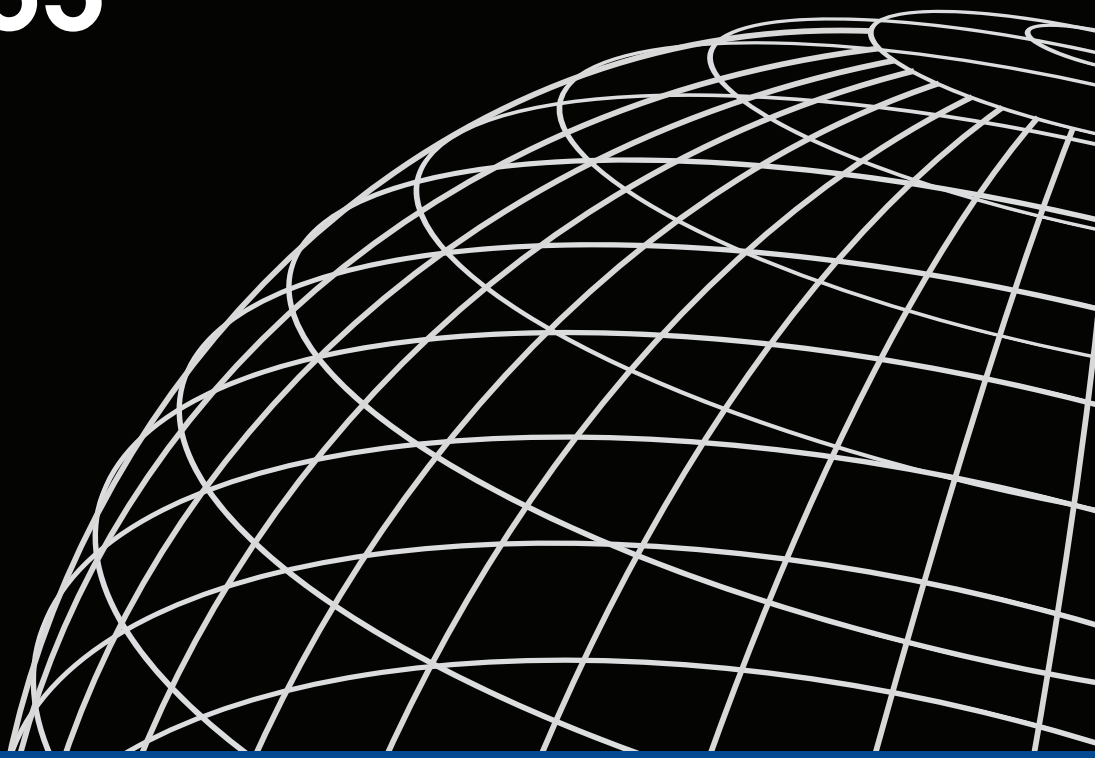
USAID
FROM THE AMERICAN PEOPLE

EFFECTIVE COVERAGE OF FACILITY DELIVERY IN BANGLADESH, HAITI, MALAWI, NEPAL, SENEGAL, AND TANZANIA

DHS ANALYTICAL STUDIES 65



August 2018

This publication was produced for review by the United States Agency for International Development. It was prepared by Wenjuan Wang, Lindsay Mallick, Courtney Allen, and Tom Pullum.

DHS Analytical Studies No. 65

Effective Coverage of Facility Delivery in Bangladesh, Haiti, Malawi, Nepal, Senegal, and Tanzania

Wenjuan Wang
Lindsay Mallick
Courtney Allen
Tom Pullum

ICF
Rockville, Maryland, USA

August 2018

Corresponding author: Wenjuan Wang, International Health and Development, ICF, 530 Gaither Road, Suite 500, Rockville, MD 20850, USA; phone: 301-572-0950; fax: 301-572-0999; email: wenjuan.wang@icf.com

Acknowledgments:

We thank Dr. William Weiss and Dr. Robert Cohen who provided insight and expertise that helped shape the design of this study. We thank our ICF colleague Tom Fish for assistance with developing the maps. We are immensely grateful to our three reviewers – Dr. Hanna Leslie, Dr. Gheda Temsah, and Dr. Hamdy Moussa – for their thorough review, thoughtful comments, and useful suggestions that greatly improved the report.

Editor: Bryant Robey
Document Production: Joan Wardell

This study was carried out with support provided by the United States Agency for International Development (USAID) through The DHS Program (#AID-OAA-C-13-00095). The views expressed are those of the authors and do not necessarily reflect the views of USAID or the United States Government.

Recommended citation:

Wang, Wenjuan, Lindsay Mallick, Courtney Allen, and Tom Pullum. 2018. *Effective Coverage of Facility Delivery in Bangladesh, Haiti, Malawi, Nepal, Senegal, and Tanzania*. DHS Analytical Studies No. 65. Rockville, Maryland, USA: ICF.

CONTENTS

TABLES

FIGURES

PREFACE

The Demographic and Health Surveys (DHS) Program is one of the principal sources of international data on fertility, family planning, maternal and child health, nutrition, mortality, environmental health, HIV/AIDS, malaria, and provision of health services.

One of the objectives of The DHS Program is to analyze DHS data and provide findings that will be useful to policymakers and program managers in low- and middle-income countries. DHS Analytical Studies serve this objective by providing in-depth research on a wide range of topics, typically including several countries, and applying multivariate statistical tools and models. These reports are also intended to illustrate research methods and applications of DHS data that may build the capacity of other researchers.

The topics in this series are selected by The DHS Program in consultation with the U. S. Agency for International Development.

It is hoped that the DHS Analytical Studies will be useful to researchers, policymakers, and survey specialists, particularly those engaged in work in low- and middle-income countries.

Sunita Kishor
Director, The DHS Program

ABSTRACT

This report uses data from Demographic and Health Surveys (DHS) and Service Provision Assessments (SPA) to estimate effective coverage of health facility delivery in Bangladesh, Haiti, Malawi, Nepal, Senegal, and Tanzania—the six countries with both an SPA and a DHS survey occurring within two years of each other. Effective coverage can be considered as crude coverage—the conventional measure of the percentage of births delivered in a health facility—adjusted for the quality of care provided. In our analysis, quality of care for health facility delivery was measured using facility readiness scores, based on availability of items necessary for a facility to provide comprehensive delivery care.

Results show that the estimates of effective coverage were substantially lower than the levels of crude coverage for facility delivery in all six countries—from 20% lower in Nepal to 39% lower in Haiti. Although Malawi has achieved almost universal coverage of facility delivery, at 93% of births, effective coverage was lower, at 66%. Senegal was the only other country with effective coverage higher than 50%. These findings suggest that many women who deliver in a health facility may not receive an adequate quality of care.

Within a country, we estimated effective coverage for each region, accounting for facility type. Effective coverage estimates differed significantly among regions in every country with the exception of Malawi. Because facility readiness scores differed little across regions, the largest factor explaining regional differences in effective coverage was the prevalence of facility delivery for recent births.

This study offers refined methods of producing effective coverage estimates of delivery care due to its adjustment for facility types and composition of a readiness score based on international guidance and empirical evidence. The fact that estimates of effective coverage—which account for a facility's preparedness to provide the care—are substantially lower than the estimates using conventional measures of facility coverage provides insight into why maternal and neonatal mortality rates in many countries are not declining as rapidly as expected.

KEY WORDS: Facility delivery, effective coverage, health facilities, quality of care, service readiness, SPA, DHS, Bangladesh, Haiti, Malawi, Nepal, Senegal, Tanzania

1 INTRODUCTION

Despite a reduction in maternal and neonatal mortality around the world, progress has been slow (Lawn et al. 2014). The global maternal mortality ratio was 216 maternal deaths per 100,000 live births in 2015, three times the level of fewer than 70 deaths per 100,000 births called for in the global Sustainable Development Goals (United Nations Economic and Social Council 2017). While the neonatal mortality rate has decreased globally, there were 2.6 million newborn deaths in 2016, and the majority occurred in Central and Southern Asia and in sub-Saharan Africa (UNICEF et al. 2017). Although globally in 2016 three in every four live births were attended by a skilled health provider, increases in coverage of facility delivery and skilled attendance at birth have resulted in only limited reductions in maternal and neonatal deaths (Marchant et al. 2016; Winter et al. 2017). This incongruous finding is believed to relate to the inadequate level of care that many women and children receive in health facilities (Graham, McCaw-Binns, and Munjanja 2013; Hodgins and D'Agostino 2014; Nguhiu, Barasa, and Chuma 2017).

The persistence of preventable maternal and newborn deaths highlights the importance of quality of care as an essential element in coverage interventions. Providing quality care during pregnancy and childbirth is key for the health of the mother and baby. Skilled care provided at delivery, supported by well-equipped facilities, is critical to identifying and addressing complications in time for women to receive treatment and to save lives (Tura, Fantahun, and Worku 2013). Universal health coverage requires that the entire population have access to essential health care of sufficient quality (WHO 2010). Quality of care is also emphasized in the Third Sustainable Development Goal, which aims to reduce the maternal mortality ratio and end preventable deaths among newborns and children under age 5 (United Nations Development Program 2015).

The concept of effective coverage signifies the focus on quality of care in the international development community. Effective coverage measures performance of the health system in a given setting; it incorporates the quality of an intervention with the conventional measurement of crude coverage—the proportion of people who use services among those in need (Colston 2011). Thus, the measure combines three aspects of health care service delivery into a single measure that encompasses need for service, use of services, and quality of care of those services. By incorporating both use and quality, effective coverage can be understood as the fraction of the maximum health gain actually delivered through the health system to the population in need (Ng et al. 2014; Shengelia et al. 2005). Specifically, it is calculated by dividing the number of people who received an intervention by the number of people in need of that intervention, adjusted by the quality of the intervention (Colston 2011; Shengelia et al. 2005). Typically, effective coverage is calculated in selected study areas or at the national level; however, it can be adapted to other administrative levels and for a variety of health needs (Ng et al. 2014). This study seeks to contribute to the knowledge about effective coverage, particularly for facility delivery, and presents a refined method for estimating effective coverage.

The concept of effective coverage first appeared several decades ago. The Tanahashi framework illustrated five stages for service provision, with effective coverage as the final stage after availability of health services, physical accessibility to services within reasonable distances, acceptability by those in need in terms of cost or religious or ethnic values, and contact, or actual use of the service (Tanahashi 1978). Shengelia et al. (2005) further constructed a framework for effective coverage that integrates need, use, and

quality. More recent studies that have examined effective coverage of maternal and child health services have found substantial gaps in the quality of coverage (Hodgins and D'Agostino 2014; Kanyangarara et al. 2018; Leslie et al. 2017; Nesbitt et al. 2013; Nguhiu, Barasa, and Chuma 2017; Willey et al. 2018). Studies have identified considerable discrepancies between women's reports of seeking or attending antenatal or intrapartum services and their receipt of the critical components of those services. For example, a study conducted in Zambia found that, while attending at least one visit for antenatal care (ANC) was nearly universal, only half of all women received at least eight of the core ANC interventions (Kyei, Chansa, and Gabrysch 2012). So, while crude coverage rates reflect women's ability to receive health care, and may be informative, this indicator does not provide information about the actual quality of care received. Leslie et al. (2017) found that the poor quality of services multiplied by crude coverage rates led to poor effective coverage across eight low-income and middle-income countries. Further, the authors found significant differences in the average effective coverage between countries, likely due to economic differences.

Within countries, effective coverage of maternal health care services has been found to be higher among wealthier households (Nguhiu, Barasa, and Chuma 2017) and lower in rural areas (Kanyangarara et al. 2018). These results are consistent with studies showing that economically disadvantaged women not only have less access to and use of services, but also receive worse quality of care (Joshi et al. 2014; Kanyangarara et al.; Kruk et al. 2017; Kyei, Chansa, and Gabrysch 2012; Larson et al. 2017; Leslie et al. 2017).

While determining the level of crude coverage, which is a prerequisite for measuring effective coverage, is straightforward, measuring quality of care can be challenging because the calculation is prone to several limitations (Nguhiu, Barasa, and Chuma 2017). One approach to measuring quality of care is to incorporate the three dimensions of structure, process, and outcome (Donabedian 1988). Structure includes the physical attributes of a health facility including infrastructure, equipment, supplies, commodities, and the availability of trained personnel. Process describes how providers deliver the services to clients, while outcome refers to client satisfaction and health outcomes. Of concern for quality of delivery care is that there is no single set of standard measures used to assess quality (Marchant et al. 2016; Nesbitt et al. 2013; Tripathi et al. 2015; Van den Broek and Graham 2009; Willey et al. 2018), although research has presented a rationale for consolidating quality into key indicators (Gabrysch et al. 2012; Tripathi et al. 2015; WHO 2015). Across studies of quality of care in facility delivery, indicators have several common domains, including infrastructure, infection prevention, monitoring labor, essential medications, equipment, neonatal resuscitation, routine and emergency obstetric care, and clean cord care (Gabrysch et al. 2012; Larson et al. 2017; Nesbitt et al. 2013; Tripathi et al. 2015; Willey et al. 2018; Winter et al. 2017).

Ideally, assessments of quality of facility-based delivery care should examine the facility's readiness to provide delivery care as well as the practices that health providers should follow during delivery care. Tripathi et al. (2015) developed an index for quality of the process of intrapartum and immediate postpartum care (QOPIIPC), identifying 20 indicators to measure quality of care based on provider performance during delivery. However, assessments of the observation of delivery services are time-consuming and prone to measurement error. Moreover, routinely collected facility data are subject to their own quality limitations, particularly in resource-constrained and high-mortality settings (Lain et al. 2012; Tripathi et al. 2015). Thus, service readiness assessments such as the World Health Organization (WHO) Service Availability Readiness Assessment (SARA), the Demographic and Health Survey Program's Service Provision Assessment (SPA), and similar health facility assessment tools have been used as substitutes (Willey et al.

2018). These tools provide an overview of a facility's capacity to provide services in terms of infrastructure, equipment, commodities, staffing, and management, but do not necessarily provide an observation of the services to capture actual service delivery. Using these data sources, quality measurements are limited to the readiness of facilities to provide quality services.

One way to assess effective coverage is to link data from assessments of health facilities that measure the quality of service delivery with data from household-based surveys that measure the use of services. Although it is desirable to directly link a woman to her nearest health facility, geographic displacement of GPS data to protect anonymity prohibits this approach. Further, this approach is problematic in areas where women have a choice of facilities to attend, given that household surveys do not confirm which facility a woman has used. Thus, a geographic linkage approach that summarizes facilities within administrative or geographic boundaries near clusters of households using GPS data collected in both types of surveys is commonly practiced.

Guided by the signal functions, or critical life-saving interventions for childbirth, proposed in Gabrysch et al. (2012), a study by Nesbitt et al. (2013) used proxy indicators for service delivery (health worker reports of how frequently an item was performed) with an assessment of the readiness to provide signal functions—grouped into four domains of routine delivery care, emergency obstetric care, emergency newborn care, and non-medical care—among 86 facilities in 7 districts in Ghana. They found that most facilities demonstrated poor quality in the emergency obstetric care dimension and that the quality between the dimensions was inconsistent. Linking facility data to population data by districts, they found that although two-thirds of all births occurred in a health facility, only one in every four births occurred in a high-quality facility. Larson et al. (2017) also examined effective coverage of facility delivery by assessing crude coverage of delivery at health facilities through household-based surveys among women in the catchment areas of 24 government-managed health facilities in Tanzania, linking the women to the quality of delivery care in the health facilities. The authors examined different dimensions of quality of care, both independently and combined, and by two thresholds—high quality and minimum quality. The first threshold, the high-quality standard, required that facilities must have nearly complete tracer indicators (90%), while the second threshold, a minimum standard, allowed for only 50% completion of indicators. The estimate of effective coverage reduced crude coverage from 80% to zero percent according to the high threshold, and to 25% according to the minimum threshold. Kanyangarara et al. (2018) examined the quality of care received by women who delivered in a health facility. The authors used a stringent cut-off of 20 or more out of 23 items essential to providing quality by linking women interviewed in either DHS surveys or Multiple Indicator Cluster Surveys (MICS) with SPA or SARA assessments of facilities in 17 countries. They found that the median coverage of delivery at an emergency obstetric and newborn care facility was 42% among women who delivered in a facility with fewer than 20 of the essential items compared with 28% among women who delivered in a facility with adequate quality of care.

Geographical linking has limitations, however, when linking individuals to a summary of nearby facilities (Do et al. 2016). Using this method, it is unknown whether the care a woman received reflects the average level of quality among the facilities near her. Willey et al. (2018) assessed the measurement of effective coverage using skilled attendance at delivery and facility readiness in Uganda to provide basic emergency obstetric and newborn care (BEmOC). This was done by comparing the more accessible geographical-linking method to the gold-standard but resource-intensive method of linking individuals to the facility they attended. This study found little difference between the two methods, suggesting that the ecological-linking

method is a suitable proxy. More precise agreement was found with geographically linking when accounting for the variable levels of quality by facility type (Willey et al. 2018). While this finding is encouraging for using a geographical-linking method, this study was based on quality of care assessed in 35 health facilities in one district in Uganda, which were linked to reports from fewer than 700 women who delivered in these facilities.

This study contributes to the limited research on effective coverage of obstetric and newborn care in health facilities by linking data from nationally representative household surveys with data from surveys of health facilities in six countries with high prevalence of maternal and newborn mortality. We use a wide range of input-based quality-of-care indicators to provide a comprehensive assessment of the readiness of facilities to deliver obstetric and newborn care in these countries. In linking coverage and quality measurements, we use a refined ecological linkage approach stratifying the calculation by facility category, which has proven effective in producing similar estimates when the exact source of care is unknown.

2 DATA AND METHODS

2.1 Data

The analysis is based on data from the Demographic and Health Surveys and Service Provision Assessment surveys in six countries—Bangladesh, Haiti, Malawi, Nepal, Senegal, and Tanzania. These countries were selected because they all have had a recent DHS survey and a recent SPA survey completed within two years of each other.

The DHS is a population-based household survey that provides representative data on population and health indicators at the national and regional levels for a specific country. The DHS usually employs a two-stage stratified cluster sampling design, with a predetermined number of clusters selected in the first stage and households selected in the second stage. All women age 15-49 in the selected households are interviewed to collect data on their sociodemographic characteristics and use of health services. Women with a birth in the five years before the survey are asked about delivery care, including place of delivery for all of her live births during this period. This study focuses on delivery care received for live births in the two years preceding the survey, to better synchronize the timing of the DHS data and the SPA data. Table 1 provides the number of births included in the analysis for each country, which ranges from 1,978 births in the 2016 Nepal DHS to 6,596 births in the 2015-16 Malawi DHS.

The SPA is a health facility-based survey designed to provide information on the availability and quality of preventive and curative health services in a country. SPA surveys use four standard instruments for data collection. The Facility Inventory Questionnaire collects information on the availability of specific services and related infrastructure, supplies, medicines, staffing, procedures, and management practices. The Provider Interview Questionnaire collects information on the qualifications, training, and supervision experience among health workers who provide selected services. The SPA often includes observations of the process of delivering specific services (typically family planning, antenatal care, and sick child care) to assess the extent to which providers adhere to accepted service delivery standards. The Client Exit Interview focuses on the client's recall or understanding of the consultation or examination and the client's satisfaction with the service received during the visit. SPA data analyzed in this study primarily come from the facility inventory and the provider interviews. In each country except Haiti and Malawi, where the SPA was a facility census, a sample of formal health facilities was selected to represent the country and the administrative regions, as well as by type of facility and by managing authority. Hospitals are normally oversampled and sometimes included as a census because of their small number. The provider sample was selected among health service workers who provided the assessed services and were present at the selected facilities on the day of the SPA survey. For each facility, a target of eight providers was randomly selected with priority given to those whose service was observed. In facilities with fewer than eight providers, all of the providers present on the day of the assessment were interviewed. This study focuses on facilities that reported to provide delivery services.

Table 1 Description of SPA and DHS surveys included in the study

Country	DHS survey year	Number of births in the two years preceding the survey	SPA survey year	Number of facilities with delivery services					
				Non-CEmOC facilities		CEmOC facilities		All facilities	
				Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted
Bangladesh	2014	3,147	2014	520	267	66	13	586	280
Haiti	2012	2,747	2013	379	379	10	10	389	389
Malawi	2015-16	6,596	2013-14	529	517	11	11	540	528
Nepal	2016	1,978	2015	585	448	36	9	621	457
Senegal	2016	2,311	2015	358	361	4	2	364	363
Tanzania	2015-16	4,327	2014-15	905	896	46	8	951	905

Table 1 lists the SPA surveys in each country included in the analysis and presents weighted and unweighted numbers of facilities in each country that were included in the analysis. These facilities are classified into comprehensive emergency obstetric care facilities and non-CEmOC facilities based on the availability of comprehensive emergency obstetric care signal functions. CEmOC facilities were not designated but were identified based on whether they provide all of the following services: parenteral administration of antibiotics, parenteral administration of oxytocic drugs, parenteral administration of anticonvulsants, manual removal of placenta, assisted vaginal delivery, removal of retained products, cesarean sections (C-sections), and safe blood transfusion (WHO et al. 2009). The total number of facilities offering delivery care in a country ranges from 280 in the 2014 Bangladesh SPA to 905 in the 2015-16 Tanzania SPA. The great majority of them are non-CEmOC facilities.

2.2 Defining Components of Effective Coverage

As discussed in the introduction, effective coverage is coverage of a service adjusted for its quality. It is calculated among individuals in need of care as the mathematical product of the use of the service and the quality of care provided. To estimate effective coverage of facility delivery, we first calculated its two components—coverage of facility delivery, and the quality of facility delivery services—as described below.

2.2.1 Coverage of facility delivery

We estimated the coverage of facility delivery based on DHS data as the percentage of births in the two years preceding the survey that were delivered in a health facility. The coverage was disaggregated by type of facility where the delivery occurred. This is because women are expected to seek delivery care in a range of facilities with varied preparedness to provide delivery services. For each of the six countries studied, facility types were harmonized between the DHS and SPA. Facilities are generally categorized by managing authority (public or private) and level of facility (hospital, health center, dispensary or health post). In some cases, the DHS grouped facilities at different levels, for example private hospitals and private health centers, into one category because they were infrequently reported as a source of delivery care. In order to align DHS and SPA categories, we then combined these facility types into a single category in the SPA. Appendix Table 1 provides a summary of reported facility categories in both DHS and SPA by the harmonized classifications in each country.

2.2.2 Facility readiness to provide delivery care

As mentioned, quality of care is usually measured in three dimensions: structure, process, and outcome (Donabedian 1988). This study focused on structure, which refers to the physical attributes of a health

facility including infrastructure, equipment, supplies, commodities, and the availability of trained personnel. In other words, it assesses whether a facility is ready to provide quality services.

We measured facility readiness to provide delivery care with a service readiness score based on a set of indicators for the structure component of providing obstetric and newborn care. The indicator selection was guided by three references: the World Health Organization (WHO) SARA Manual (WHO 2015), the indicators suggested by the Newborn Indicator Technical Working Group (Save the Children Federation, Inc. 2017), and the indicators suggested by Gabrysch et al. (2012) that are important to measure obstetric and newborn care at health facilities. The SARA manual includes a number of indicators that assess the readiness of health facilities to provide basic and comprehensive emergency obstetric care among many other health service areas. The Newborn Indicator Technical Working Group was initiated by the Children's Saving Newborn Lives (SNL) program and consists of experts from several international research organizations who collaborate to propose and assess survey-based indicators to monitor and evaluate newborn health. Gabrysch and colleagues conducted a literature review and solicited opinions from over 30 maternal and newborn health experts. The authors identified a shortlist of indicators for maternal and newborn emergency and routine care covering general health facility requirements, routine care for all mothers and babies, basic emergency care for mothers and babies with complications, and comprehensive emergency care functions (Gabrysch et al 2012). An indicator suggested by at least one of these three references was included in the analysis if data are available in the SPA. All indicators are dichotomous, with Yes representing availability and No representing unavailability. In rare cases when data are missing for some facilities, the indicator was recoded as No for these facilities. In general, the selected indicators measure a facility's readiness to provide delivery care in six domains: 1) comprehensive emergency obstetric care; 2) newborn signal functions and immediate care; 3) general requirements; 4) equipment; 5) medicine and commodities; and 6) guidelines, staff training, and supervision. Appendix Table 2 provides definitions of these indicators.

We calculated the readiness score using an equal-weight approach, in which a facility receives a total score—that is, the sum of all indicators standardized to have a maximum of 100. Equal weighting is the most intuitive approach to create a composite measurement compared with other commonly used weighting schemes (Shwartz, Restuccia, and Rosen 2015). Given this standardization, a facility's score should be interpreted as the percentage of highest possible readiness that the facility could have. When computing the readiness score, equal weight was given to each domain and to each indicator within the same domain. This approach assumes that all domains and all indicators within the same domain are equally important in preventing maternal and newborn deaths. Since non-CEmOC facilities are not expected to provide C-sections and safe blood transfusion, these two indicators were included in the calculation of readiness scores only for CEmOC facilities. This approach for creating an index, compared with other approaches—simple additive and principal components-based approach—has proven to be the most predictive of outcomes (Mallick, Wang, and Temsah 2017).

The alternative to the equal-weight approach would be to weight domains and individual items differently. We explored a weighting procedure based on expert ratings of the importance of each item for preventing maternal and newborn deaths. Eight maternal and child health experts[1] at USAID provided independent

[1] The eight experts, including program managers and researchers who participated in this exercise, are from the Bureau of Global Health, Office of Maternal and Child Health and Nutrition at USAID.

ratings to each item on a scale of 1 (not important) to 5 (extremely important). Weights were calculated for items and domains based on the ratings. Appendix Table 3 provides average expert ratings on each item, as well as the item and domain weights calculated based on the ratings. The experts tended to give similar ratings to the items within the same domain. Most of the domains were weighted similarly except the guidelines, training, and supervision domain, which was weighted lower than the others.

