended benchmark), we could instead use EmONC delivery rate as a nuance of IDR to be useful for planning where EmONC services need to be strengthened (e.g., in facilities where many women deliver but that are missing some of the signal functions), to flag low utilization (and spur further study about why women are not going there) and used to monitor implementation (are women using the facilities that had x investments).

For **deeper analyses of the IDR**, we could focus on sub-national comparisons of IDR, and where women are delivering (e.g., level of functioning (Figure 4), level of health facility (Figure 5), public/private, levels of readiness, etc.).

For **deeper analysis of EmONC delivery rate**, we could include sub-indicators that look at differences in EmONC use across sub-national areas, equity in access to EmONC services (see *Equity* section below), and indications of whether EmONC networks are working (e.g., what percent of women delivered in a 'networked' facility?).

Figure 4 is an example presentation of the distribution of expected deliveries (births) by EmONC functioning. The dark green bar ("in fully functioning EmONC facility") is the equivalent to the EmONC delivery rate (Indicator 3) and the colored bars combined represent the IDR (64%). Table 2 below indicates how EmONC functioning is defined.

Figure 4. Distribution of expected deliveries according to level of facility functioning

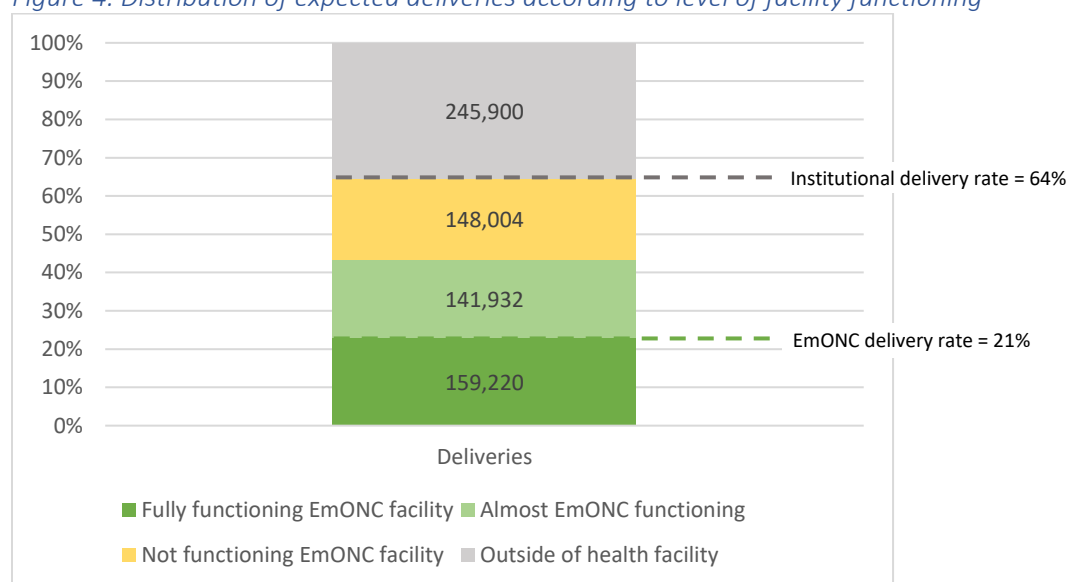


Figure 5 describes in which types of health facilities women are delivering (hospital vs. non-hospital) and the distribution of those deliveries according to the level of EmONC functioning, thus supporting planners to target efforts to increase the EmONC delivery rate. Similar analyses could be done by sub-national area and by managing authority. Interpretation of these results could be framed as indicators of women's choices/preferences of where to deliver, and thus where health planners should target investment to align women's choice with facility capacity.

Figure 5. Distribution of institutional deliveries according to level of facility functioning, by type of facility

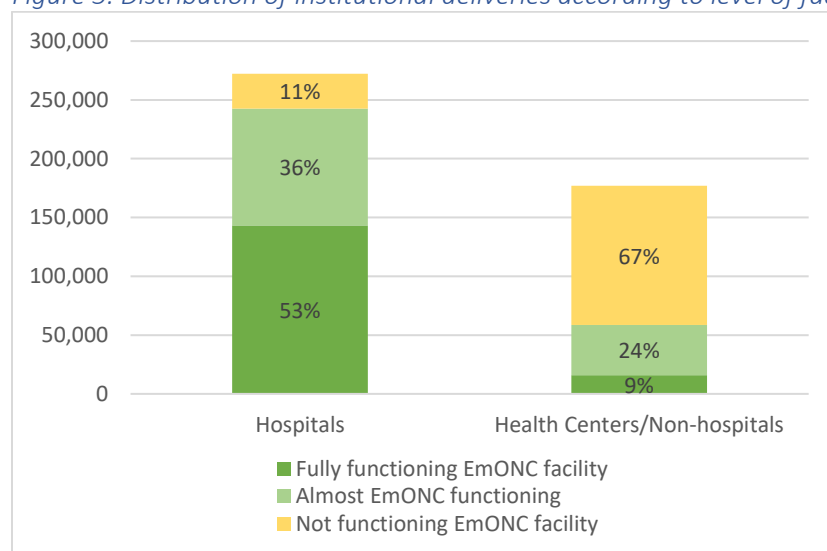


Table 2. Definition of facility functioning

Category	Hospital	Health Center/Non-hospital
Fully functioning EmONC	Comprehensive EmONC	Basic EmONC
Almost fully functioning EmONC	7-8 signal functions	5-6 signal functions
Not EmONC functioning	0-6 signal functions	0-4 signal functions

Question 2: Are targets for Indicator 3 warranted?

