



Saving Mothers, Giving Life

Maternal and Perinatal Outcomes in Health Facilities

Phase 1 Monitoring and Evaluation Report



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Phase 1 Monitoring and
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Government of Uganda	STRIDES for Family Health
Ministry of Health of Uganda	Health Care Improvement Project (HCI)
District Medical/Health Officers	Uganda Health Marketing Group (UHMG)
Uganda Village Health Teams	Uganda Episcopal Conference (UEC)
CDC Country Office	Health Initiatives for the Private Sector (HIPS)
US Agency for International Development (USAID) Mission in Uganda	Strengthening Decentralization for Sustainability (SDS)
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Uganda Infectious Diseases Institute (Makerere University, Uganda)	Makerere University School of Public Health
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Zambia

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Zambia Central Statistics Office	Maternal and Child Health Integrated Program (MCHIP)
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Community Health Workers and Safe Motherhood Action Groups (SMAGs)	Communication Support for Health (CSH)
CDC Country Office	University of Zambia (UNZA), Department of Population Studies
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Global Partners

American College of Obstetricians and Gynecologists	US Government Agencies:
Every Mother Counts	Centers for Disease Control and Prevention (CDC)
Merck for Mothers	US Agency for International Development (USAID)
Government of Norway	Peace Corps
Project CURE	US Department of Defense (DOD)
	Office of the US Global AIDS Coordinator (OGAC)

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List of Acronyms

AMTSL	Active Management of the Third Stage of Labor
BEmONC	Basic Emergency Obstetric and Newborn Care
CDC	Centers for Disease Control and Prevention
CEmONC	Comprehensive Emergency Obstetric and Newborn Care
CFR	case fatality rate (for direct obstetric complications receiving care)
C-section	Cesarean section
EmONC	Emergency Obstetric and Newborn Care
HFA	Health Facility Assessment
M&E	monitoring and evaluation
MCH	maternal and child health
MMR	maternal mortality ratio
NMR	neonatal mortality rate (in health facilities, at discharge)
PMR	perinatal mortality rate (in health facilities, at discharge)
POMS	Pregnancy Outcomes Monitoring Survey
PPH	postpartum hemorrhage
RAMOS	Reproductive Age Mortality Study
RAPID	Rapid Ascertainment Process for Institutional Deaths
SMAG	Safe Motherhood Action Group
SMGL	Saving Mothers, Giving Life
VHT	Village Health Team
WHO	World Health Organization
WRA	women of reproductive age

Summary of Findings

Saving Mothers, Giving Life (SMGL) is a 5-year initiative designed to aggressively reduce deaths related to pregnancy and childbirth through a coordinated approach that strengthens maternal health services in high-mortality settings.

Phase 1 of the initiative resulted in sharp reductions in the number of maternal deaths in the eight pilot districts in Uganda and Zambia. The improvements in access to, availability of, and quality of maternity care in the participating districts have saved the lives of many women who experienced major obstetric complications. They have also saved the lives of many infants born to women with these complications.

Improvements were reported in nearly all measures of maternal and perinatal health tracked before and after Phase 1. For example,

Increase in the Institutional Delivery Rate: The SMGL initiative increased the number of women delivering at health facilities by encouraging communities to promote facility delivery, improving transportation, and preparing facilities for an increased demand in their services. In Uganda, the proportion of deliveries that took place at any health facility increased by 62%, from 46% before Phase 1 (baseline) to 74% after Phase 1 (endline). In Zambia, it increased by 35%, from 63% at baseline to 84% at endline.

Increase in EmONC Facility Births: The proportion of all births that take place in an Emergency Obstetric and Newborn Care (EmONC) facility serves as a crude indicator of the capacity of a country's health system to respond to obstetric and newborn emergencies. The proportion of all births delivered in EmONC facilities increased from 28% at baseline to 36% at endline in Uganda and from 26% to 30% in Zambia.

Increase in Active Management of the Third Stage of Labor (AMTSL): This critical intervention can prevent postpartum hemorrhage, which is a major cause of maternal death. It should be a routine standard of care in facilities providing

delivery care. In Uganda, the percentage of births in which the mother received AMTSL in Comprehensive EmONC facilities doubled, from 42% at baseline to 85% at endline.

Increase in Cesarean Section (C-section) as a Proportion of All Births: C-sections can prevent maternal and perinatal deaths and severe maternal health complications such as obstetric fistula. The World Health Organization recommends that C-sections make up 5%–15% of all births. In Uganda, the population-based C-section rate increased by 23%, from 5.3% at baseline to 6.5% at endline. In Zambia, the rate increased by 15%, from 2.7% to 3.1%.