The two approaches—equal weighting and expert ratings-based weighting—yielded similar readiness scores at the regional and national levels, with the equal-weight approach producing scores that were consistently a few percentage points higher (Appendix Table 4). Since expert ratings can vary by expert groups, the equal-weight approach was chosen in the final analysis because it is simple, replicable, and recommended by WHO (WHO 2015).

2.3 Effective Coverage Estimates

Effective coverage was estimated at both the regional and the national level, with the mathematical product of the coverage and readiness scored by accounting for types of facilities where delivery care was sought. In most countries, the regions are administrative regions or provinces for which both DHS data and SPA data are representative. In Tanzania, regions were further grouped into nine geographic zones to allow for a large sample size in each zone, therefore reduced sampling errors. While it may strengthen the validity of the estimates by further dividing each region into urban and rural areas, such division is not permitted due to potential inconsistencies in the classification of urban and rural between DHS and SPA. The number of regions varies across countries, from three regions in Malawi to ten regions in Haiti; the rest had six (Senegal), seven (Bangladesh and Nepal), and nine (Tanzania) regions or zones.

The formula for estimating effective coverage is described as follows.

At the regional level, the effective coverage is the summation of effective coverage of each type of facility that is constructed as the product of the coverage and readiness estimates:

$$EC_r = \sum_j (C_{rj} * Q_{rj})$$

where EC_r represents effective coverage in region r,

C_{rj} is the proportion of births delivered in facility type j in region r,

and

Q_{rj} is the average readiness score of facility type j in region r.

We accounted for the DHS sampling weight when estimating facility delivery coverage and SPA sampling weight when calculating readiness scores. The calculated readiness score for a specific facility category is an average score of all facilities in the same category. Ideally, variations in client volume among facilities within the same category should be also adjusted for. However, we were not able to implement such adjustment in the calculation due to the unavailability of data.

The national effective coverage is the summation of regional effective coverage weighted by the proportion of births in each region:

$$EC_T = \sum_r (EC_r * w_r)$$

where w_r represents the proportion of births in region r.

Effective coverage of facility delivery can be considered essentially as facility delivery coverage after adjusting for facilities' readiness to provide the service. Since the readiness score lies between 0 and 100%, the effective coverage should be equal to or below the crude coverage. In cases when all facilities reach 100% of the maximum readiness, the effective coverage would be equivalent to the crude coverage. The national estimates are improved by taking regional variations into account because regions differ in the use of each type of facility and in readiness among facilities in the same category.

The uncertainty of the estimates of effective coverage was assessed with an approximation procedure sometimes referred to as the "delta" method (Hogg and Craig 1965). We refer to the SPA and DHS estimates with the subscripts i=1 and i=2 respectively. The mean readiness score, noted as p_1 for the facilities of a specified type and in a specified region, can be calculated with the coefficient of an OLS regression of readiness scores with no covariates. We call this coefficient b_1 and the standard error of its mean is s_1. The lower and upper ends of the 95% confidence interval for the readiness are $L = b_1 - 1.96 * s_1$ and $U = b_1 + 1.96 * s_1$. We took into account the effect of survey design in the estimation of standard errors when the SPA was a sample survey. A finite population correction factor was adjusted for in the estimation, given the fact that the SPA sample was drawn from more than 5% of a finite population.

The coverage of facility delivery, noted as p_2, can be estimated using the coefficient b_2 of a logit regression of facility delivery with no covariates. That is, $\text{logit}(p_2) = \log[p_2/(1 - p_2)] = b_2$. The sampling distribution of b_2 is asymptotically normal with standard deviation s_2. The lower and upper ends of the 95% confidence interval for $\text{logit}(p_2)$ are $L = b_2 - 1.96 * s_2$ and $U = b_2 + 1.96 * s_2$. We can calculate the facility delivery coverage as $p_2 = [\exp(b_2)]/[1+\exp(b_2)]$. If the same anti-logit transformation is applied to L and U, we obtain the lower and upper ends of the confidence interval for coverage. All estimates are adjusted for the survey design.

Effective coverage, p, is defined by $p = p_1 * p_2$. A confidence interval for p is calculated by converting p to the logit scale with

$$\boldsymbol{F = logit(p) = \log\left(\frac{p}{1-p}\right) = \log\left(\frac{p_1 * p_2}{1 - p_1 p_2}\right)}$$

p_1 and p_2 are functions of the coefficients b_1 and b_2 respectively; the standard errors of b_1 and b_2 are s_1 and s_2 respectively; and the covariance of b_1 and b_2 is 0 because of the independence of the SPA and DHS. Therefore, the sampling variance of F is estimated with the delta method to be

$$\boldsymbol{s^2 = \left(\frac{\partial F}{\partial b_1}\right)^2 s_1^2 + \left(\frac{\partial F}{\partial b_2}\right)^2 s_2^2}$$

and the standard error of F is the square root, s. The partial derivatives in this formula are calculated from the formula for F to be

$$\frac{\partial F}{\partial b_1} = \frac{1}{p_1(1-p_1p_2)} \text{ and } \frac{\partial F}{\partial b_2} = \frac{1-p_1}{1-p_1p_2}$$

We calculate the lower and upper ends of a 95% confidence interval as $L = F$ -1.96* s and $U = F$ +1.96* s, and then apply the anti-logit transformation to L and U to get the lower and upper ends of the confidence interval for $p = p_1 * p_2$ (effective coverage). Similar steps are used to obtain confidence intervals for the aggregated regional and national estimates.

3 RESULTS

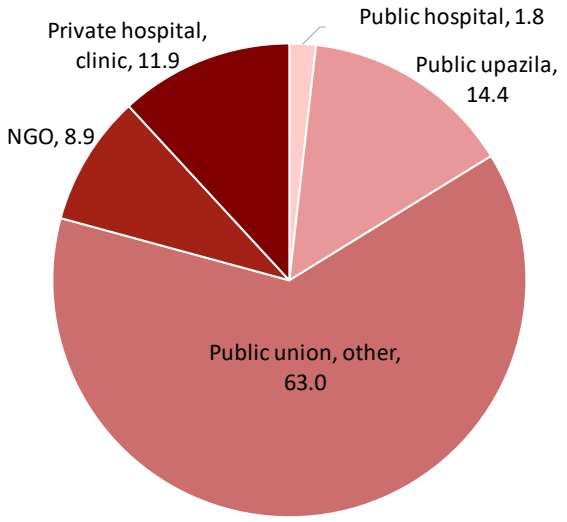
We present results by individual country. Each country section starts with a description of types of facilities that reported providing delivery care services. We then give results on facility readiness to provide delivery care, including the availability of individual items and overall readiness scores. Facility delivery coverage is then described by facility type and region. Each country section ends with a presentation of estimates of effective coverage at the regional and national levels. Finally, a brief comparison across countries appears at the end of the results chapter.

3.1 Bangladesh

3.1.1 Facility distribution by type

In Bangladesh, the health system is largely managed by the government at sub-national levels. Among 280 facilities identified to provide delivery care, the majority (63%) are sub-upazila (union level) facilities, which are staffed with a medical assistant, a family welfare visitor, and a pharmacist (Figure 1a). These facilities provide mostly maternal and child health services with some curative care services. Among the rest, 2% are government hospitals and 14% are upazila (sub-district) facilities, which are managed at the sub-district administrative level and have both inpatient and outpatient services with a number of staff including doctors, medical assistants, pharmacists, and technicians. One-fifth of facilities are private or non-governmental facilities, at 12% and 9% respectively.

Figure 1a Distribution of facilities with delivery care by facility type, Bangladesh SPA 2014



3.1.2 Facility readiness to provide delivery care

Appendix Table 5 shows, for non-CEmOC facilities at the national level as well as for seven divisions of the country, the availability of tracer items that are important for providing delivery care. For CEmOC facilities, availability is only reported at the national level because of the small number of CEmOC facilities in the country. At the national level, among non-CEmOC facilities only a few readiness items were commonly available (that is, in over 90% of facilities), including wrapping the baby (94%) and encouraging early breastfeeding (97%), and the facility has an improved water source (92%). Many items were poorly stocked or had limited availability at the national level. Less than a third of facilities had a skilled birth attendant 24 hours a day (29%) or emergency transportation (30%). Availability of medicines and commodities ranged from 17% for hydrocortisone to 32% with an injectable uterotonic and 33% with IV solution with an infusion set. The domain with the most limited availability was guidelines, training, and supervision. Nationally, 20% of facilities or fewer were staffed with at least one provider with recent training in all areas related to labor and delivery, and newborn care assessed. The availability of items increases among CEmOC facilities for all domains except the availability of guidelines and trained staff.

Even among CEmOC facilities, only 4 out of 13 facilities had at least one provider trained on CEmOC in the last 24 months.

We compared readiness scores between CEmOC facilities and non-CEmOC facilities at the national level. Overall CEmOC facilities received a significantly higher score than non-CEmOC facilities, even though a higher standard was applied to CEmOC facilities (availability of C-section and safe blood transfusion) (Appendix Table 6).

Figure 1b presents the readiness of facilities to provide delivery services in Bangladesh, by facility type and division. At the national level, facilities in Bangladesh have 47% of the maximum possible readiness to provide delivery care services. Readiness varies more by facility type than across divisions. The level of readiness is highest in public hospitals (77%), the least common type of facility, and lowest in public union or other public facilities (35%), the most common type of facility. Average readiness scores for the seven divisions range from 39% in Rajshahi to 54% in Rangpur. These levels of readiness in hospitals or union health facilities are consistent across divisions; however, there is greater variation in the level of readiness among NGO facilities, from 43% in Barisal to 85% in Rangpur. Rangpur's comparatively higher scores among NGOs as well as private hospitals/clinics (81%) and public union facilities (47%) help give it the highest total readiness score among the divisions.

Figure 1b Readiness score of delivery services by facility type and division, Bangladesh SPA 2014

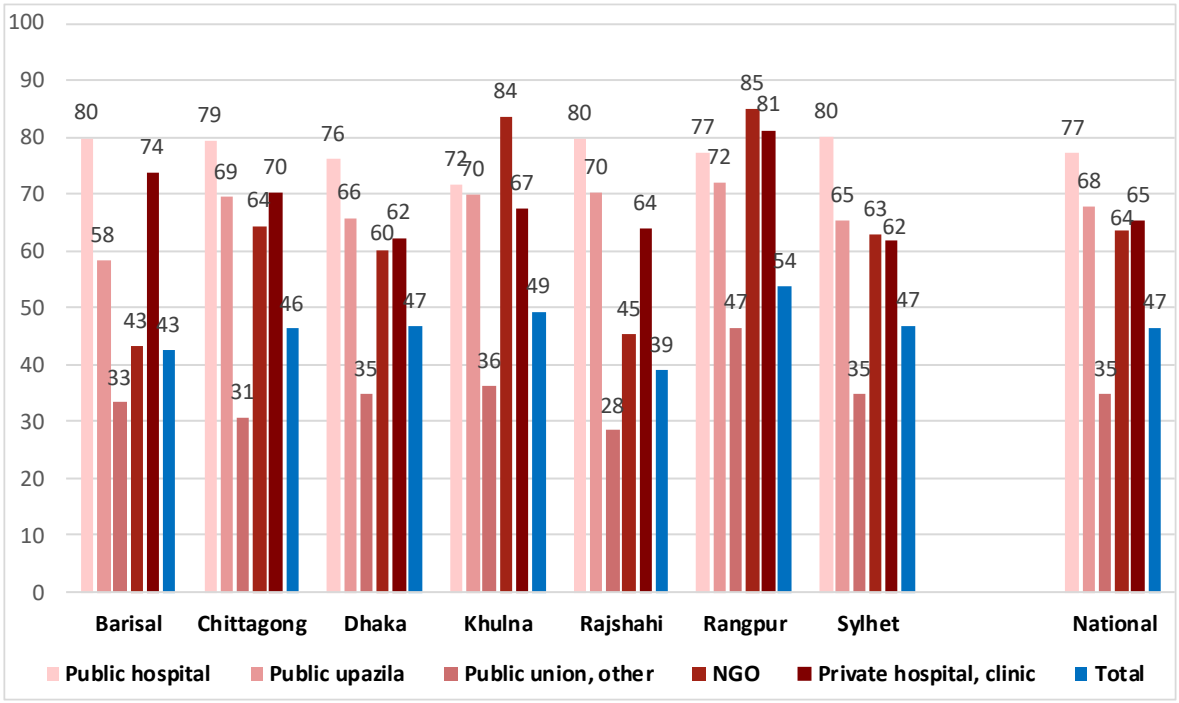
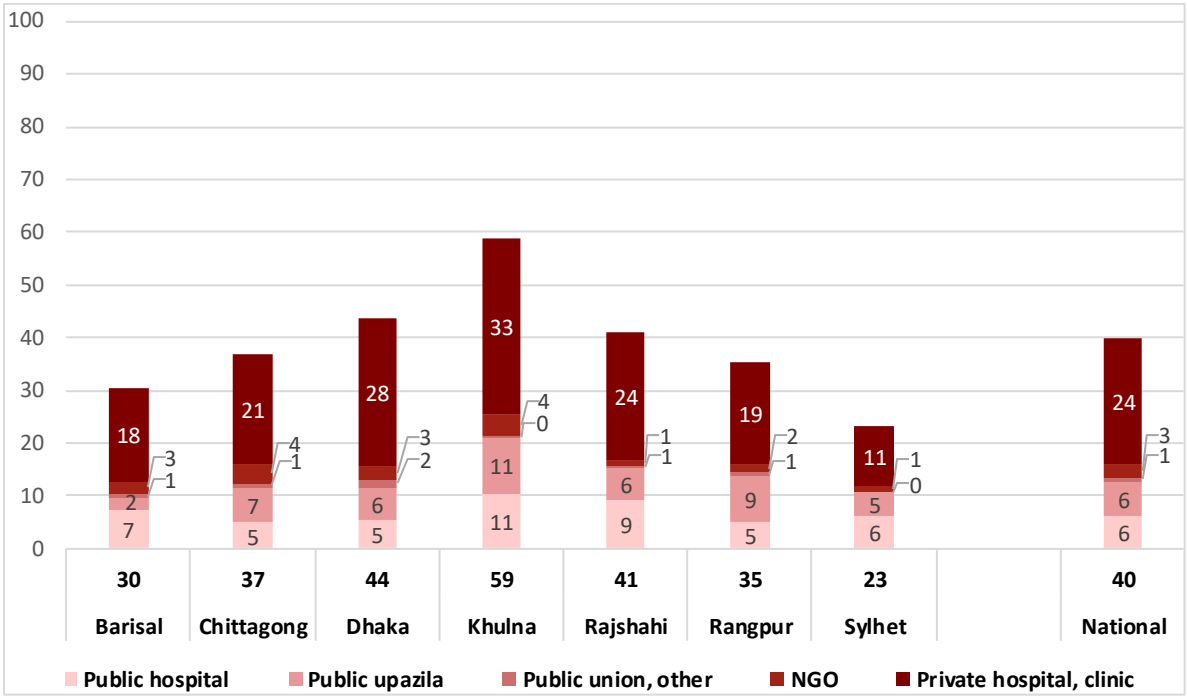


Figure 1c Percentage delivered in a health facility by facility type and division, among births in the two years preceding the survey, Bangladesh DHS 2014



3.1.3 Coverage of facility delivery

As determined in the 2014 Bangladesh DHS, and as Figure 1c shows, most births (60%) were not delivered in a health facility. Among those delivered in a health facility, most were in private hospitals and clinics, representing 24% of all births in the two years preceding the survey. Few births were delivered in NGO or union facilities. These trends are consistent across divisions. The highest level of facility delivery occurs in Khulna (59%) for all facility types combined, including 33% of births delivered in private facilities and 11% in both public upazila facilities and public hospitals.

3.1.4 Effective coverage

The scatterplot in Figure 1d demonstrates the intersections between facility readiness and coverage of facility deliveries by division in Bangladesh. In this figure the intersections between readiness and coverage occur mostly in quadrant 3, where coverage (use of health facilities) is less than 50% and facility readiness also is less than 50%, indicating low levels of effective coverage (use of facility services adjusted for the level of quality). The Khulna division is in quadrant 2, showing coverage higher than 50% and a readiness score close to 50%.

Figure 1d Readiness versus coverage by division, Bangladesh

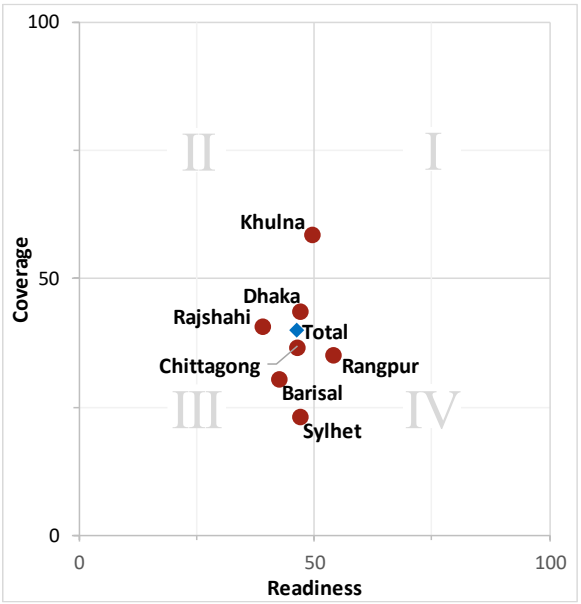
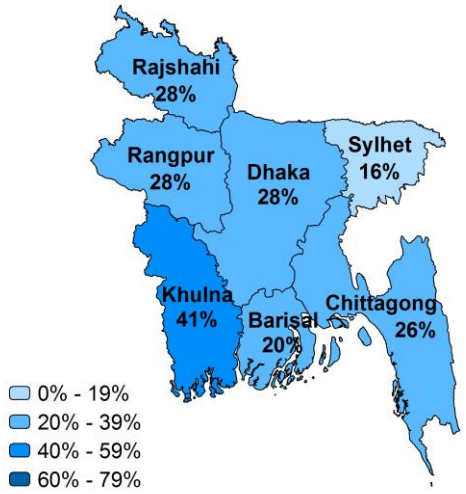


Figure 1e Effective coverage of facility delivery by division, Bangladesh



As the scatter plot in Figure 1d suggests and the map in Figure 1e depicts, effective coverage is low in Bangladesh, though with some variation across divisions. The national level of effective coverage is 27%, 13 percentage points lower than the crude coverage level of 40% (see Table 2). The level of effective coverage ranges from 16% in Sylhet to 41% in Khulna. Khulna appears to have significantly higher effective coverage compared with all other divisions. Effective coverage in Sylhet is significantly lower than in all other divisions except Barisal. Except for Khulna and Sylhet, the remaining division-level effective coverage lies within a narrow range of only a few percentage points, from 21% in Barisal to 28% in Dhaka, Rajshahi, and Rangpur. Overall, coverage of facility delivery itself remains a problem in Bangladesh, while low levels of service readiness among facilities further impede access to high-quality delivery care.

Table 2 Coverage, readiness score, and estimated effective coverage by division, Bangladesh

	Coverage	Readiness score	Effective coverage		
			Estimate	LB	UB
Barisal	30.5	42.5	20.5	15.9	25.8
Chittagong	36.8	46.3	25.8	21.0	31.2
Dhaka	43.7	46.8	27.6	23.1	32.7
Khulna	58.8	49.3	40.9	35.0	47.0
Rajshahi	40.9	39.0	27.6	23.1	32.7
Rangpur	35.4	53.8	27.6	22.6	33.2
Sylhet	23.2	46.9	15.6	11.6	20.8
Total	39.7	46.5	26.8	24.5	29.1

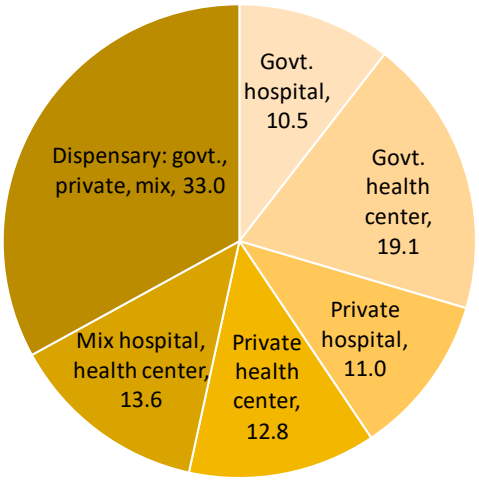
Note: LB and UB represent the lower and upper bounds of the 95% confidence interval of the effective coverage. The same applies to other tables onwards.

3.2 Haiti

3.2.1 Facility distribution by type

Several types of facilities in Haiti offer delivery services, including hospitals, health centers, and dispensaries. These facilities are managed by either the government, the private sector, or a mix of government and private. Health centers offer preventative and curative services, and are technical facilities that often possess the staff and medicines to offer a wide range of care. Dispensaries are a source for basic outpatient care, offering services for common and mild pathologies. In Haiti, hospitals and health centers with beds are mandated to provide delivery care services. Though facilities without beds and dispensaries have no such mandate, many reported providing labor and delivery care services.

Figure 2a Distribution of facilities with delivery care by facility type, Haiti SPA 2013



A total of 389 facilities surveyed in the 2013 Haiti SPA reported offering delivery services. One-third of these facilities are dispensaries (includes all three possible managing authorities) (Figure 2a). The other facilities offering delivery services are hospitals and health centers. Government hospitals (11%) and government health centers (19%) contribute to nearly a third of all facilities with delivery care. The remaining third of facilities are split approximately between private hospitals, private health centers, and mixed hospitals and health centers. Only 10 of these facilities qualify as CEmOC facilities.

3.2.2 Facility readiness to provide delivery care

Each facility type in Haiti has been given a service readiness score based on the availability of structural tracer items (Appendix Table 7). CEmOC facilities reported having the most tracer items, though some items were rare—such as an exam light (30%), suction apparatus (10%), manual vacuum extractor (30%), guidelines for management of pre-term labor (20%), and training in newborn infection management (30%). Only half of CEmOC facilities had CEmOC guidelines available, and 60% had CEmOC training.

Among non-CEmOC facilities, availability of tracer items is shown for 10 regions (Appendix Table 6). Many items are available in each region, such as specific equipment, guidelines, and training items. Often, if an item is uncommon among facilities in one region, it is also uncommon in every region. Equipment such as a manual vacuum extractor, vacuum aspirator kit, and partograph were seldom observed in more than 30% of facilities in any region. Additionally, guidelines for such practices as Integrated Management of Pregnancy and Childbirth (IMPAC), CEmOC, management of pre-term labor, and standard precaution were found in less than 30% of facilities in nearly every region.

Items that were regularly found (over 90% of facilities) were delivery beds and disposable latex gloves, and some immediate newborn care practices such as baby wrapping and early initiation of breastfeeding. Though nearly every item in the list of guidelines and trainings was not commonly found in any region, staff supervision was common in every region. Regional variation exists among specific items, and often the Sud, Ouest, and Nord regions have greater availability of tracer items than regions such as the Sud-Est and Nord-Ouest. Newborn signal functions and immediate care (excluding neonatal resuscitation) were more commonly available than any nearly other tracer items, though fewer than half of facilities had the basic necessity of improved sanitation (47%). Similar to Bangladesh, the overall readiness score was much higher among CEmOC facilities than non-CEmOC facilities in Haiti, at 78% and 52% respectively (Appendix Table 6).

As Figure 2b shows, overall, health facilities in Haiti have a readiness score of 53%. By region, the highest readiness scores are in the Sud (61%) and Centre (60%) regions, and the lowest in the Nord-Ouest region (43%). By facility type, the range of readiness is wider. Overall, government hospitals have the highest readiness score, with 72% of the maximum capacity to provide delivery care services, followed closely by private hospitals, at 68%. Health centers score much the same among government, private, and mixed (58%, 56%, and 54% respectively), but dispensaries are the least ready, with only 37% of the maximum capacity to provide delivery care services.

3.2.3 Coverage of facility delivery

Figure 2c shows facility delivery by type of facility in each of the regions. Nationally, only 39% of live births in the two years preceding the survey were delivered in a health facility. Regionally, this ranges from 30% of births in Artibonite to 49% of births in the Ouest region. In nearly every region the majority of births that took place in a health facility occurred in government hospitals, though in the Nord and Nord-Est regions more births were delivered in mixed hospitals than any other type of facility. Private hospitals were also commonly used in the Ouest region. Health centers delivered a very small proportion of these births (1-6%).