The working groups need to determine whether benchmarks for IDR, and especially for EmONC delivery rates are warranted. For example, is a target of 100% of women giving birth in fully functional EmONC facilities (including any new newborn signal functions and at the different levels of EmONC facilities) an appropriate goal, and if so, over what time horizon? How does this align with discussions around service delivery redesign, or with concerns of iatrogenic harm from overmedicalized birth? Also, where a 100% EmONC delivery target is not achievable or appropriate, perhaps targets should include a condition of delivery a high referral readiness score, as the revised framework is likely to include indicators for readiness (as well as quality of care and referral). These questions—where should women deliver, and what measures should we use to determine if they are delivering in the “right” place—will need to be decided in the context of the overall revised framework and set of indicators.

Question 3: How do we measure Indicator 3 when examining networks of care?

Further efforts to establish and monitor *networks of care (networks of facilities)* may necessitate new indicators and guidance on ways to analyze, interpret and present results related to a network that are useful and practical for planning.

Question 4: How do we measure equity in Indicator 3?

The EmONC delivery rate can provide insight into equitable access if, for example, we frame results as providing insight into whether women are accessing EmONC facilities in proportion to their distribution in the population along lines of social disadvantage. It measures the proportion of the population receiving delivery services at health facilities that are providing EmONC services, yet further analysis is needed to assess the equity of access to and use of EmONC facilities. Equity measures related to Indicator 3 must identify discrepancies in service use and need for services across groups that have historically been disadvantaged or discriminated against in the relevant context. Basic measures include client's geographic region, urban/rural residence, age, socioeconomic status (education, literacy, household wealth, employment), marital status, and parity. More nuanced measures may include client's spoken language, ethnicity, religion, ability, gender identity, citizen/migrant status, and access to information.

These measures require an examination of client-level data and a comparison of the characteristics of clients delivering at EmONC facilities to those in the general population or those attending non-EmONC health facilities. An option during EmONC assessments could include extraction of client-level data (using a supplemental client extraction form) at all sites, such that the client characteristics could then be compared between EmONC and non-EmONC facilities. Alternatively, client data could be extracted from only those health facilities meeting the criteria of functioning EmONC facilities and then compared to representative household surveys recently completed that include the equity measures recommended above. For example, the DHS and MICS can serve as a population-level comparison as they include many of the equity measures recommended above. Another option would be to perform a multilevel analysis using population-based survey data together with health facility assessment data.

Question 5: How can we understand women's choices through Indicator 3?

5A) To what extent are women bypassing closer facilities to seek emergency care and for delivery services, in general, and why?

- Bypassing may not be a direct indication of women's choice of health facility as this is a nuanced concept, however, it may offer insights on client preferences
- Methodology: Extract patient level information on referrals at higher-level health facilities to inform where women are coming from; conduct exit interviews of patients to ask women whether they delivered in the facility closest to them, why/why not, etc.

5B) What proportion of women with complications make it to the next facility, and is that facility a functioning EmONC facility or not?

- Methodology: Referral audit requiring prospective data collection; QI intervention or activity.

Question 6: What are the impacts of pandemics/national emergencies on service use?

How has COVID-19 impacted the indicators above (pre-post or trend data), and are there any changes in IDR and EmONC delivery rate that coincide with stay-at-home orders, fear of virus, etc.? In the face of poor quality of care, health system deficiencies, or in the current context (i.e., risk of contagion with Covid in the absence of adequate care for Covid illness), are women's choices to seek or avoid facility-based services associated with better health outcomes overall?

References

1. UNICEF, UNFPA, WHO. *Guidelines for Monitoring the Availability and Use of Obstetric Services*. New York, New York: UNICEF; 1997. Available at: <https://www.publichealth.columbia.edu/sites/default/files/pdf/unguidelinesen.pdf>.
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**Appendix 1: Lessons learned from EmONC assessment (less relevant to the proposal to use the HMIS)
Because the IDR is a widely-used indicator, there are political implications when assessment results do not match national estimates of IDR.**

Historically, the IDR has been estimated by household surveys, most notably the DHS, the Multiple Indicator Cluster Survey (MICS) and Reproductive Health Surveys. These population-based surveys typically use a 5-year (sometimes 2- or 3- year) retrospective measurement through participant recall of location of delivery for each live birth. Since 1999, EmONC assessments have been used to estimate the IDR using health facility data. Below we compare the IDR estimates of DHS surveys and EmONC assessments of similar time periods to inform discussions around which data sources are most reliable, and which are most useful/accessible for planners. Further, the broad roll-out of DHIS2 and other HMIS systems means that health planners have more frequent access to the data points needed to estimate IDR – the reliability and accuracy of these routine health service statistics is improving particularly for service use indicators such as number of deliveries.