Increase in Met Need for EmONC: The met need for EmONC is the proportion of all women with major obstetric complications who are treated in EmONC facilities. It is an indicator of whether the coverage and use of EmONC services are adequate. In both Uganda and Zambia, the met need improved. In Uganda, obstetric care for complications received in all health facilities increased by 42%, from 46% at baseline to 66% at endline. In Zambia, it increased by 31%, from 34% to 45%.

At EmONC facilities, met need increased by 25% in Uganda (from 39% to 49%) and by 23% in Zambia (from 26% to 32%).

Decrease in the Obstetric Case Fatality Rate (CFR): The CFR represents the proportion of women dying because of direct obstetric complications out of all women who were admitted to health facilities who experienced such complications. In Uganda, the all-facility CFR decreased by 25% (from 2.6% at baseline to 2.0% at endline).

The CFR for EmONC facilities in Uganda (providing either Basic or Comprehensive EmONC) fell by 18% (from 2.9% to 2.4%). In Zambia, the all-facility CFR decreased by 34% (from 3.1% to 2.0%), and the rate for EmONC facilities declined by 35% (from 3.4% to 2.2%).

Decrease in Maternal Mortality in Facilities:

In both countries, the maternal mortality ratio (MMR) in all facilities declined by 35%, from 534 maternal deaths per 100,000 live births at baseline to 345 per 100,000 at endline in Uganda and from 310 to 202 maternal deaths per 100,000 in Zambia. The MMR in EmONC facilities declined by 24% in Uganda (from 829 to 634 maternal deaths per 100,000) and by 28% in Zambia (from 629 to 453 maternal deaths per 100,000).

Decrease in Perinatal Deaths in Facilities:

The perinatal mortality rate (PMR) is defined in this report as the number of stillbirths and predischarge neonatal deaths divided by the total number of births in the same facilities. It is an overall measure of the quality of antenatal and obstetric care. In Uganda, the PMR fell by 17%, from 39.3 perinatal deaths per 1,000 live births at baseline to 32.7 per 1,000 at endline. In Zambia, it fell by 14%, from 37.9 to 32.8 perinatal deaths per 1,000.

Decrease in the Stillbirth Rate in Facilities:

Both Uganda and Zambia showed comparable declines in total stillbirth rates (20% and 19%, respectively). In Uganda, the intrapartum stillbirth rate declined by 28% (from 22.4 intrapartum stillbirths per 1,000 live births to 16.0 per 1,000), which suggests improvements in the quality of delivery care in health facilities.

Little Change in the Predischarge Neonatal

Mortality Rate (NMR): The NMR did not change significantly in either Uganda or Zambia. Given that the overall PMR decreased, the lack of change in predischarge NMR may be due to the poor survivability of infants who were saved from being stillborn. It may also be due to a change in the way stillbirths and live births were classified.

Introduction

Saving Mothers, Giving Life (SMGL) is a 5-year initiative designed to aggressively reduce deaths related to pregnancy and childbirth through a coordinated approach that strengthens maternal health services in high-mortality settings. SMGL's evidence-based interventions are focused primarily on the critical period of labor, delivery, and the 48 hours postpartum, when most maternal deaths and about half of newborn deaths occur. SMGL works to improve the existing health network within each district to ensure that women can receive quality facility-based care within 2 hours of the onset of labor or obstetric emergencies.

Coordinated and funded by a public-private partnership,¹ SMGL strives to improve access to, demand for, and the quality of basic and comprehensive Emergency Obstetric and Newborn Care (EmONC).² It also seeks to strengthen links to other essential services for women and children, including family planning and HIV prevention, care, and treatment.

SMGL began in June 2012 in eight pilot districts, four each in Uganda and Zambia (see Figure 1 for demographic and population data). Phase 1 (the pilot phase) activities took place from June 2012 through May 2013 and were preceded by a planning and start-up period of about 8 months.

The SMGL Model

SMGL's essential components and concepts include the following:

A comprehensive approach. Maternal deaths cannot be prevented by any one intervention alone. Reducing maternal mortality requires a solution that addresses multiple health system issues at multiple levels. SMGL uses evidence-based interventions that are designed to address three dangerous delays that pregnant women face in childbirth: delays in deciding to seek care for an obstetric emergency, delays in reaching a health facility in time, and delays in receiving quality care at health facilities.

An adequate number of high-quality delivery facilities, including EmONC, that are accessible within 2 hours of the onset of labor or obstetric emergencies.

An integrated communication-transportation system that functions 24 hours a day/7 days a week to encourage and enable pregnant women to use delivery care facilities. This system should include community outreach and interventions that increase awareness of these facilities.

An adequate number of skilled birth attendants who can provide quality care for normal delivery and who are able to identify and refer obstetric emergencies.