Figure 2b Readiness score of delivery services by facility type and region, Haiti SPA 2013

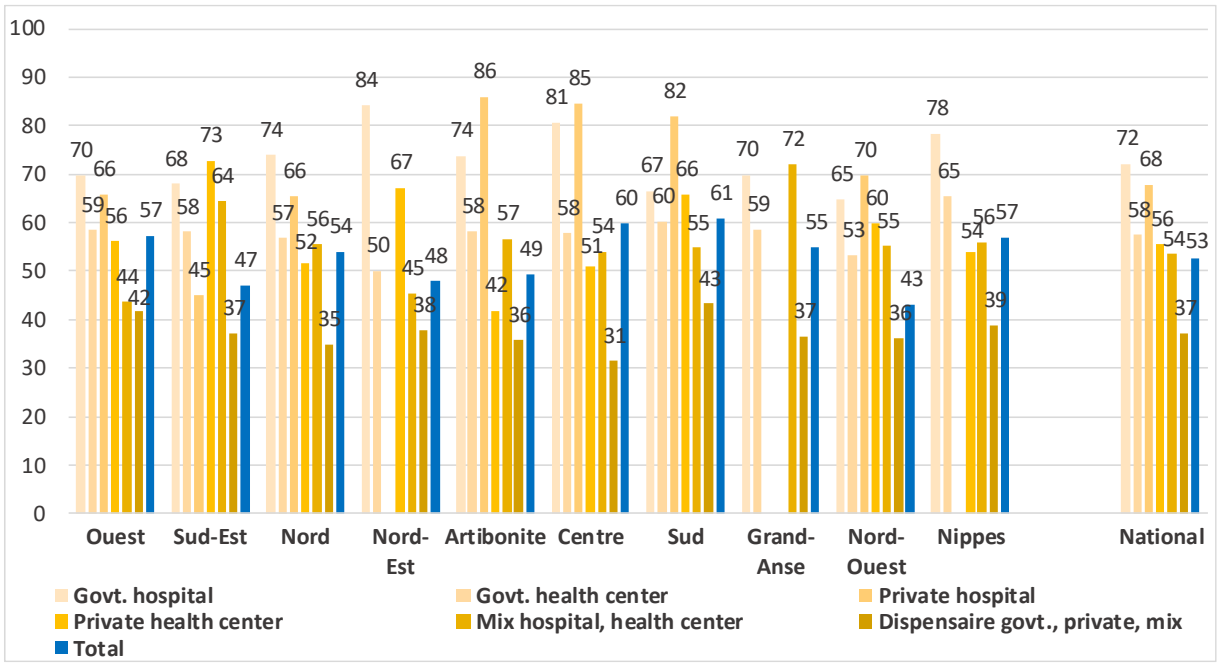
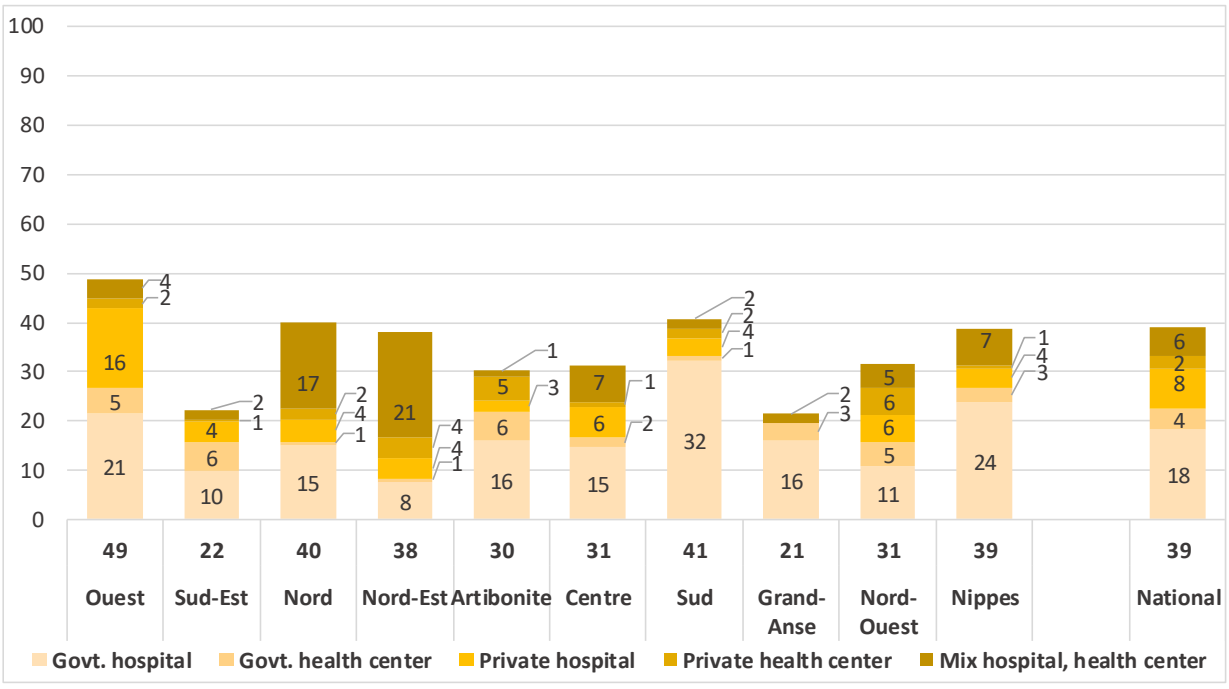


Figure 2c Percentage delivered in a health facility by facility type and region, among births in the two years preceding the survey, Haiti DHS 2012



3.2.4 Effective coverage

Figure 2d illustrates the intersection between readiness scores and facility delivery coverage among births in the two years preceding the survey. Many regions in Haiti exhibit a readiness score higher than 50% but with facility delivery coverage less than 50%, as the data points in Figure 2d in quadrant 4 indicate. In Grand-Anse region, with a readiness score similar to all other regions in quadrant 4, only 21% of births were delivered in a health facility. The remaining four regions, the Sud-Est, Nord-Est, Nord-Ouest, and Artibonite, are in quadrant 3, with less than 50% coverage and a readiness score below 50%. Overall, Haiti's regions have a large range of coverage of facility delivery, but slightly smaller differences in facility readiness scores.

Figure 2d Readiness versus coverage by region, Haiti

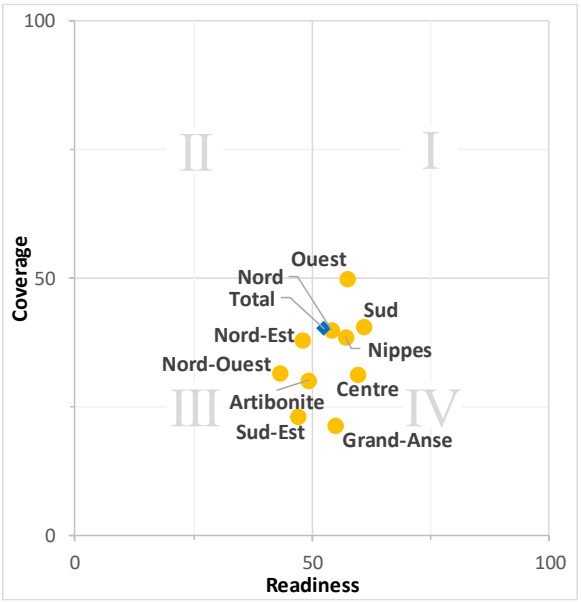
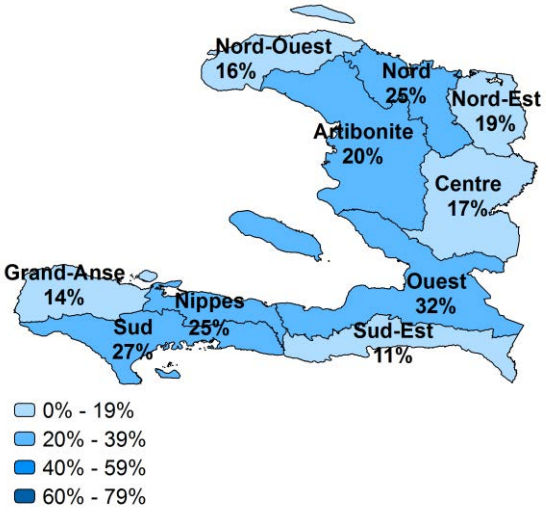


Figure 2e Effective coverage of facility delivery by region, Haiti



Haiti has a total estimated effective coverage of 24%, reflecting the level of delivery coverage (40%) adjusted for facility readiness (see Table 3). As Figure 2e shows, all regions have low effective coverage, from 11% in Sud-Est to 32% in the Ouest region, with most regions having an effective coverage below 25%. The Ouest region has a relatively high readiness level among its health facilities, combined with the highest level of coverage, at 50%. In contrast, the Sud-Est has low facility delivery coverage, at 23%, and one of the lowest facility readiness scores (47%).

Table 3 Coverage, readiness score, and estimated effective coverage by region, Haiti

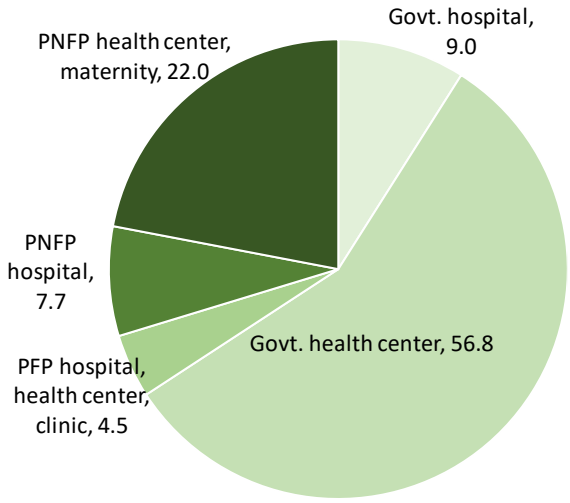
	Coverage	Readiness score	Effective coverage		
			Estimate	LB	UB
Ouest	50.0	57.4	31.5	26.7	36.7
Sud-Est	23.0	47.0	10.5	6.3	17.0
Nord	39.9	54.0	25.3	18.6	33.3
Nord-Est	38.0	48.0	19.2	12.6	28.1
Artibonite	30.2	49.3	20.0	14.2	27.4
Centre	31.2	59.8	17.5	11.3	26.1
Sud	40.7	60.9	27.4	19.2	37.4
Grand-Anse	21.4	55.0	14.4	9.1	22.1
Nord-Ouest	31.5	43.2	16.1	11.2	22.5
Nippes	38.7	57.0	24.8	16.3	35.8
Total	40.0	52.7	24.4	22.0	27.0

3.3 Malawi

3.3.1 Facility distribution by type

Figure 3a shows the distribution of facilities with delivery services by type among the 528 facilities in Malawi that provide delivery services. Eleven are CEmOC facilities, over half are government health centers, and 22% are private not-for-profit health centers or maternity facilities, primarily Christian Health Association of Malawi (CHAM) facilities. The rest, including government hospitals, private not-for-profit (PNFP) hospitals, and private for-profit (PFP) facilities (mainly health centers), make up a smaller proportion, at 9%, 8%, and 5% respectively. Government-managed facilities offer services free of charge, while CHAM facilities charge user fees, except for some preventative services and infectious disease treatment, and are located mainly in rural areas. Though hospitals provide a wide and comprehensive suite of services for inpatient and outpatient care, primary-level facilities (health centers, health clinics, and maternity facilities) typically offer mostly preventative and some curative care.

Figure 3a Distribution of facilities with delivery by facility type, Malawi SPA 2013-14



3.3.2 Facility readiness to provide delivery care

Appendix Table 8 shows the regional and national availability of tracer items that are important for providing high-quality delivery care in non-CEmOC facilities, as well as in CEmOC facilities. Overall, CEmOC facilities were observed to have all or most of the essential items or services in the areas of newborn immediate care, general requirements, equipment, or medical commodities, which results in a higher readiness score among CEmOC facilities than those non-CEmOC facilities (Appendix Table 6). CEmOC facilities appeared to have relatively lower availability of guidelines and trained staff. For example, only about a third of the CEmOC facilities reported having at least one provider trained in IMPAC and CEmOC in the past 24 months.

Among non-CEmOC facilities, the availability of the tracer items varies. For example, the most commonly observed items or services were parenteral administration of uterotonic drugs/oxytocin, skin-to-skin care, baby wrapping, early initiation of breastfeeding, improved water source, delivery bed, disposable latex gloves, infant scale, injectable uterotonic, and antibiotic eye ointment for newborn. These were available in over 90% of non-CEmOC facilities with delivery services in Malawi. Some other items or services, however, were available in less than 25% of facilities, including vacuum aspirator or D&C kit, hydrocortisone, staff training in IMPAC, and staff training in CEmOC. Regional variation is small for most items. More variation exists in the availability of electricity, 24/7 skilled birth attendance, examination light, skin disinfectant, and CEmOC guidelines, which show differences of more than 15 percentage points between the region with the highest availability and the region with the lowest availability.

Overall, Malawi's facilities have a readiness score of 59% (Figure 3b). All three regions have a score similar to the national level underscoring consistency in facility readiness across regions. Among the types of facilities, government hospitals and private not-for-profit hospitals have the highest readiness scores, at nearly 80% of the full capacity to provide delivery care services. These two types of facilities also perform consistently well across regions, with a readiness score from 74% to 82%. The other three types of facilities—government health centers, private for-profit facilities, and private not-for-profit health centers/maternities—have a national score of about 55%. The regional variations for these three facility types are also small.

Figure 3b Readiness score of delivery services by facility type and region, Malawi SPA 2013-14

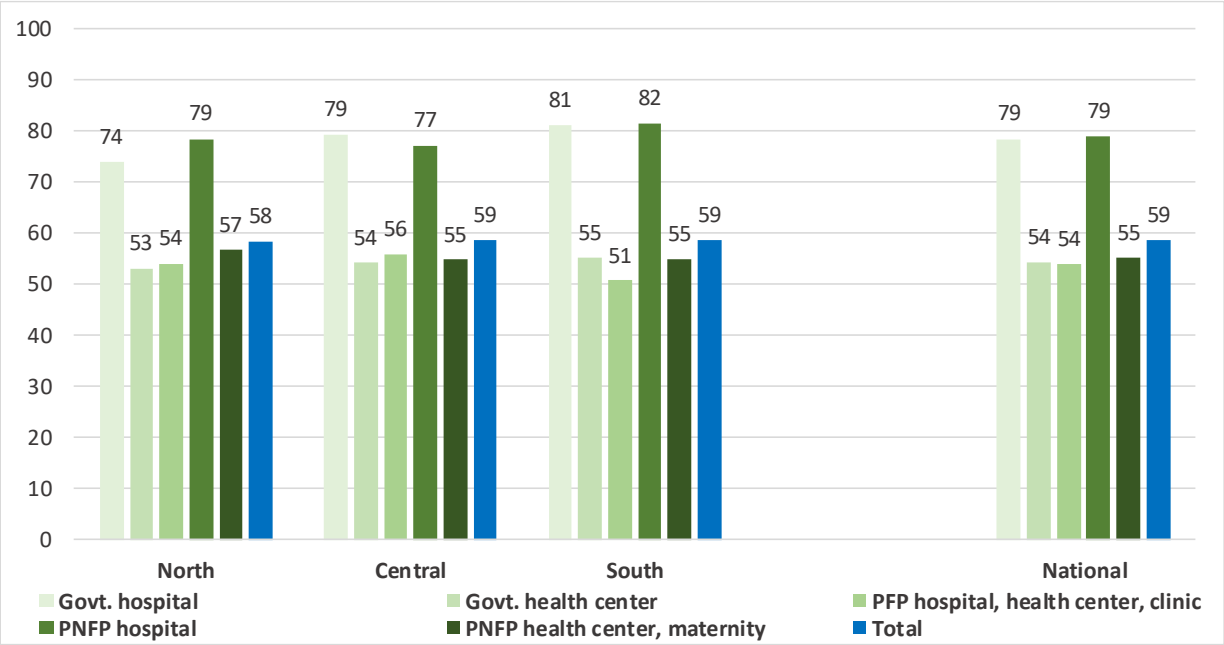
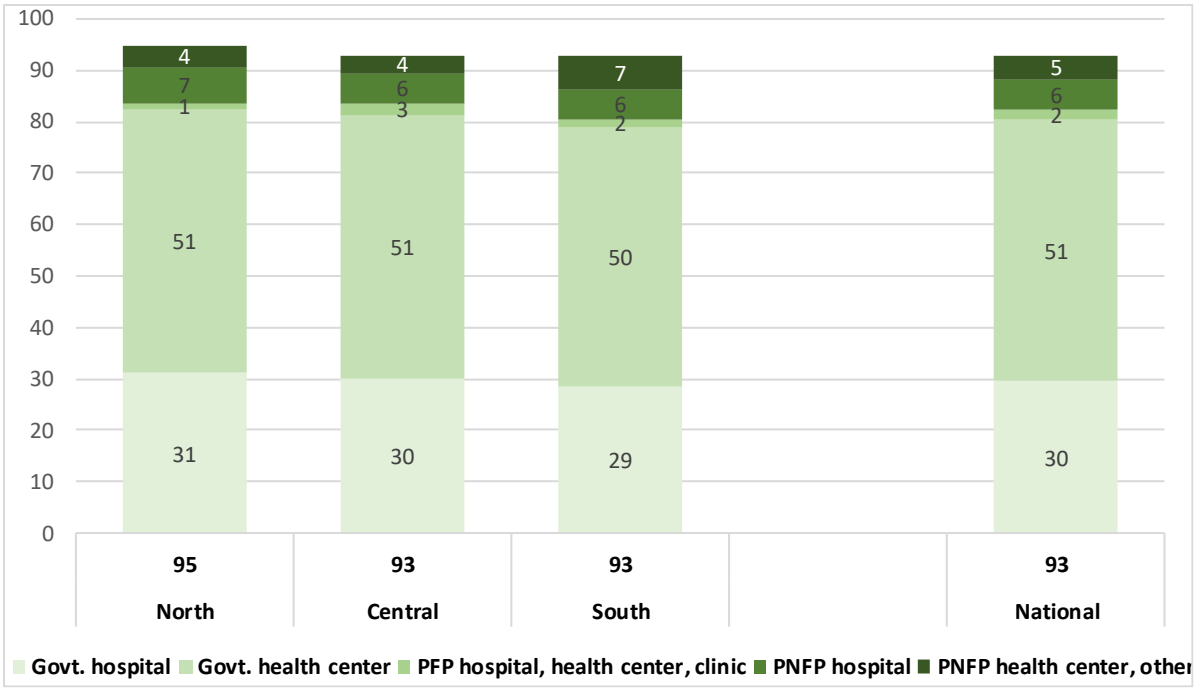


Figure 3c Percentage delivered in a health facility by facility type and region, among births in the two years preceding the survey, Malawi DHS 2012



3.3.3 Coverage of facility delivery

Malawi has achieved a high level of facility delivery—93% of births in the two years before the survey were delivered at a health facility (Figure 3c). A similar level is observed in all three regions. Delivery care is primarily provided by government health centers, at 51%, followed by government hospitals, at 30% nationally. There is limited use of private for-profit facilities and private not-for-profit health centers and maternity facilities. In all three regions, the distribution of facility delivery among the different types of facilities is similar to the national average.

Figure 3d Readiness versus coverage by region, Malawi

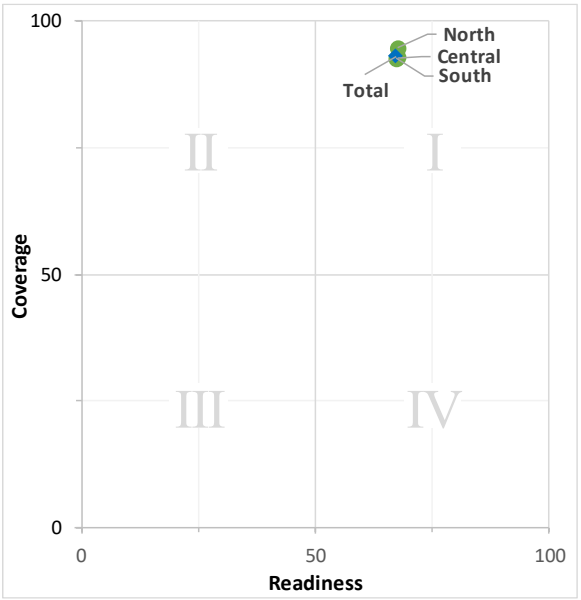
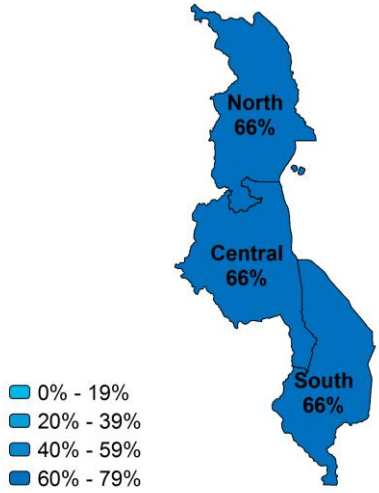


Figure 3e Effective coverage of facility delivery by region, Malawi



3.3.4 Effective coverage

Figure 3d plots coverage of facility delivery against facility service readiness for the country and for the three regions. The country average and all three regions are located in quadrant 1 and largely overlap each other. After taking into account the readiness of facilities to provide the service, the coverage of facility delivery in Malawi decreases by 30%, or 17 percentage points, from 93% for crude coverage to 66% for effective coverage. As Figure 3e illustrates, the effective coverage in all three regions is also estimated at 66% because of their similar levels of coverage and readiness. Table 4 summarizes findings on coverage, readiness, and effective coverage for Malawi nationally and by region.

Table 4 Coverage, readiness score, and estimated effective coverage by region, Malawi

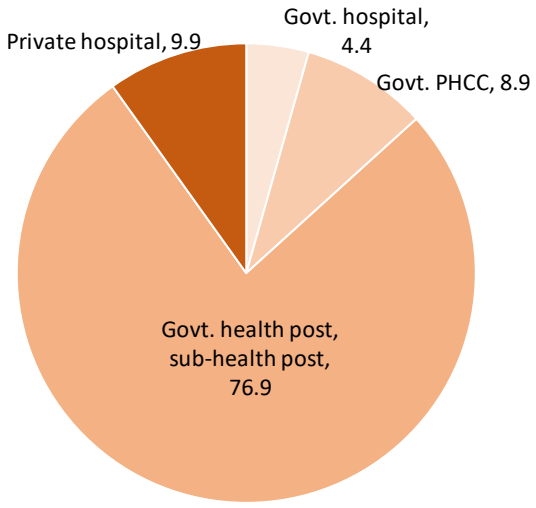
	Coverage	Readiness score	Effective coverage		
			Estimate	LB	UB
North	94.7	67.5	66.2	58.2	73.4
Central	92.8	67.6	66.3	61.6	70.7
South	92.7	67.2	66.4	62.1	70.5
Total	92.9	67.4	66.4	63.4	69.2

3.4 Nepal

3.4.1 Facility distribution by type

A total of 457 facilities in Nepal, including 9 CEmOC facilities and 448 non-CEmOC facilities, reported that they provide delivery services. The majority (77%) are government health posts or sub-posts (Figure 4a). Other types of facilities with delivery care services are government hospital, government primary health care (PHCC) center, and private hospital, accounting for 4%, 9% and 10%, respectively. Health posts provide basic curative and preventive outpatient services and are staffed by four or five health workers. Primary health centers often have a medical officer, more staff than a health post, and a few beds, enabling them to offer basic diagnosis and treatment of illnesses as well as other curative services. There is typically at least one small hospital in every district with several medical officers and around 15 health workers. However, regional and central hospitals are much larger, with up to 200 staff members and 500 beds, and offering a wide and comprehensive range of services.

Figure 4a Distribution of facilities with delivery by facility type, Nepal SPA 2015-16



3.4.2 Facility readiness to provide delivery care

Appendix Table 9 shows the availability of tracer items that are important for providing delivery care in seven provinces among non-CEmOC facilities, and at the national level for CEmOC facilities. CEmOC facilities have most items available except a few medicines (chlorhexidine and antibiotic eye ointment for newborns), guidelines, and staff training. Only a few CEmOC facilities have guidelines on reproductive health services and standard precautions available. Their staff also reported limited staff training related to delivery and newborn care, and only one of the nine CEmOC facilities has training in CEmOC. Among non-CEmOC facilities, with some variability, the provinces often have similar items available at their health facilities. Some items are scarcely available in any region. For example, fewer than one in every four facilities has a 24/7 skilled birth attendant, manual vacuum extractor, vacuum aspirator, or hydrocortisone. Conversely, nine in every ten facilities routinely provide immediate newborn care (skin-to-skin care, wrapping baby, and early initiation of breastfeeding) and have sterilization equipment, a delivery bed, latex gloves, skin disinfectant, and IV diffusion supplies. Similar to CEmOC facilities, non-CEmOC facilities also reported limited availability of guidelines and staff training; these areas were rarely available in more than 25% of facilities. As in other countries, CEmOC facilities had a much higher readiness score than non-CEmOC facilities in Nepal (Appendix Table 6).

Figure 4b shows readiness scores by facility type and region in Nepal. Overall, Nepal's facilities have a national service readiness score of 58%, which means that on average they have 58% of the maximum capacity to provide delivery services. Among the four types of facilities, government hospitals have the

highest service readiness, at nearly 80%. Government health posts and sub-posts have the lowest readiness score, at a national average at 55%. Government primary health care centers and private hospitals have similar readiness scores, at 64% and 62% respectively.

Provinces show variations in readiness by type of facility that are similar to the national level. In all provinces, government hospitals have the highest readiness score, whereas government posts and sub-posts are the least ready, with just over 50% of the maximum capacity to provide delivery care services. Across provinces, government PHCCs vary in readiness, from a score of 55% in Province 1 to 72% in Province 7. Private hospitals also exhibit a wide range of readiness across provinces, from 50% in Province 1 to 75% in Province 5.