How similar is the IDR as calculated by the EmONC assessments to the IDR as calculated by the DHS during a similar timeframe?

Table 1 provides a comparison of DHS-derived IDRs and assessment-derived IDRs for similar timeframes. Countries were included if the EmONC assessment was national in scope; if it used a census, census that restricted inclusion based on volume of deliveries, or a random sampling of lower-level health facilities; and if a DHS survey was conducted within 2 years of the assessment. Assessments that included purposive samples (e.g., all facilities identified for upgrade) were excluded from the table below. Those that included samples of lower-level facilities are included in the table, but results may not have been weighted to estimate national figures.

In most cases, the facility assessment-derived IDR is lower than the DHS-derived IDR for a similar time-period. Of the 24 comparisons, about half (11) had IDRs within 10 points. Differences may be explained by selection criteria and sampling strategies; however, there is no clear relationship between magnitude of the difference and assessment methodology. The 5-year reference period that the DHS uses makes their figure less reliable than data collectors counting from the registers in the facilities -- data that are more complete and current at least in assessments that are closer to a census of health facilities.

As mentioned, some countries now estimate IDRs using routine health service data from health management information systems (HMIS), thus providing another source of validation. For example, the Ethiopian 2016 EmONC assessment IDR is substantially higher than the 2016 DHS estimate (66.0% vs. 26.0%); yet estimates of IDR using the Ethiopian HMIS system are comparable to EmONC assessment results (the Ethiopian HMIS had an IDR of 72% for the same period, a 6-point difference with the EmONC assessment). One might therefore conclude that in many countries, the reference point for validating facility assessment-derived estimates of IDR should be the HMIS system rather than DHS. Quality of HMIS and historical IDR (low vs. high) should be criteria considered as to whether DHS or HMIS is the most appropriate comparison.

Table 1. Comparison of IDRs as calculated by DHS vs. EmONC assessments

Country	EmONC Assessment			DHS		Point difference (EmONC compared to DHS)	
	Census, Restricted Census or Sample ¹	Year	Institutional delivery rate	Year	Institutional Delivery Rate		
Congo	Census	2012	49.9%	2011-12	91.5%	-41.6	
Malawi [^]	Sample	2014	60.3%	2015-16	91.4%	-31.1	-20 to - 40 points
Benin	Restricted census	2010	58.1%	2011-12	86.9%	-28.8	
Senegal	Sample	2013	47.8%	2012-13	71.3%	-23.5	
Angola*	Restricted census	2007	28.4%	2006-07	45.7%	-17.3	
Madagascar	Census	2009	18.4%	2008-09	35.3%	-16.9	- 11 to -20 points
Sierra Leone	Restricted census	2008	10.0%	2008	24.6%	-14.6	
Cote d'Ivoire	Census	2010	43.4%	2011-12	57.4%	-14	
Haiti	Sample	2009	22.4%	2012	35.9%	-13.5	
Namibia	Sample	2005	70.9%	2006-07	80.8%	-9.9	+/- 10 points
Guinea	Census	2011	32.3%	2012	40.3%	-8	
Liberia	Restricted census	2010	29.4%	2007	36.9%	-7.5	
Niger	Restricted census	2010	22.5%	2012	29.8%	-7.3	
Ethiopia	Census	2008-2009	6.6%	2011	9.9%	-3.3	
Lesotho	Sample	2015	74.2%	2014	76.5%	-2.3	
Guyana	Census	2010	87.0%	2009	89.0%	-2	
Ghana	Restricted census	2010	57.8%	2008	57.1%	0.7	
Burkina Faso	Census	2010	71.7%	2010	66.3%	5.4	
Zambia [^]	Sample	2014-2015	73.8%	2013-14	67.4%	6.4	
Rwanda**	Sample	2007	54.1%	2007-08	45.2%	8.9	
Gambia	Census	2012	73.7%	2013	62.6%	11.1	+ 11 to 20 points
Burundi	Restricted census	2010	71.5%	2010	59.5%	12	
Mozambique***	Census	2012	72.3%	2011	54.8%	17.5	
Ethiopia ⁺	Census	2016	66.0%	2016	26.0%	40.0	+40 points

1. **Census** includes all facilities that provide delivery services; **restricted census** includes all facilities with a minimum number of annual or monthly deliveries (ranges 5 – 30 minimum per country); **sample** typically includes a census of hospitals/high volume facilities and a 10-50% sample of lower-level facilities. Results of assessments that include samples are sometimes weighted.

*comparison IDR came from MIS not DHS

**EmONC assessment estimate based on 6 months of data and multiplied by 2 to estimate annual for comparison

***EmONC assessment estimate based on 3 months of data and multiplied by 4 to estimate annual value for comparison

[^]Malawi and Zambia: EmONC assessments included samples and deliveries were weighted as per sampling design.

⁺ The Ethiopian HMIS had an IDR of 72% for the same period, a 6-point difference with the EmONC assessment.