Figure 4b Readiness score of delivery services by facility type and province, Nepal SPA 2015-16

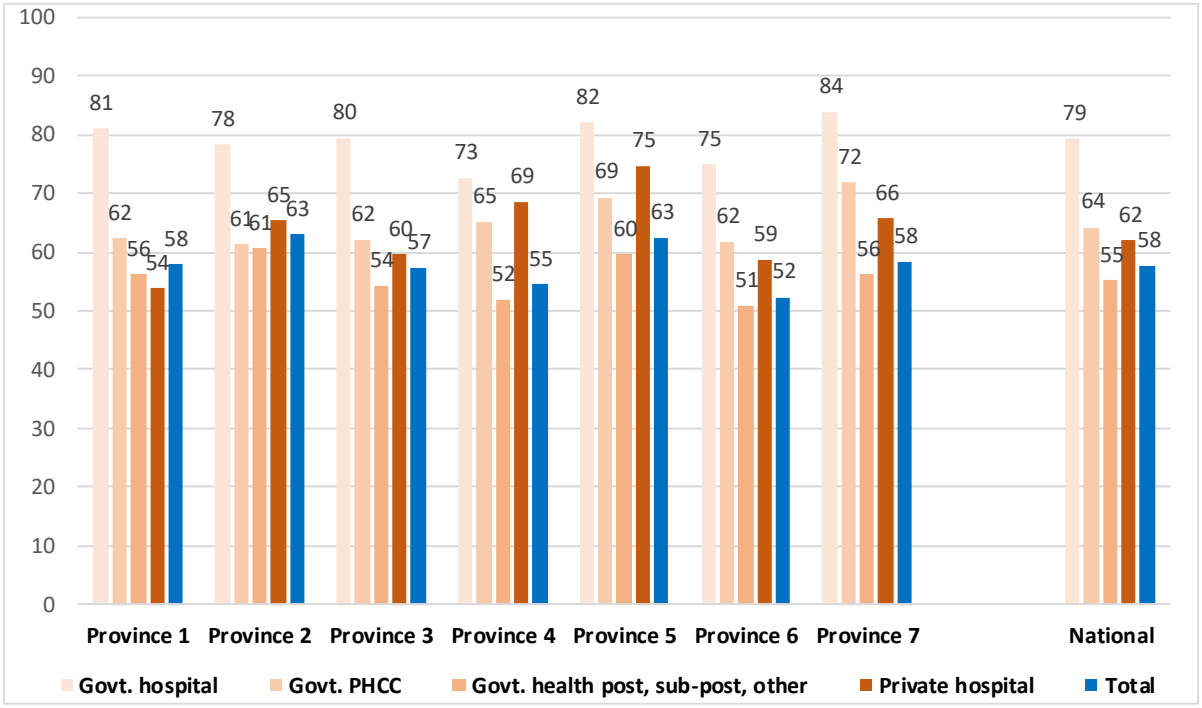
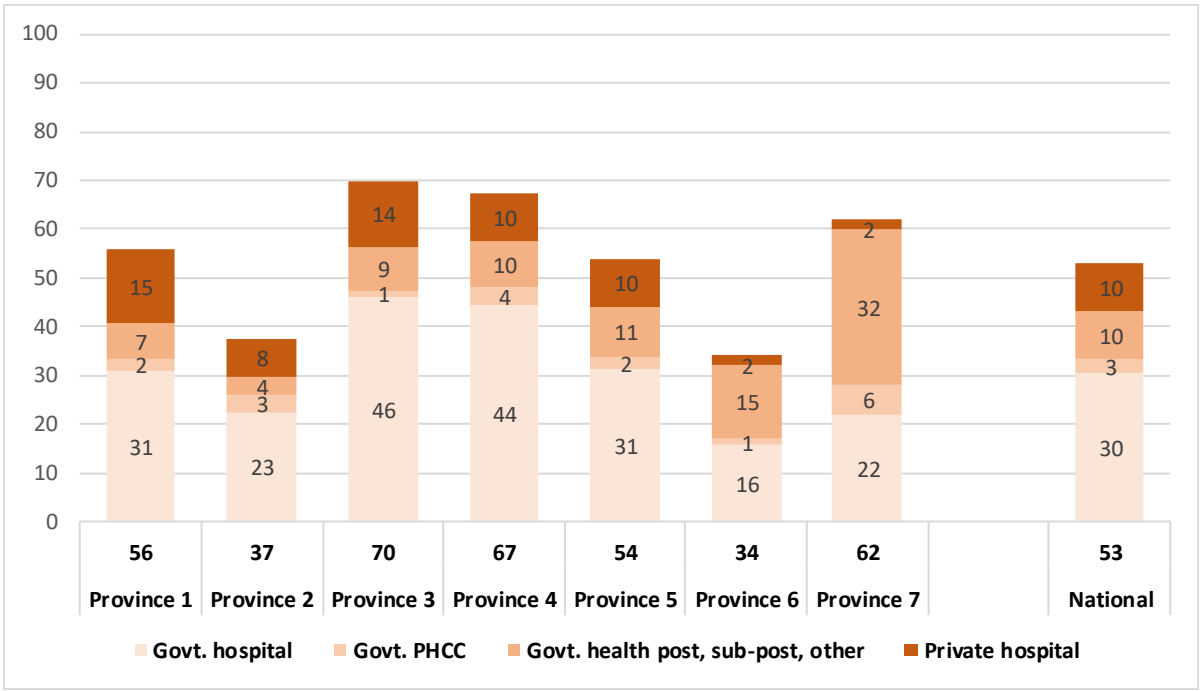


Figure 4c Percentage delivered in a health facility by facility type and province, among births in the two years preceding the survey, Nepal DHS 2015



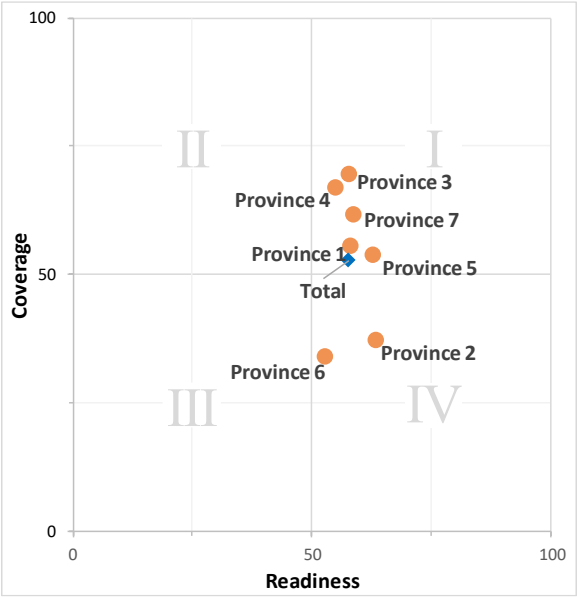
3.4.3 Coverage of facility delivery

In Nepal, 53% of live births in the two years before the survey were delivered in a health facility (Figure 4c).[2] The primary source of delivery care was government hospitals (30%), followed by private hospitals (10%), government health posts/sub-posts (10%), and government PHCCs (3%). In most of the provinces except Province 7, government hospitals are the leading source of delivery care. In Provinces 1, 2, and 3, private hospitals are more commonly used than government health posts/sub-posts and government PHCCs. Government health posts/sub-posts play a major role in Provinces 6 and 7 providing delivery care services, given that the government health post is the most common facility type. In Province 7, 32% of births were delivered at government health posts/sub-posts, a share higher than that of government hospitals (22%).

3.4.4 Effective coverage

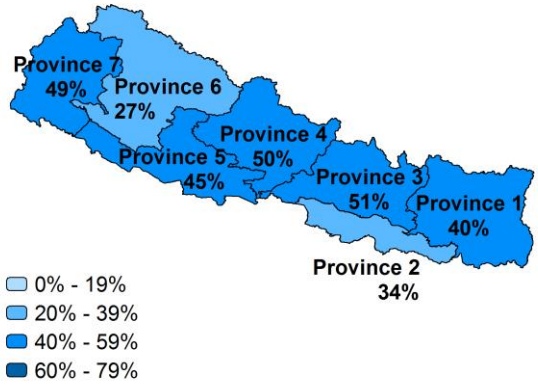
Figure 4d shows the level of service readiness and the coverage of facility delivery in Nepal nationally and in the provinces. The national average and five provinces (Provinces 1, 3, 4, 5, 7) are in quadrant 1, which indicates that both the average readiness score and coverage of facility delivery are higher than 50%. Among these provinces, Provinces 3 and 4 have the highest coverage but relatively poor readiness compared with other provinces. Provinces 2 and 6 are in quadrant 4, representing a readiness score higher than 50%, but facility delivery coverage lower than 50%. Although facilities in Province 2 have the highest readiness score (63%) among all provinces, coverage is low, at only 37% of births delivered in a health facility. Province 6 has the lowest coverage of facility delivery and its facilities also are the least ready to provide delivery services. Overall, provincial differences are greater in coverage of facility delivery (from 34% in Province 6 to 70% in Province 3) than in the readiness of facilities to provide the services (from 52% in Province 6 to 63% in Province 2).

Figure 4d Readiness versus coverage by province, Nepal



[2] An additional 6% of births were reported delivered in such places as private clinics and NGO facilities in Nepal or India, or other unnamed places.

Figure 4e Effective coverage of facility delivery by province, Nepal



While 53% of births in Nepal were delivered in a health facility, effective coverage is estimated at only 42% at the national level (see Table 5). At the provincial level, effective coverage ranges from 27% in Province 6 to 51% in Province 3. While Provinces 3, 4, and 7 have a higher effective coverage than other provinces, at about 50%, Provinces 6 and 2 have the lowest effective coverage, at 27% and 34% respectively (Figure 4e).

Table 5 Coverage, readiness score, and estimated effective coverage by province, Nepal

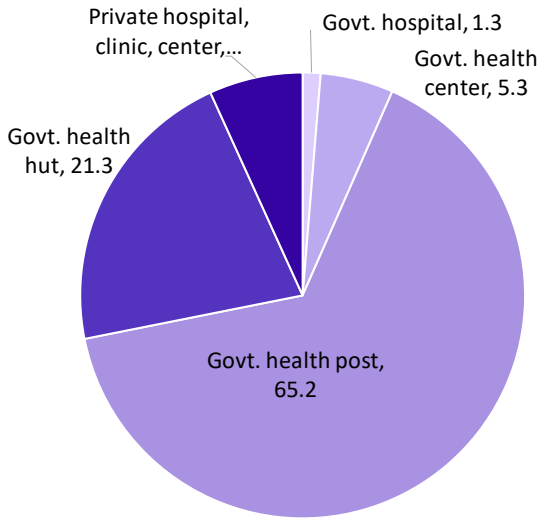
	Coverage	Readiness score	Effective coverage		
			Estimate	LB	UB
Province 1	55.9	57.9	40.1	33.4	47.3
Province 2	37.4	63.0	33.7	28.4	39.5
Province 3	69.8	57.4	50.7	41.7	59.7
Province 4	67.1	54.6	50.3	41.7	58.8
Province 5	54.1	62.5	45.4	36.9	54.3
Province 6	34.1	52.4	27.1	21.4	33.6
Province 7	61.9	58.4	49.5	39.9	59.1
Total	52.7	57.7	41.9	38.9	45.1

3.5 Senegal

3.5.1 Facility distribution by type

The majority of health facilities in Senegal that provide delivery services are managed by the public sector (Figure 5a). Two-thirds of these facilities are government health posts, 21% are health huts, 5% are government health centers, and 1% are government hospitals. Health centers in Senegal are typically better equipped and have more doctors and health workers than health posts, where typically no doctor is available, only nurses or midwives. Health huts are detachments of health posts, staffed with only health workers and providing only the most basic health services, including curative child care, growth monitoring, and vaccinations, as well as offering family planning services. Seven percent of all facilities in Senegal are privately managed (hospitals, clinics, or centers).

Figure 5a Distribution of facilities with delivery by facility type, Senegal SPA 2015



3.5.2 Facility readiness to provide delivery care

There is a broad range of availability of items for providing delivery care across and within both the types of facilities and regions (Appendix Table 10). At the national level, commonly available items (over 90%) among non-CEmOC facilities include assisted vaginal delivery, skin to skin, wrapping the baby, and early breastfeeding, delivery bed, delivery pack, and an infant scale. A few items have only limited availability: parenteral administration of anticonvulsants for hypertensive disorders of pregnancy (24%), manual vacuum extractor (3%), guidelines for management of pre-term labor (14%), and at least one staff member with training in CEmOC (24%). Only 10% of non-CEmOC facilities were found to have a skilled birth attendant available at all times. Among CEmOC facilities, the majority of items are available in 100% of facilities, the key exceptions being at least one staff member with recent training in newborn care and a number of medicines and commodities. As expected, a much higher readiness score was found among CEmOC facilities than non-CEmOC facilities (Appendix Table 6).

Figure 5b shows that at the national level the average level of readiness among facilities was 60% of the maximum capacity to provide delivery services. Across all regions, government hospitals (the least prevalent facility type) have the highest readiness, at 85%, followed by government health centers (79%) and private hospitals, clinics, or health centers (72%). The lowest level of readiness was observed among health huts, with a score of 33% at the national level. These patterns are consistent across the regions. Facilities in Dakar are the best prepared to provide delivery services, with a readiness score of 73%, due to the absence of health huts in Dakar. The readiness in the North region is the lowest of all regions (54%), with government hospitals (80%), health centers (72%), and clinics (58%) having lower scores than their respective facilities in all other regions.

3.5.3 Coverage of facility delivery

Figure 5c shows that, overall, 77% of births in the preceding two years were delivered in a health facility. Facility delivery coverage varies by region, from 63% in the North to 94% in Dakar. Nationally, among births delivered in a health facility, 44% were delivered in a government health post, the most common place of delivery, ranging from 25% in the East to 53% in Thiès. Nationally, very few babies were born in a health hut (3%) or a private facility (4%), although in Dakar, where private facilities are more accessible, 8% of births were delivered in a private facility (Agence Nationale de la Statistique et de la Démographie Sénégal and ICF International 2016).

Figure 5b Readiness score of delivery services by facility type and region, Senegal SPA 2015

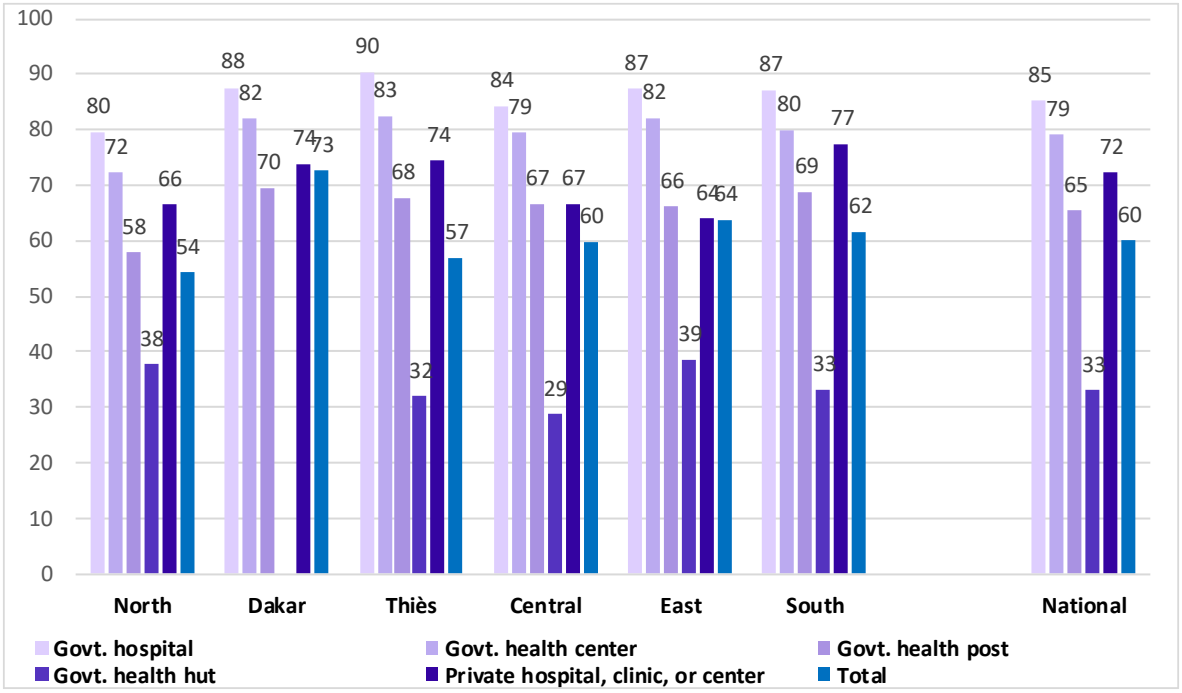
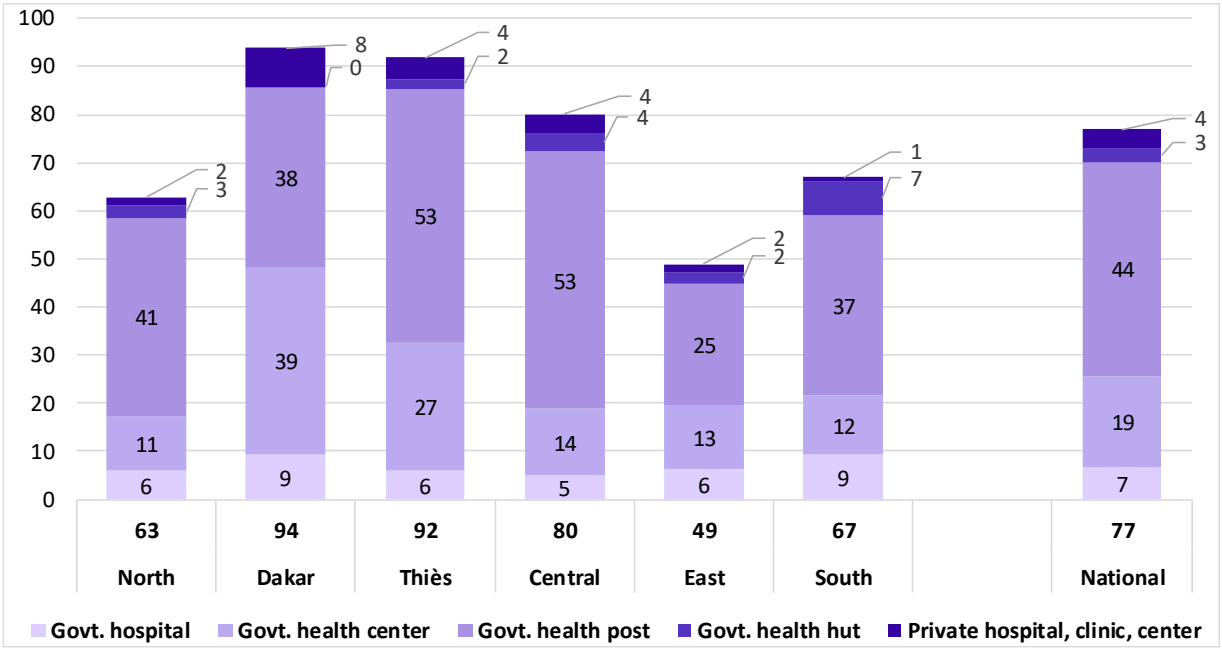


Figure 5c Percentage delivered in a health facility by facility type and region, among births in the two years preceding the survey, Senegal DHS 2016



3.5.4 Effective coverage

Examining the intersection between readiness scores and facility delivery coverage for births in the two years preceding the survey reveals higher levels of coverage than readiness to provide delivery services in most regions, as Figure 5d depicts. All regions are in quadrant 1, suggesting high levels of both coverage and readiness. There is considerable variation across the regions, however, marked more by differences in coverage than readiness. The highest levels of both coverage and readiness are in Dakar, while the North and East lag behind on both indicators.

Figure 5d Readiness versus coverage by region, Senegal

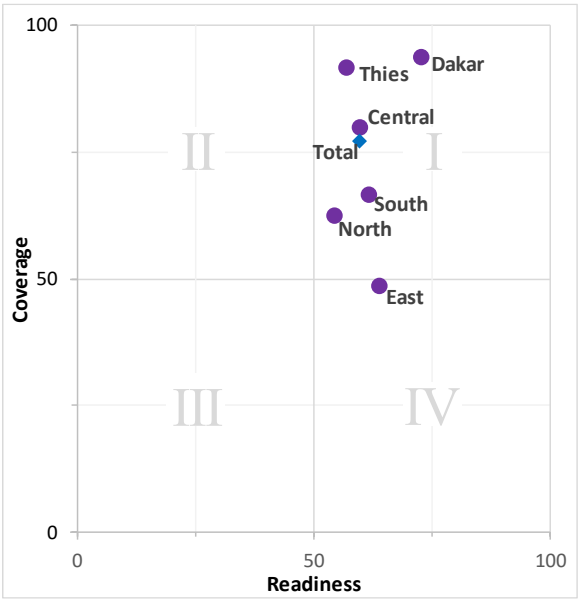


Figure 5e Effective coverage of facility delivery by region, Senegal

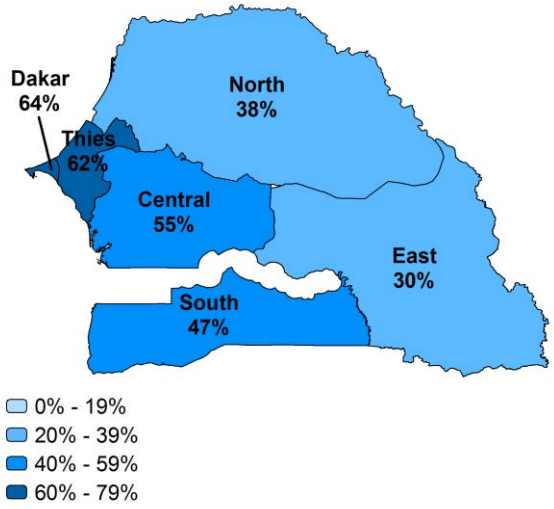


Figure 5e presents the effective coverage of facility delivery by region and at the national level. After adjusting for service readiness by the type of facility, crude coverage is reduced from 77% to an effective coverage of 52%. There is considerable variation in effective coverage among regions, from 30% in the East to 64% in Dakar. Dakar's surrounding area, the Thiès region, has the second highest effective coverage, at 62%. The level of effective coverage appears lowest in the East (30%) and North (38%) compared with other regions (see Table 6).

Table 6 Coverage, readiness score, and estimated effective coverage by region, Senegal

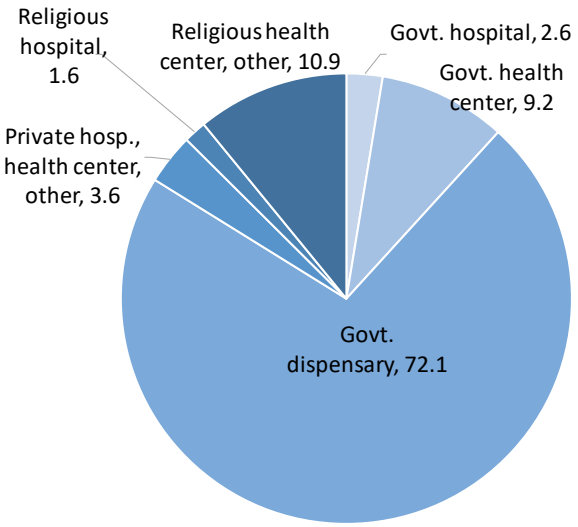
	Coverage	Readiness score	Effective coverage		
			Estimate	LB	UB
North	62.9	54.3	37.8	31.7	44.4
Dakar	93.9	72.6	63.9	46.9	78.0
Thiès	91.9	56.9	61.6	48.8	73.0
Central	80.1	59.8	54.6	48.4	60.6
East	48.9	63.8	29.7	23.3	36.9
South	67.0	61.7	46.7	38.5	55.1
Total	77.0	60.0	51.3	47.2	55.3

3.6 Tanzania

3.6.1 Facility distribution by type

Several types of facilities in Tanzania offer delivery services. Besides hospitals, there are health centers staffed by nurses and midwives that offer both preventative and curative care. Other facilities, including clinics and dispensaries, mostly offer curative services. The 2014-15 Tanzania SPA surveyed 905 facilities that offered delivery services, the large majority managed by the government (Figure 6a). Seventy-two percent of these facilities are dispensaries, followed by a small proportion of government health centers, and very few hospitals. Religious facilities account for a little over 10%. Only eight of these facilities qualify as CEmOC facilities.

Figure 6a Distribution of facilities with delivery by facility type, Tanzania SPA 2014-15



3.6.2 Facility readiness to provide delivery care

Service readiness scores were calculated based on the availability of structural tracer items (Appendix Table 11). CEmOC facilities in Tanzania reported having the most tracer items, and nearly every item was available in 9 out of 10 facilities in the country in all domains except guidelines, staff training, and supervision, though some equipment and medicines were found in less than one-third of facilities (suction apparatus, manual vacuum extractor, vacuum aspirator, chlorhexidine, and antibiotics). In most facilities, guidelines and training items were uncommon; only a third of CEmOC facilities had CEmOC guidelines or CEmOC training.

For non-CEmOC facilities, there are some large regional differences in availability of tracer items, as Appendix Table 6 shows. Compared with other regions, more facilities in Zanzibar have general requirements, equipment, and medicines (excluding antibiotic items). However, Zanzibar has the fewest number of facilities that reported training in IMPAC, normal labor and delivery, CEmOC, and active management of the third stage of labor (AMTSL). Training and guidelines are uncommon in all regions except in the Western and Northern regions, where more than seven facilities in every ten reported training in neonatal resuscitation, newborn infection management, early and exclusive breastfeeding, thermal care, and cord care. Newborn signal functions are universally common across the regions. Some basic items have large regional variation, such as handwashing necessities (46% in Western region versus 88% in Southern Highlands) and improved sanitation (19% in Central region versus 93% in Zanzibar). Given the greater availability of tracer items in CEmOC facilities than non-CEmOC facilities, the former had a higher readiness score, at 89% compared with 60% among non-CEmOC facilities.

Facilities in Tanzania have an overall readiness of 53% of the maximum capacity to provide delivery care services (Figure 6b). This varies only slightly by region, but varies greatly by facility type. Religious and government hospitals have the highest readiness scores (82% and 78% respectively), while government

dispensaries have the lowest (49%). Other types of facilities perform similarly, at 65% for government health centers, 60% of private facilities, and 58% for religious health facilities. In every region, government and religious hospitals have high readiness scores, though readiness scores among health centers are consistently higher in Western, Northern, Central, and Southern Highlands regions than elsewhere. Zanzibar ranked lowest in readiness scores across government-managed hospitals and health centers.

Figure 6b Readiness score of delivery services by facility type and zone, Tanzania SPA 2014-15

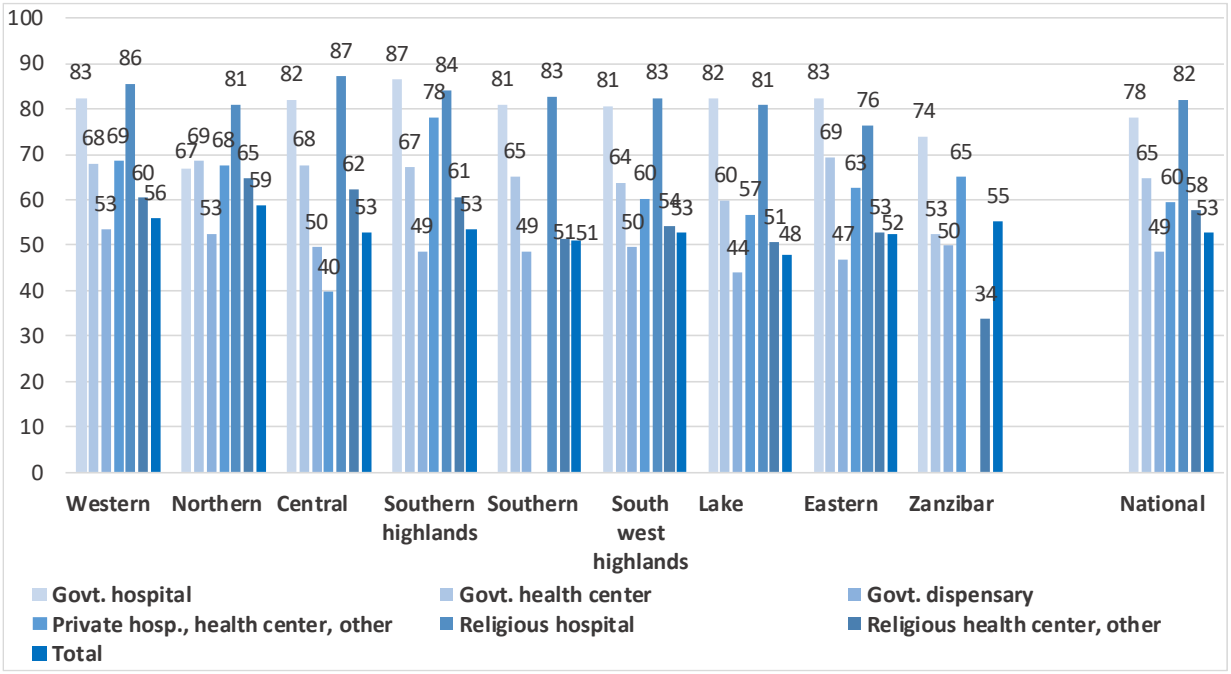
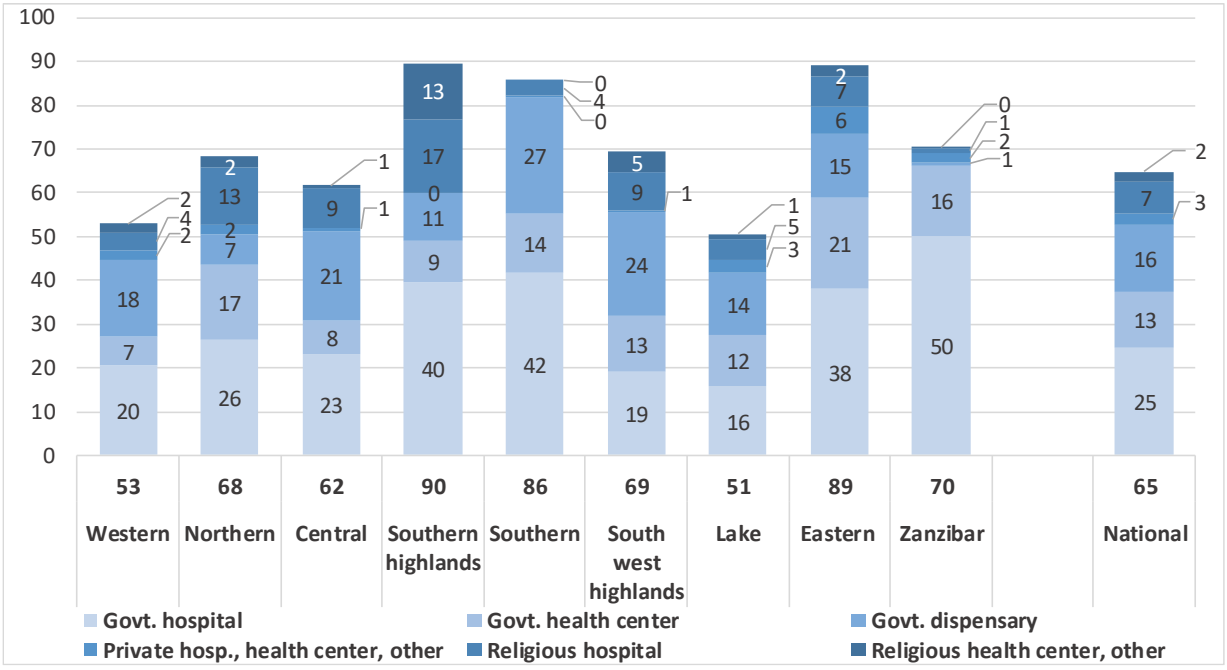


Figure 6c Percentage delivered in a health facility by facility type and zone, among births in the two years preceding the survey, Tanzania DHS 2015-16



3.6.3 Coverage of facility delivery

Among all births in the two years preceding the DHS survey, 65% were delivered in a health facility (Figure 6c). In some regions (Western and Lake), only half of births were delivered in a facility compared with about 90% in the Eastern and Southern Highlands regions. In the regions with the highest facility delivery coverage, the majority of births were delivered in government hospitals, though government dispensaries and health centers were also used. In the Western and Lake regions, births were delivered in a health facility almost as commonly in government dispensaries as in government hospitals. Other types of facilities generally delivered only a small proportion of births, except in the Northern, Central, Southern Highlands, and South West Highlands regions, where 9-17% of births were delivered in religious hospitals.

3.6.4 Effective coverage

Concerning the intersection between facility readiness scores and facility delivery coverage, all regions except Lake region are in quadrant 1 (Figure 6d), indicating that they have facility delivery coverage and facility readiness scores greater than 50%. The spread of data is only visible across regions along the y-axis, which shows the variation in coverage, while there is little variation in readiness scores, ranging from 52-58%. Coverage of facility delivery, ranging from 50-89%, appears to occur in a few regions without evident correlation with readiness scores.

Figure 6d Readiness versus coverage by zone, Tanzania

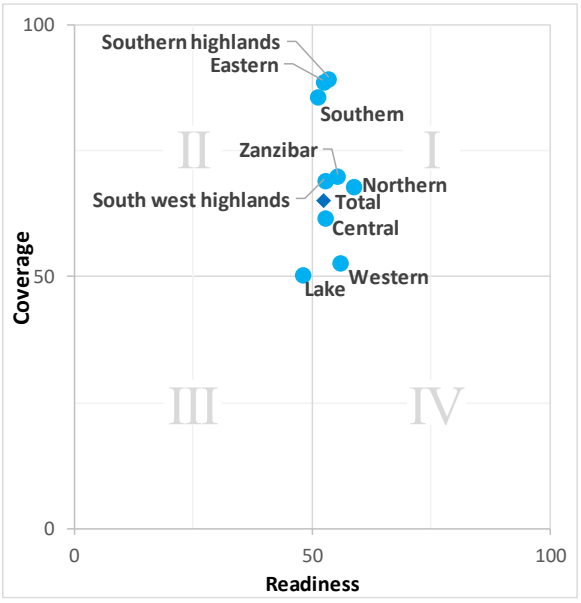


Figure 6e Effective coverage of facility delivery by zone, Tanzania

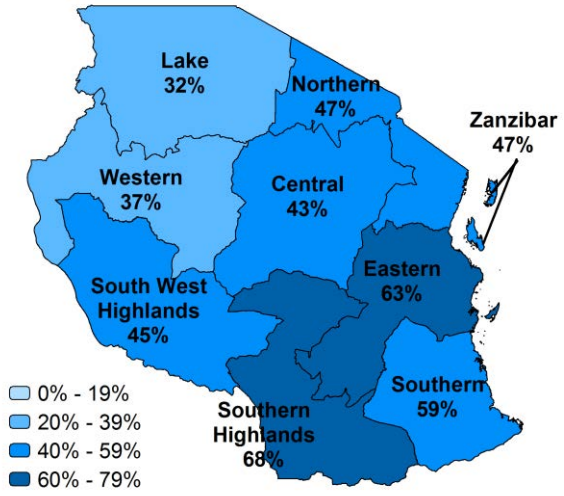


Figure 6e shows the level of effective coverage in Tanzania by facility type and region. Nationally, effective coverage is 44%, which is substantially lower than the conventional facility delivery coverage of 65% (see Table 7). Every region's effective coverage estimate is 16-27 percentage points lower than the level of crude coverage. Regionally, there is a large variation in effective coverage. The region with the highest effective coverage (Southern Highlands) is twice the level of the region with the lowest effective coverage (Lake region). The Southern Highlands, Eastern, and Southern regions have the highest effective coverage of all regions, at 68%, 63%, and 59% respectively. All other regions have an effective coverage below 50%, and lowest in the Western and Lake regions. The differences among regions are significant.

Table 7 Coverage, readiness score, and estimated effective coverage by zone, Tanzania

	Coverage	Readiness score	Effective coverage		
			Estimate	LB	UB
Western	53.0	56.0	37.0	28.9	46.0
Northern	68.2	58.7	46.8	37.9	55.8
Central	61.7	52.8	42.9	35.1	51.0
Southern Highlands	89.5	53.4	67.7	55.7	77.8
Southern	85.8	51.2	58.5	48.0	68.3
South West Highlands	69.3	52.7	45.2	36.2	54.5
Lake	50.6	48.0	32.4	28.5	36.6
Eastern	89.0	52.3	63.1	55.6	70.0
Zanzibar	70.2	55.3	47.1	42.5	51.8
Total	65.0	52.7	44.2	41.6	46.8

3.7 Comparison of Countries

Table 8 and Figure 7 plot the countries' national average of facility delivery against their facilities' readiness score. In Figure 7 for each country, the width of the horizontal whisker indicates the range of the readiness score among the country's regions, and the length of the vertical whisker represents the range of the facility delivery coverage among the regions. The longer the whisker, the greater the variability among the regions. Four countries—Malawi, Senegal, Tanzania, and Nepal—appear in quadrant 1, indicating a national coverage and readiness score both higher than 50%. Malawi has both the highest coverage of facility delivery and the greatest readiness to provide delivery services. Bangladesh has the lowest coverage and readiness, both lower than 50%. Haiti is in quadrant 4, with a readiness score above 50% but coverage below 50%. All countries demonstrate a larger regional variability in coverage than in readiness except Malawi, where the regions have similar levels of coverage and readiness. Senegal has the greatest range of crude coverage of both facility delivery and facility readiness by region.

Figure 7 National readiness score versus coverage and regional variations

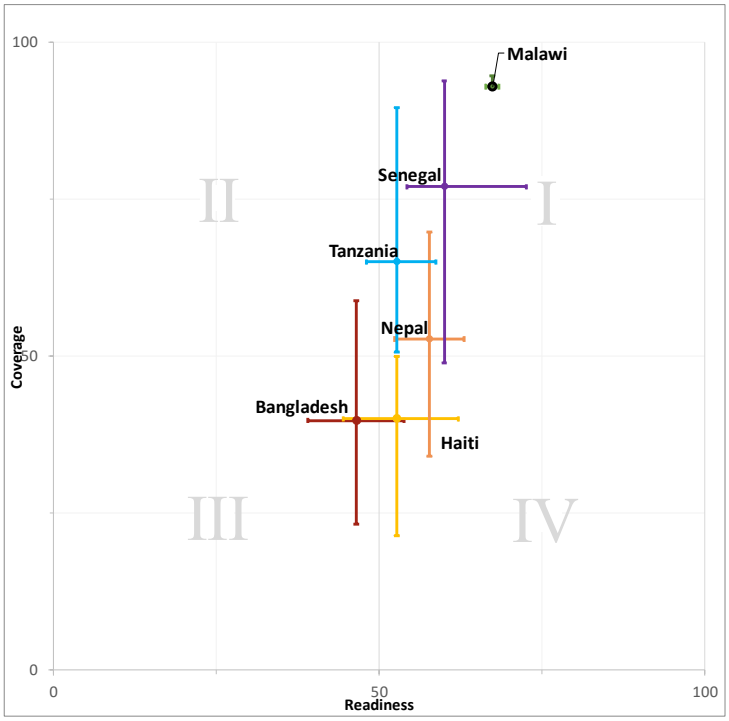


Table 8 Estimated effective coverage of facility delivery in all six countries

	Coverage	Readiness score	Effective coverage		
			Estimate	LB	UB
Bangladesh					
Barisal	30.5	42.5	20.5	15.9	25.8
Chittagong	36.8	46.3	25.8	21.0	31.2
Dhaka	43.7	46.8	27.6	23.1	32.7
Khulna	58.8	49.3	40.9	35.0	47.0
Rajshahi	40.9	39.0	27.6	23.1	32.7
Rangpur	35.4	53.8	27.6	22.6	33.2
Sylhet	23.2	46.9	15.6	11.6	20.8
Total	39.7	46.5	26.8	24.5	29.1
Haiti					
Ouest	50.0	57.4	31.5	26.7	36.7
Sud-Est	23.0	47.0	10.5	6.3	17.0
Nord	39.9	54.0	25.3	18.6	33.3
Nord-Est	38.0	48.0	19.2	12.6	28.1
Artibonite	30.2	49.3	20.0	14.2	27.4
Centre	31.2	59.8	17.5	11.3	26.1
Sud	40.7	60.9	27.4	19.2	37.4
Grand-Anse	21.4	55.0	14.4	9.1	22.1
Nord-Ouest	31.5	43.2	16.1	11.2	22.5
Nippes	38.7	57.0	24.8	16.3	35.8
Total	40.0	52.7	24.4	22.0	27.0
Malawi					
North	94.7	67.5	66.2	58.2	73.4
Central	92.8	67.6	66.3	61.6	70.7
South	92.7	67.2	66.4	62.1	70.5
Total	92.9	67.4	66.4	63.4	69.2
Nepal					
Province 1	55.9	57.9	40.1	33.4	47.3
Province 2	37.4	63.0	33.7	28.4	39.5
Province 3	69.8	57.4	50.7	41.7	59.7
Province 4	67.1	54.6	50.3	41.7	58.8
Province 5	54.1	62.5	45.4	36.9	54.3
Province 6	34.1	52.4	27.1	21.4	33.6
Province 7	61.9	58.4	49.5	39.9	59.1
Total	52.7	57.7	41.9	38.9	45.1
Senegal					
North	62.9	54.3	37.8	31.7	44.4
Dakar	93.9	72.6	63.9	46.9	78.0
Thiès	91.9	56.9	61.6	48.8	73.0
Central	80.1	59.8	54.6	48.4	60.6
East	48.9	63.8	29.7	23.3	36.9
South	67.0	61.7	46.7	38.5	55.1
Total	77.0	60.0	51.3	47.2	55.3
Tanzania					
Western	53.0	56.0	37.0	28.9	46.0
Northern	68.2	58.7	46.8	37.9	55.8
Central	61.7	52.8	42.9	35.1	51.0
Southern Highlands	89.5	53.4	67.7	55.7	77.8
Southern	85.8	51.2	58.5	48.0	68.3
South West Highlands	69.3	52.7	45.2	36.2	54.5
Lake	50.6	48.0	32.4	28.5	36.6
Eastern	89.0	52.3	63.1	55.6	70.0
Zanzibar	70.2	55.3	47.1	42.5	51.8
Total	65.0	52.7	44.2	41.6	46.8

4 DISCUSSION AND CONCLUSION

Effective coverage—a measurement that adjusts the conventional measurement of facility use for the quality of care clients receive—is a useful tool for evaluating the impact of maternal and newborn health interventions, and monitoring a country's progress toward achieving universal coverage of health care with sufficient quality (Colston 2011). This study estimated effective coverage of facility delivery in Bangladesh, Haiti, Malawi, Nepal, Senegal, and Tanzania by linking data from household surveys with data from health facility surveys. We focused on the structural dimension of quality of care, which we measured with a readiness score computed with a number of obstetric and newborn care indicators, using an equal-weight approach. Other studies have used different methods to measure facility readiness, such as requiring a minimum number of items to deem a facility "ready" or not (Kanyangarara et al. 2018; Larson et al. 2017). The different measures of quality should be kept in mind in the interpretation and comparisons of effective coverage across studies.

Given the global efforts to improve maternal health, many developing countries have witnessed a remarkable increase in coverage of facility delivery in the last two decades. Among the six countries in our study, at least two-thirds of births in Senegal and Tanzania and more than 90% of births in Malawi were delivered in a health facility. While facility delivery coverage in Haiti and Bangladesh remains relatively low, their levels have doubled since 2000. Nevertheless, after taking into account facilities' preparedness to provide delivery care services, the level of effective coverage in all countries studied becomes much lower. The reduction ranges from 20% in Nepal to 39% in Haiti, whose resulting national effective coverage is only 24%, the lowest among the six countries. Even though Malawi has achieved almost universal facility delivery, the effective coverage is much lower, at 66%, after adjusting for facility readiness to provide delivery services. Senegal is the only other country that has an effective coverage higher than 50%. These findings suggest that many women who delivered in a health facility did not necessarily receive the quality of care needed to avoiding preventable maternal and newborn mortality (Bhutta et al. 2014).

The substantial drop of coverage shown in this study when incorporating the quality-of-care component is also found in other health areas and other settings. Leslie et al. (2017) found that in eight high-mortality countries, after adjusting for the process aspect of quality of care, coverage was reduced by half or more when examining prevalence of four or more antenatal care visits, treatment for child illnesses (diarrhea, fever, or acute respiratory illness), and demand satisfied for modern contraception. In rural Burkina Faso, compared with the level of crude coverage of curative child care, at around 70%, the effective coverage was only an estimated 5% based on a high-quality standard and 45% based on a high or intermediate standard of quality (Koulidiati et al. 2018). A study in a rural region of Tanzania found that, while over 80% of women delivered their most recent birth in a health facility, few delivered at a facility that offered high-quality routine or emergency obstetric care, and none delivered in a facility staffed by providers with a high level of clinical knowledge and skills (Larson et al. 2017). The authors estimated that effective coverage of obstetric care was only 25%, even using a minimum threshold of quality. These studies, along with our own analysis, highlight the need for improving quality of care to achieve the health-related Sustainable Development Goals. To further reduce the prevalence of maternal and newborn deaths, global efforts should go beyond increasing the use of health services to also promoting higher-quality services, because health care can only achieve its full potential when it offers sufficient quality.

In examining readiness to provide delivery service, our analysis found that facilities are often poorly equipped and/or have a shortage of essential supplies or medicines for care of mothers and newborns, even among such high-level facilities as comprehensive emergency obstetric care facilities. Staff training is important to ensuring that health providers possess the technical competence needed to provide services, yet in-service trainings in pregnancy, labor, and delivery care are universally inadequate. Across all countries studied, more than two-thirds of CEmOC facilities did not have a provider who received in-service training in CEmOC. Among non-CEmOC facilities, provision of basic emergency obstetric care and newborn resuscitation was limited in all six countries. Service guidelines were commonly missing among all facilities. While it is expected that lower-level facilities might not be equipped with all of the tracer items examined, many lacked essential supplies or equipment or did not have an appropriate referral system. The majority of non-CEmOC facilities lacked an emergency transportation system, even though it is critically important for these facilities to be able to transfer medical emergencies or complications that they are not able to treat themselves.

We found that in all six countries a variety of facility types reported providing delivery care services, from peripheral facilities such as dispensaries, health posts, and union facilities to high-level facilities such as regional or national hospitals. In all countries, hospitals, private or public, are typically the type of facility most prepared to provide adequate care, whereas lower-level facilities are much less prepared. Despite the poor readiness of these lower-level facilities, many were reported by women to be one of the major sources of delivery care. In fact, in several countries the type of facility least ready to provide delivery care was the most commonly reported source of delivery care. In Nepal, for example, despite having the lowest readiness score, government health posts were widely used in Provinces 6 and 7. In Tanzania, delivery care was commonly sought in public dispensaries, the facility type with the lowest readiness score. A similar pattern was found in Senegal—the most commonly used type of facility, the government health post, had low service readiness scores compared with government hospitals and health centers. Measures can be taken to improve quality of care in these facilities, but another important strategy would be to increase the use of facilities with high readiness for delivery. Individuals may have limited access, perhaps physical or financial, to health facilities that are well prepared, usually government hospitals or private hospitals. Moreover, these high-level facilities may be already overburdened by serving a large population for a wide array of services. It was also common that the most prepared facilities were the fewest in number, as in Bangladesh, where the level of readiness was highest in public hospitals, the least common type of facility. For facilities that are poorly prepared, it would be recommended to invest in emergency transportation as a first step.

CEmOC facilities were exceedingly rare. Entire regions of a country undoubtedly lack a CEmOC facility, as in Senegal, where only two CEmOC facilities were available among the six regions, indicating that lack of proximity may be a physical barrier for many women. It is expected that primary facilities will continue to play an important role in providing delivery services to women. Countries need to increasingly invest in these facilities, and ensure that they are properly equipped to deliver services and have a referral system in place. While investment in all domains of service readiness is needed, most urgent are expanding emergency obstetric care and newborn resuscitation, which are critical for saving mothers' and newborns' lives. More investment in human resources is also warranted, as demonstrated in our analysis and in other studies (Lanata 2007; Manzi et al. 2012).

While it is important to strengthen the ability of health facilities to provide quality delivery services, additional efforts should continue to improve the use of these services in countries or regions where a large proportion of women still deliver at home. Looking across countries and within countries, the wide variation in effective coverage appears to be a result of the differences in both facility delivery coverage and facility readiness to provide good care. Malawi possesses the highest level of effective coverage because it has the highest coverage and highest facility readiness, while Haiti, the country with the lowest use of facility delivery and a low facility readiness score, has the lowest level of effective coverage. However, national levels of effective coverage align more with the level of coverage for facility births than with facility readiness. In fact, all countries except Malawi demonstrate a greater regional variability in the percentage of facility births than in facility readiness; hence, differences in effective coverage appear to be primarily driven by a country's various levels of facility delivery coverage. In Senegal, for example, Dakar and Thiès, the two regions with the highest effective coverage, more than 90% of births were delivered in a health facility, while the East region had less than 50% facility delivery and suffered from the lowest effective coverage. Haiti, Nepal, and Bangladesh, the regions with the highest percentages of facility deliveries, had double the level of effective coverage compared with countries with the lowest percentages of facility deliveries. In regions with very low readiness scores, levels of facility delivery are correspondingly low. The patterns observed between use of health facilities and their readiness to provide adequate services suggest that quality of care may be another factor that drives or deters facility use (Acharya and Cleland 2000; Karim et al. 2015).

Haiti presents the lowest effective coverage among the six countries—just 24% at the national level. In five of its ten regions, effective coverage is below 20%. Though Haiti has readiness scores similar to Tanzania's, its low effective coverage seems primarily a result of low levels of use of facility delivery. Due to the mountainous terrain in Haiti, women face a particular challenge in reaching health facilities (Alexandre et al. 2005). Further, half of all of the health facilities were destroyed in the earthquake in 2010 (Behrman and Weitzman 2016)—only three years before the Haiti SPA was conducted. Access to facilities with a better quality of services could be even more limited, and women in rural areas particularly likely to suffer, as those facilities are usually located in the metropolitan or urban areas (Gage and Guirlène Calixte 2006; Gage et al. 2017). Studies have found that physical proximity to a health facility is significantly associated with women's use of maternal health services (Gage and Guirlène Calixte 2006; Wang, Winner, and Burgert-Brucker 2017). Many dispensaries in Haiti reported to provide delivery service, although they are not mandated to provide such services. Their readiness was also the lowest, but women rarely use dispensaries for delivery care. In addition to other factors that affect women's access to facilities, quality of care provided by health facilities still plays an important role in the use of services, especially where access to services is less of an issue. A recent analysis showed that for Haitian women, the odds of facility delivery in a nonmetropolitan urban area doubled if they lived in an area with a high level of facility service readiness compared with women in an area with low readiness (Wang, Winner, and Burgert-Brucker 2017).

Second to Haiti, Bangladesh has the lowest effective coverage among the six countries, which is the result of both limited use of health facilities for delivery and poor readiness among the facilities. About 60% of births in the country, and up to 70-80% in some regions, were delivered at home. Among the many factors that could hinder women from using a health facility for delivery, the poor quality of services undoubtedly contributes to the low rate of use (Acharya and Cleland 2000; Karim et al. 2015). This is supported by our findings that the most commonly used sources, private hospital and clinics, have relatively better service readiness than other types of facilities. Union facilities, the most common type of facility, have the lowest

readiness and are the least used. It is believed that the poor quality of care in health facilities contributes to the stall of maternal mortality decline identified in the 2016 Bangladesh Maternal Mortality and Health Care Survey compared with the 2011 survey, despite an increase in facility delivery coverage between the two surveys (National Institute of Population Research and Training (NIPORT), International Centre for Diarrhoeal Disease Research Bangladesh (ICDDRB), and MEASURE Evaluation 2017). We found that only one-third of non-CEmOC facilities and less than two-thirds of CEmOC facilities had a 24/7 skilled birth attendant, and that the staff received little training on labor and delivery care; in addition, over half of the facilities did not have reliable electricity. The poor quality of obstetric care has also been reported in other studies (Anwar, Kalim, and Koblinsky 2009). While private facilities play a major role in providing facility delivery in Bangladesh, and they generally provide better quality of care, as indicated in this study and others (Alam et al. 2015; Siddiqui and Khandaker 2007; Sikder et al. 2015), they are usually less financially and geographically accessible compared with public facilities (Sikder et al. 2015). The Bangladesh SPA survey excluded private facilities with fewer than 20 beds. The exclusion of small private facilities could bias the effective coverage estimates if women also use these facilities for delivery care, but these facilities possess different levels of readiness from the facilities included in the survey.

Malawi has the highest effective coverage among the six countries—66% at the national level as well as 67-68% in all three regions—and very high delivery coverage, at 93-95%. No other country in the study shows such consistency among regions, nor such universally high delivery coverage. Malawi's high prevalence of facility delivery is due in part to a ban on informal birth attendants enacted in 2007—a policy aimed at transitioning births to the formal sector, where quality of care is higher (Godlonton and Okeke 2016). Additionally, adoption of the Newborn Action Plan prioritized quality of care during labor, delivery, and the newborn period. This plan directed efforts to strengthening facility capacity including provision of medicines, commodities, equipment, staff training, and care guidelines (The Ministry of Health of Malawi 2015).

Our study is subject to several limitations. First, the effective coverage estimated in this study is the facility delivery coverage adjusted for facility readiness, which is a score based on the availability of a range of structural inputs. Structure is only one aspect of the quality of care, according to the Donabedian (1988) quality-of care-framework. We did not assess the process of the service delivery, that is, to what extent the providers adhere to acceptable standards of care. Possessing infrastructure, supplies, and equipment enables a facility to provide good quality of care, but does not guarantee that it will do so. For example, even though they have functioning equipment, providers nevertheless might not measure a client's blood pressure (Assaf, Wang, and Mallick 2016). The positive association between structure and process was found to be weak in 11 countries studied based on SPA data (Leslie, Sun, and Kruk 2017). The SPA typically observes service delivery for three areas: antenatal care, family planning, and sick child care. It does not normally observe services for labor and delivery services. In the Malawi 2014-15 SPA, a special module was added to observe the labor, delivery, and newborn resuscitation services. We did not include these process indicators for Malawi because the interpretation of effective coverage could not be compared with the other study countries if process indicators were included as part of the quality measurement. A separate analysis focusing on Malawi would be more appropriate to estimate effective coverage incorporating a measure of the quality of actual service delivery rather than service readiness alone. Staff training, guidelines, and supervision tracer items can be used as a proxy for provider competence and standard adherence, though this domain was found to be the least common in every country in our study. This limitation suggests that our results might overestimate effective coverage in the absence of data on the process of service delivery.

It is obvious that indicators used to assess quality of care have an impact on effective coverage estimates. The readiness indicators in this study were chosen based on international guidance and empirical evidence. Together, these indicators provide a comprehensive picture of a facility's preparedness to provide delivery services from multiple domains. Facilities were scored based on all of these indicators, except that two of them, C-sections and safe blood transfusion, were considered only for CEmOC facilities. Although not all facilities are expected to provide all tracer items examined, such a scoring approach is necessary to provide effective coverage estimates at the population level. That is, effective coverage aims to capture the expected level of coverage of services provided in a service delivery environment with the optimal readiness. However, the readiness score itself cannot identify where a service delivery problem lies. Facilities with a similar score could possess quite different specific tracer items. In other words, the readiness score measures an average facility readiness based on a range of indicators, from basic infrastructure (electricity and improved water source) to advanced service provision, but does not show which items are available and which are not. Information on the availability or lack of specific items should be assessed to identify specific areas that need improvement. Effective coverage must be interpreted with pragmatism, and the tracer items used to compute the measure should always be referenced.

Another limitation is associated with harmonizing facility categories between the SPA and DHS surveys. In the DHS recode data, some sources of care, especially those infrequently reported as place of delivery, were combined into one category. For example, private facilities, including hospital, health center, and others, could be recoded in one category. To adjust coverage by type of facility, we needed to match such categorization between the SPA and DHS surveys conducted in the same country. Therefore, an assumption was made such that any facilities grouped into one category had a similar level of readiness, which might not be true. These facilities are usually not widely used for delivery, hence they have only a limited contribution to coverage. Invalidity of this assumption should not substantially affect the estimates of effective coverage.

Finally, we linked the DHS and SPA surveys at the regional level stratified by facility type. We used an average readiness score for all deliveries that occurred in the same type of facility. Variation in readiness may exist among the same types of facilities in the same region. However, matching deliveries with exact facilities is not possible because of limitations of the data. In fact, a study that compared exact-match and ecological-linking methods in Côte d'Ivoire found that both methods produced similar estimates of effective coverage for maternal and sick child health services, when a census of providers was available and provider category was taken into account (Munos et al 2018).

We found that adjusting for facility readiness reduces crude coverage of facility delivery everywhere, resulting in estimates of effective coverage that give a richer understanding of how need, use, and quality create a landscape of delivery care. Our findings reinforce the importance of prioritizing quality of obstetric and newborn care to achieve further reduction of maternal and neonatal mortality. Also highlighted in our results is the lack of specific items for service delivery, which should be kept in mind when interpreting estimates of effective coverage. Facilities too often lack the training and guidelines to properly offer their services. Investing in equipment, medicines, and infrastructure without having competent health care providers may falsely characterize a facility as ready to provide quality care. Disaggregating by facility type added value to our analysis, since facility types have a wide range of readiness and use for delivery. Continued efforts are needed to increase the use of facility delivery services in countries where coverage remains low or varies substantially among different regions.

REFERENCES

Acharya, L. B., and J. Cleland. 2000. "Maternal and Child Health Services in Rural Nepal: Does Access or Quality Matter More?" *Health Policy Plan* 15(2):223-9.

Agence Nationale de la Statistique et de la Démographie (ANSD) Sénégal and ICF International. 2016. *Senegal Enquête Continue sur la Prestation des Services de Soins de Santé (ECPSS) 2015*. Rockville, Maryland, USA: ANSD/Sénégal and ICF International. http://dhsprogram.com/pubs/pdf/SPA25/SPA25.pdf.

Alam, B., M. K. Mridha, T. K. Biswas, L. Roy, M. Rahman, and M. E. Chowdhury. 2015. "Coverage of Emergency Obstetric Care and Availability of Services in Public and Private Health Facilities in Bangladesh." *International Journal of Gynaecology & Obstetrics* 131(1):63-9. https://doi.org/10.1016/j.ijgo.2015.04.041.

Alexandre, P. K., G. Saint-Jean, L. Crandall, and E. Fevrin. 2005. "Prenatal Care Utilization in Rural Areas and Urban Areas of Haiti." *Revista Panamericana de Salud Pública* 18(2):84-92.

Anwar, I., N. Kalim, and M. Koblinsky. 2009. "Quality of Obstetric Care in Public-Sector Facilities and Constraints to Implementing Emergency Obstetric Care Services: Evidence from High- and Low-Performing Districts of Bangladesh." *Journal of Health, Population and Nutrition* 27(2):139-55.

Assaf, S., W. Wang, and L. Mallick. 2016. *Provider Counseling and Knowledge Transfer in Health Facilities of Haiti, Malawi, and Senegal*. DHS Analytical Studies No. 60. Rockville, Maryland, USA: ICF International. http://dhsprogram.com/pubs/pdf/AS60/AS60.pdf.

Behrman, J. A., and A. Weitzman. 2016. "Effects of the 2010 Haiti Earthquake on Women's Reproductive Health." *Studies in Family Planning* 47(1):3-17. https://doi.org/10.1111/j.1728-4465.2016.00045.x.

Bhutta, Z. A., J. K. Das, R. Bahl, J. E. Lawn, R. A. Salam, V. K. Paul, M. J. Sankar, H. Blencowe, A. Rizvi, V. B. Chou, and N. Walker. 2014. "Can Available Interventions End Preventable Deaths in Mothers, Newborn Babies, and Stillbirths, and at What Cost?" *Lancet* 384(9940):347-70. https://doi.org/10.1016/S0140-6736(14)60792-3.

Colston, J. 2011. *The Use of Effective Coverage in the Evaluation of Maternal and Child Health Programs: A Technical Note for the IDB's Social Protection and Health Division*. Washington, DC: Inter-American Development Bank.

Do, M., A. Micah, L. Brondi, H. Campbell, T. Marchant, T. Eisele, and M. Munos. 2016. "Linking Household and Facility Data for Better Coverage Measures in Reproductive, Maternal, Newborn, and Child Health Care: Systematic Review." *Journal of Global Health* 6(2). https://doi.org/10.7189/jogh.06.020501.

Donabedian, A. 1988. "The Quality of Care. How Can It Be Assessed?" *JAMA* 260(12):1743-8.

Gabrysch, S., G. Civitelli, K. M. Edmond, M. Mathai, M. Ali, Z. A. Bhutta, and O. M. R. Campbell. 2012. "New Signal Functions to Measure the Ability of Health Facilities to Provide Routine and Emergency Newborn Care." *PLoS Medicine* 9(11). https://doi.org/10.1371/journal.pmed.1001340.

Gage, A. D., H. H. Leslie, A. Bitton, J. G. Jerome, R. Thermidor, J. P. Joseph, and M. E. Kruk. 2017. "Assessing the Quality of Primary Care in Haiti." *Bulletin of the World Health Organization* 95(3):182-190. https://dx.doi.org/10.2471%2FBLT.16.179846.

Gage, A. J., and M. Guirlène Calixte. 2006. "Effects of the Physical Accessibility of Maternal Health Services on Their Use in Rural Haiti." *Population Studies* 60(3):271-288. https://doi.org/10.1080/00324720600895934.

Godlonton, S., and E. N. Okeke. 2016. "Does a Ban on Informal Health Providers Save Lives? Evidence from Malawi." *Journal of Development Economics* 118:112-132. https://doi.org/10.1016/j.jdeveco.2015.09.001.

Graham, W. J., A. McCaw-Binns, and S. Munjanja. 2013. "Translating Coverage Gains into Health Gains for All Women and Children: The Quality Care Opportunity." *PLoS Medicine* 10(1). https://doi.org/10.1371/journal.pmed.1001368.

Hodgins, S., and A. D'Agostino. 2014. "The Quality–Coverage Gap in Antenatal Care: Toward Better Measurement of Effective Coverage." *Global Health: Science and Practice* 2(2):173-181. https://dx.doi.org/10.9745%2FGHSP-D-13-00176.

Hogg, R. V., and A. T. Craig. 1965. Introduction to Mathematical Statistics. 2nd ed. New York: Macmillan Publishing Co., Inc.

Joshi, C., S. Torvaldsen, R. Hodgson, and A. Hayen. 2014. "Factors Associated with the Use and Quality of Antenatal Care in Nepal: A Population-Based Study Using the Demographic and Health Survey Data." *BMC Pregnancy and Childbirth* 14(1):94. https://doi.org/10.1186/1471-2393-14-94.

Kanyangarara, M., V. B. Chou, A. A. Creanga, and N. Walker. 2018. "Linking Household and Health Facility Surveys to Assess Obstetric Service Availability, Readiness and Coverage: Evidence from 17 Low- and Middle-Income Countries." *Journal of Global Health* 8(1). https://dx.doi.org/10.7189%2Fjogh.08.010603.

Karim, R. M., M. S. Abdullah, A. M. Rahman, and A. M. Alam. 2015. "Identifying Influence of Perceived Quality and Satisfaction on the Utilization Status of the Community Clinic Services; Bangladesh Context." *Bangladesh Medical Research Council Bulletin* 41(1):1-12. https://doi.org/10.1186/s12913-016-1461-z.

Koulidiati, J. L., R. C. Nesbitt, N. Ouedraogo, H. Hien, P. J. Robyn, P. Compaore, A. Souares, and S. Brenner. 2018. "Measuring Effective Coverage of Curative Child Health Services in Rural Burkina Faso: A Cross-Sectional Study." *BMJ Open* 8(5). doi:10.1136/bmjopen-2017-020423.

Kruk, M. E., A. Chukwuma, G. Mbaruku, and H. H. Leslie. 2017. "Variation in Quality of Primary-Care Services in Kenya, Malawi, Namibia, Rwanda, Senegal, Uganda and the United Republic of Tanzania." *Bulletin of the World Health Organization* 95(6):408. http://dx.doi.org/10.2471/BLT.16.175869.

Kyei, N. N., C. Chansa, and S. Gabrysch. 2012. "Quality of Antenatal Care in Zambia: A National Assessment." *BMC Pregnancy and Childbirth* 12(1):151. https://doi.org/10.1186/1471-2393-12-151.

Lain, S. J., R. M. Hadfield, C. H. Raynes-Greenow, J. B. Ford, N. M. Mealing, C. S. Algert, and C. L. Roberts. 2012. "Quality of Data in Perinatal Population Health Databases: A Systematic Review." *Medical Care* 50(4):e7-20. https://doi.org/10.1097/MLR.0b013e31821d2b1d.

Lanata, C. F. 2007. "Human Resources in Developing Countries." *Lancet* 369(9569):1238-9. https://doi.org/10.1016/S0140-6736(07)60573-X.

Larson, E., D. Vail, G. M. Mbaruku, R. Mbatia, and M. E. Kruk. 2017. "Beyond Utilization: Measuring Effective Coverage of Obstetric Care Along the Quality Cascade." *International Journal for Quality Health Care* 29(1):104-110. https://doi.org/10.1093/intqhc/mzw141.

Lawn, J. E., H. Blencowe, S. Oza, D. You, A. C. Lee, P. Waiswa, M. Lalli, Z. Bhutta, A. J. Barros, P. Christian, C. Mathers, and S. N. Cousens. 2014. "Every Newborn: Progress, Priorities, and Potential Beyond Survival." *Lancet* 384(9938):189-205. https://doi.org/10.1016/S0140-6736(14)60496-7.

Leslie, H. H., A. Malata, Y. Ndiaye, and M. E. Kruk. 2017. "Effective Coverage of Primary Care Services in Eight High-Mortality Countries." *BMJ Global Health* 2(3). doi:10.1136/bmjgh-2017-000424.

Leslie, H. H., Z. Sun, and M. E. Kruk. 2017. "Association between Infrastructure and Observed Quality of Care in 4 Healthcare Services: A Cross-Sectional Study of 4,300 Facilities in 8 Countries." *PLoS Medicine* 14(12). https://doi.org/10.1371/journal.pmed.1002464.

Mallick, L., W. Wang, and G. Temsah. 2017. *A Comparison of Summary Measures of Quality of Service and Quality of Care for Family Planning in Haiti, Malawi, and Tanzania*. DHS Methodological Report No. 20. Rockville, Maryland, USA: ICF. http://dhsprogram.com/pubs/pdf/MR20/MR20.pdf.

Manzi, F., J. A. Schellenberg, G. Hutton, K. Wyss, C. Mbuya, K. Shirima, H. Mshinda, M. Tanner, and D. Schellenberg. 2012. "Human Resources for Health Care Delivery in Tanzania: A Multifaceted Problem." *Human Resources for Health* 10:3. https://dx.doi.org/10.1186%2F1478-4491-10-3.

Marchant, T., J. Bryce, C. Victora, A. C. Moran, M. Claeson, J. Requejo, A. Amouzou, N. Walker, T. Boerma, and J. Grove. 2016. "Improved Measurement for Mothers, Newborns and Children in the Era of the Sustainable Development Goals." *The Journal of Global Health* 6(1). https://dx.doi.org/10.7189%2Fjogh.06.010506.

National Institute of Population Research and Training (NIPORT), International Centre for Diarrhoeal Disease Research Bangladesh (ICDDRB), and MEASURE Evaluation. 2017. *Bangladesh Maternal Mortality and Health Care Survey 2016: Preliminary Report*. Dhaka, Bangladesh, and Chapel Hill, NC, USA: NIPORT, ICDDRB, and MEASURE Evaluation.

Nesbitt, R. C., T. J. Lohela, A. Manu, L. Vesel, E. Okyere, K. Edmond, S. Owusu-Agyei, B. R. Kirkwood, and S. Gabrysch. 2013. "Quality Along the Continuum: A Health Facility Assessment of Intrapartum and Postnatal Care in Ghana." *PLoS One* 8(11). https://doi.org/10.1371/journal.pone.0081089.

Ng, M., N. Fullman, J. L. Dieleman, A. D. Flaxman, C. J. Murray, and S. S. Lim. 2014. "Effective Coverage: A Metric for Monitoring Universal Health Coverage." *PLoS Medicine* 11(9). https://doi.org/10.1371/journal.pmed.1001730.

Nguhiu, P. K., E. W. Barasa, and J. Chuma. 2017. "Determining the Effective Coverage of Maternal and Child Health Services in Kenya, Using Demographic and Health Survey Data Sets: Tracking Progress Towards Universal Health Coverage." *Tropical Medicine & International Health* 22(4):442-453. https://doi.org/10.1111/tmi.12841.

Save the Children Federation, Incorporated. 2017. *Newborn Indicators*. http://www.healthynewbornnetwork.org/numbers/newborn-indicators/.

Shengelia, B., A. Tandon, O. B. Adams, and C. J. Murray. 2005. "Access, Utilization, Quality, and Effective Coverage: An Integrated Conceptual Framework and Measurement Strategy." *Social Science & Medicine* 61(1):97-109. https://doi.org/10.1016/j.socscimed.2004.11.055.

Shwartz, M., J. D. Restuccia, and A. K. Rosen. 2015. "Composite Measures of Health Care Provider Performance: A Description of Approaches." *The Milbank Quarterly* 93(4):788-825. https://dx.doi.org/10.1111%2F1468-0009.12165.

Siddiqui, N., and S. A. Khandaker. 2007. "Comparison of Services of Public, Private and Foreign Hospitals from the Perspective of Bangladeshi Patients." *Journal of Health, Population and Nutrition* 25(2):221-30.

Sikder, S. S., A. B. Labrique, H. Ali, A. A. Hanif, R. D. Klemm, S. Mehra, K. P. West, Jr., and P. Christian. 2015. "Availability of Emergency Obstetric Care (EmOC) among Public and Private Health Facilities in Rural Northwest Bangladesh." *BMC Public Health* 15:36.

Tanahashi, T. 1978. "Health Service Coverage and Its Evaluation." *Bulletin of the World Health Organization* 56(2):295-303.

The Ministry of Health of Malawi. 2015. *Every Newborn Action Plan: An Action Plan to End Preventable Neonatal Deaths in Malawi*. Malawi: The Ministry of Health of Malawi.

Tripathi, V., C. Stanton, D. Strobino, and L. Bartlett. 2015. "Development and Validation of an Index to Measure the Quality of Facility-Based Labor and Delivery Care Processes in Sub-Saharan Africa." *PLoS One* 10(6). https://doi.org/10.1371/journal.pone.0129491.

Tura, G., M. Fantahun, and A. Worku. 2013. "The Effect of Health Facility Delivery on Neonatal Mortality: Systematic Review and Meta-Analysis." *BMC Pregnancy and Childbirth* 13(1):18.

UNICEF, WHO, World Bank Group, and United Nations. 2017. *Levels & Trends in Child Mortality: Report 2017*. New York: UNICEF.

United Nations Development Program. 2015. *Sustainable Development Goals*. Geneva: United Nations.

United Nations Economic and Social Council. 2017. *Progress towards the Sustainable Development Goals: Report of the Secretary-General,* 66. Geneva: United Nations.

Van den Broek, N., and W. Graham. 2009. "Quality of Care for Maternal and Newborn Health: The Neglected Agenda." *BJOG: An International Journal of Obstetrics & Gynaecology* 116(s1):18-21. https://doi.org/10.1111/j.1471-0528.2009.02333.x.

Wang, W., M. Winner, and C. R. Burgert-Brucker. 2017. "Limited Service Availability, Readiness, and Use of Facility-Based Delivery Care in Haiti: A Study Linking Health Facility Data and Population Data." *Global Health: Science and Practice* 5(2):244-260. https://doi.org/10.9745/GHSP-D-16-00311.

WHO. 2010. *World Health Report 2010: Health Systems Financing: Path to Universal Coverage.* Geneva: WHO.

WHO. 2015. *Service Availability and Readiness Assessment (SARA): An Annual Monitoring System for Service Delivery Reference Manual.* http://www.who.int/healthinfo/systems/SARA_Reference_Manual_Chapter3.pdf?ua=1.

WHO, UNFPA, UNICEF, and AMDD. 2009. *Monitoring Emergency Obstetric Care: A Handbook*. Geneva: WHO.

Willey, B., P. Waiswa, D. Kajjo, M. Munos, J. Akuze, E. Allen, and T. Marchant. 2018. "Linking Data Sources for Measurement of Effective Coverage in Maternal and Newborn Health: What Do We Learn from Individual- vs Ecological-Linking Methods?" *Journal of Global Health* 8(1). https://dx.doi.org/10.7189%2Fjogh.08.010601.

Winter, R., T. Pullum, L. Florey, and S. Hodgins. 2017. "Impact of Scale-up of Maternal and Delivery Care on Reductions in Neonatal Mortality in USAID MCH Priority Countries, 2000–2010." *Applied Demography and Public Health in the 21st Century* 8:269-305.

APPENDICES

Appendix Table 1 Harmonized facility categories and reported categories in SPA and DHS

Harmonized facility category	SPA facility category	DHS facility category
Bangladesh		
Government hospital	Government district hospital	Government hospital Government district hospital
Government upazila facilities	Upazila health complex Maternal and child welfare center	Upazila health complex Upazila health & family welfare center Maternal and child welfare center
Government union, other Government	Union health and family welfare center Union health and family welfare center Union subcenter (UNSC) / rural dispensary Community clinic	Other Government sector Community clinic
NGO	NGO clinic NGO hospital	NGO clinic Other NGO sector
Private hospital, clinic	Private hospital	Private hospital/clinic
Haiti		
Government hospital	Government university hospital Government departmental hospital Government community hospital Other government hospital	Government hospital Government maternity
Government health center	Government health center with bed Government health center without bed	Government health center
Private hospital	Private university hospital Private departmental hospital private community hospital Private hospital	Private hospital/clinic
Private health center	Private health center with bed Private health center without bed	Private health center
Mix hospital, health center	Mix hospital Mix health center	Mix hospital Mix health center Mix maternity center
Dispensary	Dispensary	
Malawi		
Government hospital	Central hospital District hospital Rural/community hospital Other hospital	Government hospital
Government health center	Government health center Government maternity health	Government health center Government health post other Government sector
Private for-profit hospital, health center, clinic	Private hospital Private health center Private clinic Private maternity center	Private for-profit hospital/clinic
Private not-for-profit hospital	private not-for-profit hospital	CHAM/mission hospital
Private not-for-profit health center, maternity	Private not-for-profit health center Private not-for-profit maternity Private not-for-profit clinic	CHAM/mission health center BLM
Nepal		
Government Hospital	Central government hospital Regional government hos Sub-regional government hospital Zonal government hospital District government hospital	Government hospital
Government primary health care center (PHCC)	Government primary health care center (PHCC)	Government primary health care center (PHCC)
Government health post, sub-post, other	Government health post Government sub-health post	Government health center Other government sector
Private hospital	Private hospital	Private hospital

Senegal		
Government hospital	Government hospital	Government hospital
Government health center	Government health center	Government health center/maternity
Government health post	Government health center	Government health center
Government health hut	Government health hut	Government health hut
Private hospital, clinic, or center	Private hospital Private health center Private health poster	Private hospital/clinic
Tanzania		
Government hospital	Government national referral hospital Government regional hospital Government district hospital Government district-designated hospital Other government hospital	Government national referral hospital Government regional referral hospital Government regional hospital Government district hospital
Government health center	Government health center	Government health center
Government dispensary	Government dispensary	Government dispensary
Private hospital, health center, other	Private hospital Private health center private dispensary private clinic	Private hospital Private health center private dispensary private clinic
Religious hospital	Religious national referral hospital Religious regional hospital Religious district hospital Religious district-designated hospital Other religious hospital	Religious national referral hospital Religious district hospital Other religious hospital
Religious health center, other	Religious health center Religious other	Religious health center Religious other

Appendix Table 2 Obstetric and newborn care readiness indicators and definitions

Domain/ Indicator Name	Definition
Domain A: Comprehensive emergency obstetric care	
Parenteral administration of antibiotics	Facility performed this signal function for emergency obstetric care at least once during the three months before the assessment
Parenteral administration of uterotonic drugs/oxytocin	See above
Parenteral administration of anticonvulsants for hypertensive disorders of pregnancy	See above
Manual removal of placenta	See above
Assisted vaginal delivery	See above
Removal of retained products	See above
Caesarean section	See above (incorporate the availability of equipment and materials for performing the service)
Blood transfusion	See above (incorporate the availability of equipment and materials for performing the service)
Domain B: Newborn signal functions and immediate care	
Neonatal resuscitation	Facility performed neonatal resuscitation at least once during the three months before the assessment
Skin-to-skin	Facility reported this intervention is routinely practiced
Breast feeding in 1st hour	See above
Drying and wrapping newborns	See above
Domain C: General requirements	
Electricity	Facility is connected to a central power grid and there has not been an interruption in power supply lasting for more than two hours at a time during normal working hours in the seven days before the assessment, or the facility had a functioning generator with fuel available on the day of the assessment, or else facility has a backup solar power.
Improved water source	Facility has an improved water source available. For most countries, this means that water is piped into the facility or onto facility grounds, or else water comes from a public tap or standpipe, a tube well or borehole, a protected dug well, protected spring, rain water, or bottled water, and the outlet from this source is within 500 meters of the facility.
Improved sanitation	Facility has a functioning flush or pour-flush toilet, a ventilated improved pit latrine, or composting toilet.
24/7 Skilled birth attendance	Provider of delivery care available on-site or on-call 24 hours/day, with observed duty schedule.
Emergency transport	The facility had a functioning ambulance or other vehicle for emergency transport that was stationed at the facility and had fuel available on the day of the assessment, or the facility has access to an ambulance or other vehicle for emergency transport that is stationed at another facility or that operates from another facility.
Domain D: Equipment	
Sterilization equipment	Facility reports that some instruments are processed in the facility and the facility has a functioning electric dry heat sterilizer, a functioning electric autoclave, or a non-electric autoclave with a functioning heat source available somewhere in the facility.
Delivery bed	At least one delivery bed available and observed in delivery area.
Examination light	Examination light (flashlight okay) available, observed, and functioning in delivery area.
Delivery pack	Delivery pack OR cord clamp, episiotomy scissors, scissors/lade to cut cord, suture material with need, AND needle holder all available in delivery area.
Suction apparatus (mucus abstractor)	Suction apparatus (mucus abstractor) available, observed, and functioning in the delivery area.
Manual vacuum extractor	Manual vacuum extractor available, observed, and functioning in the delivery area.
Vacuum aspirator or D&C kit	Vacuum aspirator or D&C kit available, observed, and functioning, in the delivery area.
Partograph	Partograph available, observed, and functioning in delivery area.
Disposable latex gloves	Disposable latex gloves observed in delivery area.
Newborn bag and mask	Newborn bag and mask (AMBU bag and mask) available, observed, and functioning in the delivery area.
Infant scale	Infant scale observed and functioning in delivery area.
Blood pressure apparatus (digital or manual)	Manual or digital blood pressure apparatus observed and functioning in delivery area.
Hand-washing soap and running water or hand disinfectant	Hand-washing soap and running water or hand disinfectant available and observed in delivery area.
Domain E: Medicines and commodities	
Injectable antibiotic	Injectable antibiotics observed in delivery area (i.e., at “service site”) and at least one dose valid.
Hydrocortisone available at the facility	Hydrocortisone observed at the facility and at least one dose valid.
Injectable uterotonic	Oxytocin observed in delivery area with at least one dose valid.
Skin disinfectant	Skin disinfectant available for newborns in delivery area.
Magnesium sulfate	Magnesium sulphate available in delivery area with at least one dose valid.
IV solution with infusion set	IV solution with infusion set available in delivery area with at least one set valid.
Chlorhexidine for cord cleaning	Chlorhexidine solution (4%) for umbilical cord cleaning available in delivery area, with at least one dose valid.
Antibiotic eye ointment for newborn	Tetracycline eye ointment for newborn available in delivery area and at least one dose valid.

Domain F: Guidelines, staff training and supervision	
Guidelines: Integrated Management of Pregnancy and Childbirth (IMPAC) Guidelines	Guidelines available in delivery area
Guidelines: CEmOC Guidelines	Guidelines available in delivery area
Guidelines: Guidelines for management of pre-term labor	Guidelines available in delivery area
Guidelines for standard precautions	Guidelines available in delivery area
Training in neonatal resuscitation	At least one provider of delivery/newborn care in facility received training in neonatal resuscitation in the past 24 months
Training in early and exclusive breastfeeding	At least one provider of delivery/newborn care in facility received training in early and exclusive breastfeeding in the past 24 months
Training in newborn infection management (including injectable antibiotics)	At least one provider of delivery/newborn care in facility received training in newborn infection management (including injectable antibiotics) in the past 24 months
Training in thermal care	At least one provider of delivery/newborn care in facility received training in thermal care in the past 24 months
Training in cord care	At least one provider of delivery/newborn care in facility received training in cord care in the past 24 months
Training in IMPAC	At least one provider of delivery/newborn care in facility received training in IMPAC in the past 24 months
Training in routine care during labor and delivery	At least one provider of delivery/newborn care in facility received training in routine care during labor and normal vaginal delivery in the past 24 months
Training in CEmOC	At least one provider of delivery/newborn care in facility received training in IMPAC in the past 24 months
Training in Active Management of Third Stage of Labor (AMTSL)	At least one provider of delivery/newborn care in facility received training in AMTSL in the past 24 months
Training in Kangaroo Mother Care (KMC)	At least one provider of delivery/newborn care in facility received training in KMC in the past 24 months
Supervision	At least half of interviewed providers reported being personally supervised at least once during the 6 months preceding the survey

Appendix Table 3 Weights based on expert ratings

Domain/ Indicator Name	Average rating (out of 5)	Local weight (item score /domain total)	Domain weight (domain average/total)	Global weight (local weight x domain weight)
Domain A: Comprehensive emergency obstetric care		4.859		
Parenteral administration of antibiotics	4.875	0.125	0.206	0.026
Parenteral administration of uterotonic drugs/oxytocin	5.000	0.129	0.206	0.027
Parenteral administration of anticonvulsants for hypertensive disorders of pregnancy	4.750	0.122	0.206	0.025
Manual removal of placenta	4.625	0.119	0.206	0.025
Assisted vaginal delivery	4.875	0.125	0.206	0.026
Removal of retained products	4.875	0.125	0.206	0.026
Caesarean section	5.000	0.129	0.206	0.027
Blood transfusion	4.875	0.125	0.206	0.026
Domain B: Newborn signal functions and immediate care		3.825		
Neonatal resuscitation	5.000	0.261	0.163	0.042
Skin-to-skin	4.500	0.235	0.163	0.038
Breast feeding in 1st hour	4.250	0.222	0.163	0.036
Drying and wrapping newborns	4.500	0.235	0.163	0.038
Domain C: General requirements		4.425		
Electricity	4.500	0.203	0.188	0.038
Improved water source	4.375	0.198	0.188	0.037
Improved sanitation	3.875	0.175	0.188	0.033
24/7 skilled birth attendance	5.000	0.226	0.188	0.042
Emergency transport	4.375	0.198	0.188	0.037
Domain D: Equipment		4.019		
Sterilization equipment	5.000	0.096	0.171	0.016
Delivery bed	3.375	0.065	0.171	0.011
Examination light	4.250	0.081	0.171	0.014
Delivery pack	4.750	0.091	0.171	0.016
Suction apparatus (mucus abstractor)	3.875	0.074	0.171	0.013
Manual vacuum extractor	3.750	0.072	0.171	0.012
Vacuum aspirator or D&C kit	3.250	0.062	0.171	0.011
Partograph	1.750	0.033	0.171	0.006
Disposable latex gloves	4.625	0.089	0.171	0.015
Newborn bag and mask	5.000	0.096	0.171	0.016
Infant scale	2.875	0.055	0.171	0.009
Blood pressure apparatus (digital or manual)	4.875	0.093	0.171	0.016
Hand-washing soap and running water or hand disinfectant	4.875	0.093	0.171	0.016
Domain E: Medicines and commodities		3.813		
Injectable antibiotic	4.750	0.156	0.162	0.025
Hydrocortisone available at the facility	1.750	0.057	0.162	0.009
Injectable uterotonic	4.875	0.160	0.162	0.026
Skin disinfectant	3.125	0.102	0.162	0.017
Magnesium sulfate	4.625	0.152	0.162	0.025
IV solution with infusion set	5.000	0.164	0.162	0.027
Chlorhexidine for cord cleaning	3.875	0.127	0.162	0.021
Antibiotic eye ointment for newborn	2.500	0.082	0.162	0.013
Domain F: Guidelines, staff training and supervision		2.592		
Guidelines: Integrated Management of Pregnancy and Childbirth (IMPAC) Guidelines	2.500	0.064	0.110	0.007
Guidelines: CEmOC Guidelines	2.625	0.068	0.110	0.007
Guidelines: Guidelines for management of pre-term labor	2.625	0.068	0.110	0.007
Guidelines for standard precautions	2.000	0.051	0.110	0.006
Training in neonatal resuscitation	2.750	0.071	0.110	0.008
Training in early and exclusive breastfeeding	2.375	0.061	0.110	0.007
Training in newborn infection management (including injectable antibiotics)	2.750	0.071	0.110	0.008
Training in thermal care	2.875	0.074	0.110	0.008
Training in cord care	2.750	0.071	0.110	0.008
Training in IMPAC	2.375	0.061	0.110	0.007
Training in routine care during labor and delivery	2.375	0.061	0.110	0.007
Training in CEmOC	2.375	0.061	0.110	0.007
Training in Active Management of Third Stage of Labor (AMTSL)	2.375	0.061	0.110	0.007
Training in KMC	2.250	0.058	0.110	0.006
Supervision	3.875	0.100	0.112	0.011

Appendix Table 4 Effective coverage of facility delivery: equal weight versus expert ratings-based weight

	Equal weight				Expert ratings-based weight			
	Readiness score	Effective coverage	95% CI LB	95% CI UB	Readiness score	Effective coverage	95% CI LB	95% CI UB
Bangladesh								
Barisal	42.5	20.5	15.9	25.8	40.9	19.9	15.5	25.1
Chittagong	46.3	25.8	21.0	31.2	44.9	25.0	20.4	30.3
Dhaka	46.8	27.6	23.1	32.7	45.4	26.9	22.4	31.8
Khulna	49.3	40.9	35.0	47.0	47.3	39.4	33.7	45.3
Rajshahi	39.0	27.6	23.1	32.7	37.6	26.7	22.2	31.8
Rangpur	53.8	27.6	22.6	33.2	51.5	26.1	21.3	31.5
Sylhet	46.9	15.6	11.6	20.8	44.9	15.3	11.4	20.2
Total	46.5	26.8	24.5	29.1	44.9	25.9	23.7	28.2
Haiti								
Ouest	57.4	52.1	43.8	60.3	54.2	48.1	40.4	55.9
Sud-Est	47.0	38.4	31.8	45.5	42.6	33.7	27.7	40.3
Nord	54.0	46.1	37.7	54.8	50.4	41.7	34.0	49.7
Nord-Est	48.0	42.3	32.9	52.3	45.0	39.1	30.5	48.5
Artibonite	49.3	44.8	36.4	53.5	46.0	40.4	32.7	48.6
Centre	59.8	17.5	11.3	26.1	56.5	16.8	10.9	25.1
Sud	60.9	52.2	41.0	63.3	57.3	48.9	37.9	60.1
Grand-Anse	55.0	43.1	34.1	52.5	50.9	37.9	29.8	46.9
Nord-Ouest	43.2	40.6	33.8	47.9	40.4	37.8	31.3	44.7
Nippes	57.0	48.1	36.9	59.5	53.6	45.1	34.5	56.1
Total	52.7	45.6	41.9	49.3	49.4	41.8	38.3	45.3
Malawi								
North	67.5	66.2	58.2	73.4	63.6	62.7	55.2	69.6
Central	67.6	66.3	61.6	70.7	64.8	63.5	59.0	67.8
South	67.2	66.4	62.1	70.5	63.7	62.9	58.8	66.8
Total	67.4	66.4	63.4	69.2	64.1	63.1	60.4	65.8
Nepal								
Province 1	57.9	40.1	33.4	47.3	54.9	38.5	32.1	45.4
Province 2	63.0	33.7	28.4	39.5	61.3	32.2	27.1	37.7
Province 3	57.4	50.7	41.7	59.7	54.7	48.5	40.0	57.1
Province 4	54.6	50.3	41.7	58.8	51.0	47.2	39.2	55.4
Province 5	62.5	45.4	36.9	54.3	59.3	43.9	35.6	52.5
Province 6	52.4	27.1	21.4	33.6	49.4	25.6	20.2	31.8
Province 7	58.4	49.5	39.9	59.1	54.9	46.7	37.6	55.9
Total	57.7	41.9	38.9	45.1	54.7	40.1	37.1	43.0
Senegal								
North	54.3	37.8	31.7	44.4	49.0	34.4	28.8	40.6
Dakar	72.6	63.9	46.9	78.0	69.5	60.2	44.6	74.0
Thiès	56.9	61.6	48.8	73.0	52.4	58.0	46.1	69.0
Central	59.8	54.6	48.4	60.6	54.5	50.3	44.6	56.0
East	63.8	29.7	23.3	36.9	57.7	27.2	21.4	33.9
South	61.7	46.7	38.5	55.1	55.7	43.3	35.8	51.2
Total	60.0	51.3	47.2	55.3	54.7	47.6	43.7	51.4
Tanzania								
Western	56.0	37.0	28.9	46.0	50.3	34.8	27.1	43.4
Northern	58.7	46.8	37.9	55.8	52.8	43.8	35.4	52.5
Central	52.8	42.9	35.1	51.0	48.9	40.0	32.8	47.7
Southern Highlands	53.4	67.7	55.7	77.8	48.7	64.0	52.8	73.8
Southern	51.2	58.5	48.0	68.3	46.8	55.1	45.3	64.6
South West Highlands	52.7	45.2	36.2	54.5	49.5	42.7	34.3	51.6
Lake	48.0	32.4	28.5	36.6	44.4	30.4	26.7	34.4
Eastern	52.3	63.1	55.6	70.0	47.2	59.3	52.3	65.9
Zanzibar	55.3	47.1	42.5	51.8	50.8	43.8	39.5	48.1
Total	52.7	44.2	41.6	46.8	48.2	41.5	39.1	44.0

Appendix Table 5 Percentage of health facilities with structural tracer items, Bangladesh SPA 2014

	Non-CEmOC facilities								CEmOC facilities
Domain/Indicator Name	Barisal	Chittagong	Dhaka	Khulna	Rajshahi	Rangpur	Sylhet	National Average	National average
Domain A: Comprehensive emergency obstetric care									
Parenteral administration of antibiotics	46.1	49.1	46.5	38.6	28.2	37.1	36.1	42.2	100.0
Parenteral administration of uterotonic drugs/oxytocin	44.9	48.0	48.3	55.5	27.5	68.7	41.3	48.1	100.0
Parenteral administration of anticonvulsants for hypertensive disorders of pregnancy	17.2	21.0	23.6	31.1	17.6	53.1	28.4	26.5	100.0
Manual removal of placenta	43.8	41.9	35.7	34.4	39.7	45.4	43.3	39.4	100.0
Assisted vaginal delivery	40.1	43.0	46.1	39.8	46.1	43.9	63.0	45.4	100.0
Removal of retained products	27.8	27.3	25.8	25.5	29.7	43.5	28.3	29.0	100.0
Caesarean section	na	na	na	na	na	na	na	na	100.0
Blood transfusion	na	na	na	na	na	na	na	na	100.0
Domain B: Newborn signal functions and immediate care									
Neonatal resuscitation	29.8	34.2	45.0	55.9	26.9	48.9	31.1	40.2	94.3
Skin-to-skin care	51.6	57.3	70.5	84.4	62.4	90.9	62.5	69.0	93.1
Wrap baby	90.1	90.8	98.7	98.4	96.4	87.8	89.5	94.4	99.4
Initiate breastfeeding within the first hour	91.8	97.5	100.0	98.8	100.0	91.2	87.9	97.1	99.4
Domain C: General requirements									
Electricity	39.0	48.0	42.6	62.1	24.4	59.3	49.7	45.4	94.5
Improved water source	88.5	95.6	90.0	97.5	88.6	96.9	93.2	92.6	98.7
Improved sanitation	77.6	85.9	67.1	53.1	77.3	76.8	86.0	73.9	93.1
24/7 skilled birth attendance	37.8	25.7	27.6	30.7	17.4	44.0	30.1	28.9	64.7
Emergency transport	31.0	27.5	34.7	43.9	14.4	20.9	40.0	29.9	88.5
Domain D: Equipment									
Sterilization equipment	61.4	58.5	65.5	57.3	30.5	94.7	59.6	61.9	90.6
Delivery bed	80.2	67.9	76.7	64.9	70.9	68.8	73.4	72.2	92.4
Examination light	42.1	51.4	66.2	72.7	44.7	93.3	72.4	63.5	98.7
Delivery pack	54.1	47.9	59.5	44.4	56.9	89.7	52.1	58.4	82.0
Suction apparatus (mucus abstractor)	40.5	45.1	53.3	54.0	25.6	49.0	31.8	45.6	93.7
Manual vacuum extractor	22.6	28.1	18.1	18.6	14.8	40.1	25.9	23.2	52.7
Vacuum aspirator or D&C kit	27.9	33.9	20.1	32.0	10.5	45.5	29.2	26.8	66.3
Partograph	25.7	16.2	28.5	27.3	12.7	35.2	21.9	24.2	45.9
Disposable latex gloves	82.7	63.7	57.7	81.2	62.8	98.2	96.1	70.4	91.0
Newborn bag and mask	48.6	39.8	45.6	48.9	26.9	62.3	43.7	44.4	84.3
Infant scale	50.1	53.7	48.7	57.2	76.5	89.5	51.1	59.2	64.6
Blood pressure apparatus (digital or manual)	87.0	82.3	88.9	82.0	99.8	100.0	92.8	89.8	98.7
Hand-washing soap and running water or hand disinfectant	69.6	69.0	75.3	73.4	68.9	94.7	83.1	75.6	95.0
Domain E: Medicines and commodities									
Injectable antibiotic	20.1	30.4	39.8	18.8	27.6	23.2	30.0	30.8	68.4
Hydrocortisone available at the facility	11.2	20.7	21.7	13.5	8.8	11.7	20.5	17.3	71.6
Injectable uterotonic	19.9	26.9	33.6	30.2	28.1	46.2	33.4	32.0	79.1
Skin disinfectant	18.9	27.8	23.0	36.6	14.9	27.5	27.3	24.8	66.5
Magnesium sulfate	3.5	15.2	24.8	14.9	24.2	20.4	25.7	20.3	56.6
IV solution with infusion set	22.5	28.7	37.6	30.2	31.5	36.0	36.3	33.3	83.3
Chlorhexidine for cord cleaning	14.5	33.7	31.0	21.3	15.4	50.5	26.8	29.9	71.3
Antibiotic eye ointment for newborn	10.1	20.2	26.5	7.7	22.6	33.4	29.3	23.2	37.9

Domain F: Guidelines, staff training and supervision									
Guidelines: Integrated Management of Pregnancy and Childbirth (IMPAC) Guidelines	30.8	17.3	23.8	18.8	4.1	56.4	20.2	23.7	25.4
Guidelines: CEmOC Guidelines	16.4	22.5	15.1	20.9	9.8	56.7	20.7	21.9	28.9
Guidelines: Guidelines for management of pre-term labor	19.1	15.8	18.8	12.6	11.4	41.4	34.1	20.5	36.9
Guidelines on standard precaution	29.6	19.1	31.7	19.9	9.9	59.1	19.8	27.8	32.7
Training in neonatal resuscitation	19.3	24.7	11.8	48.4	6.7	17.4	43.4	20.1	29.9
Training in early and exclusive breastfeeding	18.8	28.3	16.7	35.3	2.2	19.7	39.4	20.8	21.7
Training in newborn infection management (including injectable antibiotics)	11.4	13.0	6.9	18.2	1.2	9.5	17.0	9.6	25.3
Training in thermal care	21.8	15.7	7.9	33.7	1.2	7.4	33.0	13.2	21.8
Training in cord care	21.8	19.4	13.5	43.8	2.2	10.5	28.7	17.0	29.2
Training in IMPAC	11.4	12.5	6.2	11.0	1.9	7.4	10.6	8.1	30.1
Training in normal labor and delivery care	17.8	13.4	7.6	18.9	3.1	7.7	17.8	10.4	33.3
Training in CEmOC	12.2	6.9	5.4	14.7	1.0	4.3	3.9	6.1	28.9
Training in AMTSL	16.9	15.8	5.4	23.6	1.2	8.4	15.1	10.2	32.0
Training in KMC	11.8	17.2	14.3	33.7	2.2	9.6	19.1	14.7	30.2
Supervision	82.4	89.2	87.9	89.3	90.3	95.2	84.0	88.9	92.0
Number of facilities	15	53	92	24	34	32	17	267	13

Appendix Table 6 Service readiness scores for CEmOC facilities and non-CEmOC facilities

	Bangladesh		Haiti		Malawi		Nepal		Senegal		Tanzania	
	Readiness score	95% CI	Readiness score	95% CI	Readiness score	95% CI	Readiness score	95% CI	Readiness score	95% CI	Readiness score	95% CI
Non-CEmOC facilities	45.0	[43.0,47.0]	52.1	[50.6,53.6]	66.9	[65.9,68.0]	57.3	[56.0,58.5]	59.8	[58.3,61.3]	52.4	[51.4,53.4]
CEmOC facilities	77.6	[73.6,81.7]	77.9	[71.1,84.7]	90.0	[86.5,93.5]	79.7	[76.7,82.7]	88.9	[86.7,91.2]	85.5	[83.4,87.5]
National average	46.5	[44.6,48.4]	52.7	[51.3,54.2]	67.4	[66.3,68.4]	57.7	[56.5,59.0]	60.0	[58.4,61.5]	52.7	[51.7,53.7]

Appendix Table 7 Percentage of health facilities with structural tracer items, Haiti SPA 2013

	Non-CEmOC facilities											CEmOC facilities
Domain/Indicator Name	Ouest	Sud-Est	Nord	Nord-Est	Artibonite	Centre	Sud	Grand-Anse	Nord-Ouest	Nippes	National Average	National average
Domain A: Comprehensive emergency obstetric care												
Parenteral administration of antibiotics	70.3	40.0	61.1	42.3	45.1	47.6	73.9	40.0	46.1	50.0	54.6	100.0
Parenteral administration of uterotonic drugs/oxytocin	72.3	45.7	66.7	65.4	60.8	76.2	100.0	75.0	58.1	75.0	67.5	100.0
Parenteral administration of anticonvulsants for hypertensive disorders of pregnancy	34.7	17.1	36.1	23.1	29.4	28.6	34.8	35.0	21.8	18.8	29.0	100.0
Manual removal of placenta	55.4	34.3	47.2	42.3	52.9	42.9	56.5	65.0	42.2	50.0	49.3	100.0
Assisted vaginal delivery	79.2	65.7	80.6	73.1	62.7	76.2	87.0	70.0	63.9	81.3	73.3	100.0
Removal of retained products	53.5	48.6	50.0	42.3	41.2	52.4	47.8	65.0	32.0	37.5	46.9	100.0
Caesarean section	na	na	na	na	na	na	na	na	na	na	na	100.0
Blood transfusion	na	na	na	na	na	na	na	na	na	na	na	100.0
Domain B: Newborn signal functions and immediate newborn care												
Neonatal resuscitation	47.5	25.7	38.9	23.1	37.3	42.9	47.8	40.0	39.7	56.3	40.3	100.0
Skin-to-skin care	78.2	97.1	86.1	69.2	76.5	85.7	91.3	95.0	84.0	93.8	83.4	80.0
Wrap baby	97.0	97.1	94.4	84.6	88.2	95.2	100.0	95.0	96.0	100.0	94.7	100.0
Initiate breastfeeding within the first hour	86.1	85.7	97.2	84.6	88.2	95.2	100.0	90.0	96.0	93.8	90.5	90.0
Domain C: General requirements												
Electricity	83.2	68.6	88.9	69.2	62.7	85.7	95.7	95.0	74.0	68.8	78.4	90.0
Improved water source	72.3	85.7	77.8	69.2	68.6	71.4	87.0	85.0	70.1	93.8	75.5	80.0
Improved sanitation	78.2	28.6	36.1	38.5	41.2	52.4	47.8	35.0	15.9	56.3	47.1	50.0
24/7 skilled birth attendance	38.6	22.9	41.7	30.8	33.3	42.9	30.4	50.0	15.7	25.0	32.9	90.0
Emergency transport	40.6	25.7	30.6	11.5	41.2	42.9	34.8	15.0	7.9	31.3	30.0	80.0
Domain D: Equipment												
Sterilization equipment	55.4	40.0	50.0	53.8	35.3	76.2	56.5	25.0	35.9	50.0	47.5	100.0
Delivery bed	93.1	88.6	91.7	92.3	92.2	100.0	100.0	90.0	94.0	100.0	93.4	100.0
Examination light	46.5	28.6	27.8	38.5	27.5	42.9	47.8	45.0	23.9	43.8	36.6	30.0
Delivery pack	80.2	82.9	86.1	76.9	62.7	95.2	91.3	85.0	70.1	81.3	78.9	100.0
Suction apparatus (mucus abstractor)	45.5	11.4	25.0	15.4	25.5	14.3	43.5	35.0	11.9	18.8	27.7	10.0
Manual vacuum extractor	16.8	2.9	13.9	7.7	3.9	9.5	4.3	10.0	5.9	0.0	9.2	40.0
Vacuum aspirator or D&C kit	28.7	20.0	25.0	15.4	11.8	4.8	26.1	15.0	9.9	18.8	19.2	30.0
Partograph	22.8	25.7	19.4	23.1	23.5	28.6	26.1	40.0	7.9	31.3	22.7	90.0
Disposable latex gloves	93.1	94.3	88.9	96.2	92.2	90.5	87.0	100.0	81.9	93.8	91.3	100.0
Newborn bag and mask	49.5	25.7	38.9	15.4	27.5	47.6	56.5	25.0	11.8	43.8	34.8	80.0
Infant scale	73.3	74.3	91.7	65.4	60.8	90.5	78.3	75.0	65.9	62.5	72.8	90.0
Blood pressure apparatus (digital or manual)	87.1	88.6	91.7	73.1	84.3	100.0	82.6	75.0	92.1	93.8	87.1	70.0
Hand-washing soap and running water or hand disinfectant	80.2	71.4	63.9	65.4	64.7	81.0	69.6	50.0	65.9	75.0	70.4	60.0
Domain E: Medicines and commodities												
Injectable antibiotic	40.6	20.0	33.3	30.8	19.6	47.6	34.8	25.0	17.8	37.5	30.6	50.0
Hydrocortisone available at the facility	33.7	20.0	36.1	23.1	25.5	52.4	52.2	20.0	9.9	31.3	29.0	70.0
Injectable uterotonic	52.5	51.4	55.6	50.0	41.2	52.4	60.9	60.0	45.8	50.0	50.9	90.0
Skin disinfectant	66.3	51.4	61.1	65.4	64.7	76.2	73.9	65.0	53.7	68.8	63.5	90.0
Magnesium sulfate	44.6	28.6	36.1	34.6	33.3	61.9	52.2	45.0	25.8	25.0	38.2	100.0
IV solution with infusion set	40.6	40.0	50.0	50.0	41.2	52.4	34.8	40.0	31.8	43.8	41.4	60.0
Chlorhexidine for cord cleaning	43.6	51.4	47.2	46.2	39.2	42.9	65.2	45.0	26.0	62.5	44.0	40.0
Antibiotic eye ointment for newborn	45.5	40.0	63.9	42.3	58.8	57.1	52.2	40.0	41.9	37.5	48.3	80.0

Domain F: Guidelines, staff training and supervision												
Guidelines: Integrated Management of Pregnancy and Childbirth (IMPAC) Guidelines	15.8	31.4	19.4	26.9	23.5	19.0	21.7	15.0	26.0	25.0	21.7	60.0
Guidelines: CEmOC Guidelines	15.8	14.3	19.4	15.4	15.7	19.0	21.7	30.0	14.0	18.8	17.1	50.0
Guidelines: Guidelines for management of pre-term labor	12.9	5.7	16.7	3.8	11.8	23.8	13.0	20.0	9.9	18.8	12.6	20.0
Guidelines on standard precaution	8.9	5.7	25.0	7.7	11.8	4.8	4.3	10.0	9.9	37.5	11.3	60.0
Training in neonatal resuscitation	44.6	20.0	33.3	23.1	27.5	42.9	43.5	35.0	22.0	50.0	34.0	60.0
Training in early and exclusive breastfeeding	51.5	28.6	30.6	34.6	31.4	42.9	34.8	30.0	19.8	50.0	36.6	60.0
Training in newborn infection management (including injectable antibiotics)	39.6	22.9	25.0	23.1	31.4	42.9	26.1	25.0	18.0	37.5	30.1	30.0
Training in thermal care	43.6	31.4	27.8	26.9	25.5	42.9	34.8	35.0	17.8	50.0	33.2	70.0
Training in cord care	46.5	31.4	27.8	30.8	29.4	42.9	34.8	45.0	13.8	50.0	34.8	70.0
Training in IMPAC	43.6	31.4	30.6	42.3	35.3	52.4	47.8	20.0	26.0	43.8	37.2	70.0
Training in normal labor and delivery care	41.6	34.3	30.6	46.2	33.3	47.6	47.8	30.0	24.0	50.0	37.2	60.0
Training in CEmOC	37.6	25.7	27.8	34.6	27.5	42.9	34.8	20.0	20.0	43.8	31.1	60.0
Training in AMTSL	38.6	31.4	33.3	46.2	35.3	47.6	43.5	25.0	24.0	43.8	35.9	70.0
Training in KMC	33.7	20.0	25.0	23.1	25.5	42.9	30.4	20.0	5.9	37.5	25.8	50.0
Supervision	73.3	88.6	77.8	88.5	80.4	95.2	87.0	70.0	76.0	93.8	80.2	80.0
Number of facilities	100	35	36	26	51	21	23	20	51	16	379	10

Appendix Table 8 Percentage of health facilities with structural tracer items, Malawi SPA 2013-14

	Non-CEmOC facilities				CEmOC facilities
Domain/Indicator Name	**North**	**Central**	**South**	National Average	National average
Domain A: Comprehensive emergency obstetric care					
Parenteral administration of antibiotics	75.6	84.9	80.7	81.3	100.0
Parenteral administration of uterotonic drugs/oxytocin	98.1	97.0	98.7	97.9	100.0
Parenteral administration of anticonvulsants for hypertensive disorders of pregnancy	46.4	49.2	48.6	48.4	100.0
Manual removal of placenta	35.8	44.7	42.4	42.0	100.0
Assisted vaginal delivery	57.1	52.7	45.2	50.3	100.0
Removal of retained products	42.4	38.1	35.0	37.6	100.0
Caesarean section	na	na	na	na	100.0
Blood transfusion	na	na	na	na	100.0
Domain B: Newborn signal functions and immediate newborn care					
Neonatal resuscitation	93.2	90.5	82.8	87.7	100.0
Skin-to-skin care	100.0	96.5	98.7	98.1	100.0
Wrap baby	100.0	99.5	100.0	99.8	100.0
Initiate breastfeeding within the first hour	100.0	98.5	98.7	98.9	100.0
Domain C: General requirements					
Electricity	69.9	75.8	58.8	67.4	91.0
Improved water source	88.3	95.5	97.4	94.9	100.0
Improved sanitation	24.1	28.1	21.2	24.3	54.6
24/7 skilled birth attendance	36.6	52.2	60.9	52.8	100.0
Emergency transport	89.3	88.4	90.0	89.3	100.0
Domain D: Equipment					
Sterilization equipment	20.1	32.6	31.6	29.7	81.7
Delivery bed	98.0	99.0	98.3	98.5	100.0
Examination light	42.5	24.6	30.3	30.6	82.0
Delivery pack	86.4	90.4	96.0	92.0	100.0
Suction apparatus (mucus abstractor)	64.9	64.8	59.2	62.4	91.0
Manual vacuum extractor	34.7	43.1	38.5	39.5	100.0
Vacuum aspirator or D&C kit	18.2	23.1	24.5	22.7	91.0
Partograph	86.3	86.9	89.4	87.9	100.0
Disposable latex gloves	100.0	96.5	96.9	97.4	100.0
Newborn bag and mask	93.2	91.4	85.4	89.2	100.0
Infant scale	95.1	94.5	95.6	95.1	100.0
Blood pressure apparatus (digital or manual)	76.6	72.8	76.4	75.1	100.0
Hand-washing soap and running water or hand disinfectant	76.6	75.9	73.7	75.1	82.0
Domain E: Medicines and commodities					
Injectable antibiotic	57.2	52.2	55.3	54.5	100.0
Hydrocortisone available at the facility	13.4	9.5	13.3	11.9	73.0
Injectable uterotonic	90.3	97.0	95.6	95.1	100.0
Skin disinfectant	63.0	46.7	57.4	54.5	91.0
Magnesium sulfate	83.5	82.9	85.7	84.2	100.0
IV solution with infusion set	69.0	65.4	67.6	67.1	64.0
Chlorhexidine for cord cleaning	34.8	30.7	39.4	35.2	64.0
Antibiotic eye ointment for newborn	98.1	90.5	93.9	93.4	91.0
Domain F: Guidelines, staff training and supervision					
Guidelines: Integrated Management of Pregnancy and Childbirth (IMPAC) Guidelines	48.6	41.2	45.6	44.5	54.4
Guidelines: CEmOC Guidelines	40.8	21.6	25.0	26.8	54.7
Guidelines: Guidelines for management of pre-term labor	40.8	41.2	40.7	40.9	82.0
Guidelines on standard precaution	47.4	40.7	40.8	42.1	73.0
Training in neonatal resuscitation	70.7	58.2	60.4	61.6	91.0
Training in early and exclusive breastfeeding	56.2	45.2	45.6	47.5	72.9
Training in newborn infection management (including injectable antibiotics)	46.5	41.2	35.9	39.9	54.6
Training in thermal care	54.2	53.2	53.4	53.5	81.9
Training in cord care	55.2	55.7	53.4	54.6	72.9
Training in IMPAC	21.2	31.6	17.9	23.7	35.9
Training in normal labor and delivery care	37.7	44.7	32.8	38.2	54.3
Training in CEmOC	21.2	29.1	18.8	23.1	35.9
Training in AMTSL	35.7	47.7	34.5	39.7	54.3
Training in KMC	42.6	43.2	35.9	40.0	54.3
Supervision	76.7	86.4	82.9	83.0	91.0
Number of facilities	102	194	221	517	11

Appendix Table 9 Percentage of health facilities with structural tracer items, Nepal SPA 2015

	Non-CEmOC facilities								CEmOC facilities
Domain/Indicator Name	Province 1	Province 2	Province 3	Province 4	Province 5	Province 6	Province 7	National Average	National average
Domain A: Comprehensive emergency obstetric care									
Parenteral administration of antibiotics	35.6	64.6	40.2	35.5	57.8	28.6	33.5	39.5	100.0
Parenteral administration of uterotonic drugs/oxytocin	83.1	95.7	77.3	76.0	93.8	85.3	96.2	85.5	100.0
Parenteral administration of anticonvulsants for hypertensive disorders of pregnancy	7.9	27.0	9.9	4.1	15.8	5.5	6.8	8.1	100.0
Manual removal of placenta	51.3	54.3	31.6	32.4	57.1	34.4	44.7	41.6	100.0
Assisted vaginal delivery	11.4	35.0	12.9	8.7	22.4	16.5	15.3	14.3	100.0
Removal of retained products	40.5	44.3	25.6	15.5	46.0	23.9	39.8	31.6	100.0
Caesarean section	na	na	na	na	na	na	na	na	100.0
Blood transfusion	na	na	na	na	na	na	na	na	100.0
Domain B: Newborn signal functions and immediate newborn care									
Neonatal resuscitation	42.3	54.0	27.9	19.1	46.1	43.5	33.5	35.5	97.8
Skin-to-skin care	96.4	84.9	89.0	98.1	93.3	75.5	93.5	90.8	85.4
Wrap baby	97.2	100.0	100.0	97.9	100.0	86.1	100.0	97.3	100.0
Initiate breastfeeding within the first hour	98.5	100.0	99.7	99.7	100.0	94.1	100.0	98.8	100.0
Domain C: General requirements									
Electricity	80.5	69.0	72.4	54.0	77.1	94.2	76.3	74.5	100.0
Improved water source	91.8	100.0	91.9	87.6	85.2	61.9	77.7	84.7	95.6
Improved sanitation	97.1	90.6	95.3	92.0	89.8	79.4	83.3	89.9	97.8
24/7 skilled birth attendance	21.5	39.3	30.4	27.3	21.3	5.3	22.1	22.4	70.6
Emergency transport	55.1	81.7	81.1	67.4	64.1	37.7	51.7	61.5	97.8
Domain D: Equipment									
Sterilization equipment	95.0	91.9	96.6	91.4	88.6	81.7	95.3	91.8	97.6
Delivery bed	94.9	96.2	95.0	95.8	99.7	93.3	100.0	96.3	97.6
Examination light	60.8	65.3	68.2	73.7	63.5	38.1	54.2	59.9	97.6
Delivery pack	91.4	95.2	91.1	87.5	100.0	91.5	95.1	92.8	97.6
Suction apparatus (mucus abstractor)	63.0	87.8	76.9	77.0	52.0	31.5	50.0	61.2	97.6
Manual vacuum extractor	28.2	28.8	22.0	13.4	16.9	14.1	22.6	19.3	87.4
Vacuum aspirator or D&C kit	18.4	35.0	25.1	10.4	17.7	10.8	21.3	17.9	80.8
Partograph	68.3	72.4	80.2	93.8	91.1	82.7	71.6	79.9	85.1
Disposable latex gloves	96.0	96.5	91.1	95.7	95.4	85.9	88.3	92.6	91.8
Newborn bag and mask	80.9	93.6	89.6	72.7	88.2	71.5	85.7	82.5	97.6
Infant scale	80.5	93.8	87.3	87.0	99.7	88.2	96.7	89.7	95.4
Blood pressure apparatus (digital or manual)	78.4	76.9	81.5	87.4	90.7	80.3	84.2	82.6	97.6
Hand-washing soap and running water or hand disinfectant	69.8	78.2	84.2	84.3	81.1	61.0	61.3	74.0	87.4
Domain E: Medicines and commodities									
Injectable antibiotic	41.6	62.3	42.6	30.4	48.6	39.0	30.2	39.8	90.9
Hydrocortisone available at the facility	10.9	22.4	25.3	17.5	13.8	9.1	14.0	14.9	70.3
Injectable uterotonic	83.8	92.2	82.5	89.7	95.5	78.7	98.0	88.0	97.6
Skin disinfectant	87.5	96.2	94.7	91.4	93.9	83.7	93.4	91.2	97.6
Magnesium sulfate	62.9	59.8	63.1	84.0	81.9	65.3	86.7	71.6	97.6
IV solution with infusion set	88.0	89.8	86.8	93.6	92.9	83.2	98.6	90.4	87.4
Chlorhexidine for cord cleaning	61.9	52.6	60.4	41.0	75.7	37.6	72.3	58.3	41.8
Antibiotic eye ointment for newborn	25.1	24.5	40.0	53.4	48.2	45.2	37.0	40.0	13.3

Domain F: Guidelines, staff training and supervision									
Guidelines: Integrated Management of Pregnancy and Childbirth (IMPAC) Guidelines	na	na	na	na	na	na	na	na	na
Guidelines: CEmOC Guidelines	na	na	na	na	na	na	na	na	na
Guidelines: Guidelines for management of pre-term labor	na	na	na	na	na	na	na	na	na
Medical Standards Volume III or reproductive health Guidelines	19.5	20.4	9.5	25.9	41.6	20.4	19.2	22.0	13.1
Guidelines on standard precaution	1.6	4.3	3.9	14.8	11.8	5.2	8.7	6.9	14.6
Training in neonatal resuscitation	30.7	25.5	25.6	12.0	30.6	44.6	34.9	29.2	26.9
Training in early and exclusive breastfeeding	32.6	24.5	23.3	13.5	30.6	52.4	32.9	30.1	22.1
Training in newborn infection management (including injectable antibiotics)	23.5	8.5	11.6	6.5	23.3	38.9	19.0	19.2	11.0
Training in thermal care	30.7	21.4	21.4	11.4	26.2	42.4	27.7	26.2	15.3
Training in cord care	30.7	25.5	21.2	10.8	31.2	38.5	34.4	27.5	17.5
Training in IMPAC	2.0	3.8	0.0	0.3	0.0	0.7	0.6	0.9	2.2
Training in normal labor and delivery care	30.6	24.6	28.6	13.5	25.3	23.9	30.2	25.5	29.9
Training in CEmOC	13.1	8.5	7.0	6.5	13.3	15.2	20.4	12.1	11.0
Training in AMTSL	31.9	33.7	29.1	12.9	24.1	26.2	32.4	27.0	29.9
Training in KMC	30.9	19.2	21.7	13.8	32.5	40.8	31.7	27.6	19.7
Supervision	76.0	81.6	59.3	84.2	91.7	72.5	88.6	78.2	76.5
Number of facilities	77	37	79	65	61	61	67	448	9

Appendix Table 10 Percentage of health facilities with structural tracer items, Senegal SPA 2015

	Non-CEmOC facilities							CEmOC facilities
Domain/Indicator Name	North	Dakar	Thiès	Central	East	South	National Average	National average
Domain A: Comprehensive emergency obstetric care								
Parenteral administration of antibiotics	47.5	85.3	55.5	68.3	41.2	57.5	58.9	100.0
Parenteral administration of uterotonic drugs/oxytocin	83.3	98.4	64.3	80.5	87.3	74.3	79.6	100.0
Parenteral administration of anticonvulsants for hypertensive disorders of pregnancy	21.2	44.3	15.1	25.8	34.4	17.1	23.9	100.0
Manual removal of placenta	40.0	41.1	34.0	43.9	39.5	26.4	37.8	100.0
Assisted vaginal delivery	98.3	100.0	93.6	94.3	94.4	99.3	96.4	100.0
Removal of retained products	69.2	78.6	51.9	59.3	66.6	41.0	59.3	100.0
Caesarean section	na	na	na	na	na	na	na	100.0
Blood transfusion	na	na	na	na	na	na	na	100.0
Domain B: Newborn signal functions and immediate newborn care								
Neonatal resuscitation	41.3	85.2	55.5	53.9	43.2	43.0	51.2	100.0
Skin-to-skin care	92.0	100.0	100.0	97.9	100.0	100.0	97.7	100.0
Wrap baby	100.0	100.0	100.0	99.2	100.0	100.0	99.8	100.0
Initiate breastfeeding within the first hour	99.3	100.0	100.0	99.2	100.0	99.2	99.5	100.0
Domain C: General requirements								
Electricity	42.4	67.1	34.5	41.9	68.7	52.1	47.2	52.9
Improved water source	97.2	100.0	95.4	92.3	86.1	64.0	88.8	100.0
Improved sanitation	93.6	100.0	86.0	84.9	89.6	84.7	88.6	100.0
24/7 skilled birth attendance	2.5	40.0	8.5	10.5	8.4	6.4	10.0	100.0
Emergency transport	45.2	57.1	31.3	49.9	75.1	65.4	51.6	100.0
Domain D: Equipment								
Sterilization equipment	35.1	100.0	41.7	37.3	28.3	40.7	42.6	100.0
Delivery bed	98.3	100.0	100.0	96.8	97.9	99.2	98.4	100.0
Examination light	57.1	95.3	60.9	53.2	54.0	66.8	61.3	100.0
Delivery pack	98.4	100.0	100.0	97.2	96.9	100.0	98.6	100.0
Suction apparatus (mucus abstractor)	29.7	73.5	35.3	22.9	9.0	20.4	28.9	100.0
Manual vacuum extractor	3.5	7.9	2.1	2.3	2.3	2.6	3.1	58.8
Vacuum aspirator or D&C kit	35.0	27.9	16.8	33.9	48.6	51.1	35.4	70.6
Partograph	56.8	91.9	62.2	71.5	75.0	57.4	66.4	100.0
Disposable latex gloves	86.9	100.0	84.3	82.0	95.7	91.9	87.9	100.0
Newborn bag and mask	39.1	68.6	42.8	41.8	34.8	53.4	45.1	100.0
Infant scale	87.0	100.0	97.4	88.9	83.8	90.1	90.5	100.0
Blood pressure apparatus (digital or manual)	24.5	93.5	46.9	63.7	86.6	76.4	59.4	100.0
Hand-washing soap and running water or hand disinfectant	88.9	100.0	84.3	87.8	92.7	87.0	88.8	100.0
Domain E: Medicines and commodities								
Injectable antibiotic	2.7	64.5	45.9	37.9	34.5	51.5	35.9	88.2
Hydrocortisone available at the facility	41.2	41.8	37.2	44.5	45.5	50.1	43.5	52.9
Injectable uterotonic	30.8	96.9	60.6	57.4	73.9	70.2	59.2	88.2
Skin disinfectant	88.1	93.5	83.2	84.5	97.6	85.3	87.1	100.0
Magnesium sulfate	19.6	54.4	39.1	30.6	35.0	46.4	34.8	100.0
IV solution with infusion set	28.3	56.0	53.0	44.6	41.1	44.8	43.0	100.0
Chlorhexidine for cord cleaning	25.9	59.3	41.8	43.8	85.6	78.7	50.9	58.8
Antibiotic eye ointment for newborn	0.4	62.8	47.4	51.0	69.0	63.4	44.3	41.2

Domain F: Guidelines, staff training and supervision								
Guidelines: Integrated Management of Pregnancy and Childbirth (IMPAC) Guidelines	65.8	56.5	70.4	53.9	59.1	74.5	63.4	47.1
Guidelines: CEmOC Guidelines	52.0	45.0	47.3	25.3	43.0	42.4	40.8	76.5
Guidelines: Guidelines for management of pre-term labor	19.2	14.9	18.8	9.6	9.2	10.2	13.6	47.1
Guidelines on standard precaution	23.5	52.2	38.3	30.4	65.3	54.8	39.4	47.1
Training in neonatal resuscitation	44.6	34.9	35.5	58.3	75.5	65.0	52.5	100.0
Training in early and exclusive breastfeeding	50.7	49.8	35.7	56.3	72.2	63.5	54.0	100.0
Training in newborn infection management (including injectable antibiotics)	28.6	33.3	23.9	50.8	50.9	54.8	41.1	100.0
Training in thermal care	47.8	49.8	33.7	56.8	74.0	66.8	54.0	100.0
Training in cord care	47.8	49.8	33.7	57.0	74.0	65.0	53.7	100.0
Training in IMPAC	18.4	52.9	25.6	34.5	27.0	45.1	32.4	58.8
Training in normal labor and delivery care	42.6	52.9	35.4	48.0	42.4	50.0	45.2	11.8
Training in CEmOC	17.9	26.5	18.6	24.5	17.0	37.0	23.9	11.8
Training in AMTSL	30.9	42.9	26.5	40.8	31.3	45.1	36.6	58.8
Training in KMC	49.0	39.8	30.0	54.8	56.0	61.2	49.7	100.0
Supervision	56.1	37.6	49.1	51.8	35.9	45.7	48.6	88.2
Number of facilities	78	31	56	100	31	65	361	2

Appendix Table 11 Percentage of health facilities with structural tracer items, Tanzania SPA 2014-15

	Non-CEmOC facilities										CEmOC facilities
Domain/Indicator Name	Western	Northern	Central	Southern Highlands	Southern	South West Highlands	Lake	Eastern	Zanzibar	National Average	National average
Domain A: Comprehensive emergency obstetric care											
Parenteral administration of antibiotics	43.0	31.9	50.5	20.9	25.2	43.6	28.1	30.4	22.5	33.4	100.0
Parenteral administration of uterotonic drugs/oxytocin	81.9	89.5	90.3	72.1	91.6	95	73.8	85.1	92.3	83.5	100.0
Parenteral administration of anticonvulsants for hypertensive disorders of pregnancy	24.6	18.1	13.0	7.2	3.8	6.8	7.2	22.8	17.5	12.6	100.0
Manual removal of placenta	37.8	31.3	36.5	30.5	59.1	27.4	31.3	27.0	21.0	33.4	100.0
Assisted vaginal delivery	81.6	78.1	78.5	57.2	75.5	55.9	74.0	58.6	29.1	69.3	100.0
Removal of retained products	38.7	21.7	63.8	32.0	33.7	26.3	37.3	25.1	29.3	34.8	100.0
Caesarean section	na	na	na	na	na	na	na	na	na	na	100.0
Blood transfusion	na	na	na	na	na	na	na	na	na	na	100.0
Domain B: Newborn signal functions and immediate newborn care											
Neonatal resuscitation	50.1	56.2	59.0	74.4	57.9	61.3	35.4	36.4	35.5	51.7	100.0
Skin-to-skin care	89.7	99.8	91.3	99.4	100.0	95.4	92.4	84.3	81.3	93.6	97.9
Wrap baby	97.5	99.6	99.7	95.7	100.0	96.3	99.7	93.9	96.5	97.9	100.0
Initiate breastfeeding within the first hour	99.7	99.6	92.8	100.0	100.0	100.0	99.3	96.4	88.0	98.4	97.9
Domain C: General requirements											
Electricity	87.9	54.2	66.7	63.9	68.4	56.1	72.8	56.6	86.8	66.0	100.0
Improved water source	74.2	69.7	66.2	65.6	61.2	41.8	56.0	65.6	90.3	62.0	88.0
Improved sanitation	25.6	28.1	18.7	25.7	31.7	19.5	45.3	45.7	92.6	32.3	72.1
24/7 skilled birth attendance	18.9	32.7	23.7	18.0	16.9	28.2	39.9	27.0	21.0	27.6	100.0
Emergency transport	57.7	67.5	78.2	42.5	35.8	68.4	74.5	48.4	43.6	61.4	87.5
Domain D: Equipment											
Sterilization equipment	28.9	36.7	6.2	12.7	10.1	10.5	15.9	37.0	59.6	20.1	91.3
Delivery bed	100.0	100.0	100.0	98.0	89.0	96.0	99.4	100.0	100.0	98.3	100.0
Examination light	6.5	21.0	6.3	5.6	10.1	26.1	9.0	26.2	35.1	13.9	60.8
Delivery pack	87.9	86.3	89.5	92.2	85.0	95.2	78.8	88.2	52.5	86.8	100.0
Suction apparatus (mucus abstractor)	24.8	25.7	17.7	22.0	22.9	24.3	21.0	21.9	37.4	22.4	73.4
Manual vacuum extractor	2.5	7.0	3.5	1.2	1.0	1.4	7.3	8.3	11.6	4.6	78.8
Vacuum aspirator or D&C kit	11.3	9.5	3.6	4.7	1.3	0.7	10.5	8.4	25.4	7.0	62.0
Partograph	60.1	74.0	43.9	62.0	76.6	51.4	45.9	59.4	59.9	57.1	100.0
Disposable latex gloves	73.4	87.8	95.0	92.7	79.8	83.1	85.3	86.4	96.5	86.1	100.0
Newborn bag and mask	76.4	96.0	85.3	94.1	83.1	76.4	40.5	89.0	45.8	75.9	100.0
Infant scale	82.0	79.5	71.5	74.0	83.9	80.7	76.9	90.2	82.8	79.4	100.0
Blood pressure apparatus (digital or manual)	46.9	77.5	66.9	76.4	57.5	91.4	53.7	65.2	68.6	66.5	95.8
Hand-washing soap and running water or hand disinfectant	46.3	78.4	50.6	87.6	56.8	76.2	56.2	81.2	86.0	67.1	95.8
Domain E: Medicines and commodities											
Injectable antibiotic	41.5	35.3	34.8	21.6	35.3	49.9	22.8	26.4	21.0	31.8	70.4
Hydrocortisone available at the facility	25.1	44.6	37.8	26.5	14.8	24.3	21.8	52.4	26.3	31.0	91.7
Injectable uterotonic	71.0	87.6	81.7	84.8	74.0	87.5	71.5	72.7	92.3	78.6	100.0
Skin disinfectant	63.3	70.2	55.6	42.3	71.9	64.9	62.7	60.1	64.0	60.9	85.9
Magnesium sulfate	40.3	41.8	21.1	35.7	50.4	57.0	34.0	48.8	71.2	40.3	97.7

IV solution with infusion set	40.6	55.3	47.4	49.5	28.5	62.5	44.1	45.7	85.5	47.7	95.8
Chlorhexidine for cord cleaning	6.3	19.6	5.0	11.0	9.0	25.4	9.3	9.9	8.2	11.9	20.3
Antibiotic eye ointment for newborn	8.8	34.2	29.3	46.9	9.9	46.3	16.5	30.1	7.0	27.8	51.6
Domain F: Guidelines, staff training and supervision											
Guidelines: Integrated Management of Pregnancy and Childbirth (IMPAC) Guidelines	41.2	36.2	16.2	26.7	31.9	21.7	19.7	40.0	32.0	28.0	56.1
Guidelines: CEmOC Guidelines	14.4	5.6	7.5	9.1	3.8	1.5	5.9	22.7	8.2	8.7	26.6
Guidelines: Guidelines for management of pre-term labor	7.7	7.7	8.1	30.4	12.9	4.8	4.4	18.0	7.0	11.2	47.9
Guidelines on standard precaution	12.1	47.2	16.0	38.9	21.9	31.6	19.6	31.0	33.9	27.4	55.0
Training in neonatal resuscitation	79.1	92.1	43.8	76.5	46.2	43.4	21.7	64.5	67.3	55.1	72.9
Training in early and exclusive breastfeeding	74.4	72.6	43.4	69.4	34.6	43.5	23.5	50.1	58.0	49.1	66.5
Training in newborn infection management (including injectable antibiotics)	66.3	54.3	34.8	45.3	30.7	34.6	20.7	34.7	46.3	38.1	54.5
Training in thermal care	76.7	87.4	41.3	61.5	43.0	38.4	22.6	41.3	53.3	48.5	66.5
Training in cord care	76.7	90.5	43.6	65.6	43.0	36.9	21.3	41.6	55.7	49.3	62.3
Training in IMPAC	26.0	24.7	13.2	21.0	10.9	20.0	11.6	13.9	4.7	17.0	24.7
Training in normal labor and delivery care	33.8	28.3	16.1	17.6	24.1	26.5	15.7	16.5	4.7	21.1	37.5
Training in CEmOC	28.6	20.6	9.1	13.7	12.6	15.8	14.1	13.7	2.3	15.6	30.9
Training in AMTSL	33.8	25.0	18.8	17.8	21.3	27.3	16.1	21.3	7.0	21.6	37.4
Training in KMC	59.3	57.8	38.8	55.5	33.8	36.7	19.6	39.8	52.2	40.5	62.2
Supervision	83.0	73.8	81.3	69.2	82.2	86.2	82.7	62.3	89.5	77.6	69.3
Number of facilities	84	109	103	114	65	103	198	113	7	896	8