A functional supply chain system to ensure that facilities have the equipment, supplies, commodities, and drugs they need to deliver high-quality obstetric care.

A system that accurately records every birth and maternal and neonatal death.

1. Current partners are the American College of Obstetricians and Gynecologists, Every Mother Counts, Merck for Mothers, the Government of Norway, Project CURE, and the US Government [Centers for Disease Control and Prevention (CDC), US Agency for International Development (USAID), Peace Corps, US Department of Defense, and US Office of the Global AIDS Coordinator (OGAC)]. The governments of Uganda and Zambia were central to the partnership and all activities.
2. EmONC facilities are those that have recently performed specific life-saving obstetric interventions called "signal functions" that are recommended by the World Health Organization. Basic care interventions include administration of parenteral antibiotics, uterotonics, or anticonvulsants; manual removal of placenta; removal of retained products; assisted vaginal delivery; and basic neonatal resuscitation. Comprehensive care interventions include two additional services: ability to perform obstetric surgery (e.g., Cesarean section) and blood transfusion.

Figure 1. Demographic and Population Data for Uganda, Zambia, and Their SMGL-Supported Districts

Uganda



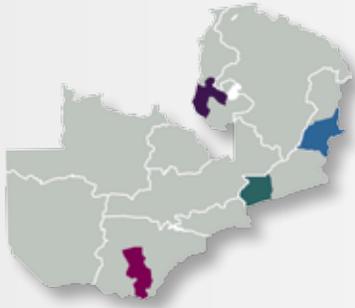
Uganda

Population of the country (2014 Uganda Bureau of Statistics projection)	36,615,600
Total fertility rate (2011 DHS)	6.2

SMGL-Supported Districts in Uganda

Total population of the 4 SMGL-supported districts (2011 Uganda Bureau of Statistics projection)	1,750,000
Estimated number of births in the 4 SMGL-supported districts during Phase 1 (2012–2013 endline data and DHS age-specific fertility rates)	78,261
Combined area of the 4 SMGL-supported districts	13,079 sq km
Population density of the 4 SMGL-supported districts	26.2 WRA per sq km

Zambia



Zambia

Population of the country (2010 national census)	13,092,666
Total fertility rate (2007 DHS)	6.2

SMGL-Supported Districts in Zambia

Total population of the 4 SMGL-supported districts (Projected from 2010 national census data for 2011)	925,198
Estimated number of births in the 4 SMGL-supported districts during Phase 1 (crude birth rate combined with census projection)	37,267
Combined area of the 4 SMGL-supported districts	49,412 sq km
Population density of the 4 SMGL-supported districts	3.9 WRA per sq km

SMGL = Saving Mothers, Giving Life; DHS = Demographic and Health Survey;
WRA = women of reproductive age.
Note: The total fertility rate indicates the average number of births a woman would have in her lifetime at current age-specific fertility rates.

Participating US Government agencies, along with partner governments and multiple partner organizations, built on existing district maternal and child health services. SMGL-supported staff conducted routine monitoring during the first year of the project, including baseline and endline assessments³ before and after Phase 1.

Results from monitoring and evaluation indicate that SMGL interventions are effective, because of a combination of the following factors:

- Greater **supply** of services, including increased availability of and improved access to obstetric services.
- Increased **demand** for obstetric and HIV services, due to voucher programs and intensified activities to increase community awareness, as well as to women's growing recognition of the importance of facility delivery and skilled attendance at birth.
- Improved **quality of care** at facilities that hired more staff, trained and mentored more staff in EmONC, stocked necessary equipment and supplies, and had reliable supplies of medicines.

The first year of SMGL was designed to provide “proof of concept” in the eight pilot districts to determine (1) if the SMGL interventions could improve health outcomes for women and their infants and (2) how these interventions could be scaled up as SMGL expands. The declines in mortality achieved in both countries are extraordinary given the short timeframe of Phase 1 (12 months).

This report, which focuses on Maternal and Perinatal Health Outcomes in Health Facilities, is one of five SMGL documents prepared by the Centers for Disease Control and Prevention (CDC) and by the Uganda and Zambia CDC country offices. The other documents are an Executive Summary and reports on the following topics: Monitoring and Evaluation Overview, Maternal Mortality, and Emergency Obstetric and Newborn Care Access and Availability.

CDC, in collaboration with the US Agency for International Development and the US Office of the Global AIDS Coordinator, led the monitoring and evaluation efforts for the SMGL initiative. These activities were conducted in close collaboration with the governments of Uganda and Zambia and partner organizations.

SMGL Monitoring and Evaluation

Extensive monitoring and evaluation (M&E) of SMGL during Phase 1 was essential to assess potential changes in the key indicators closely related to maternal and neonatal mortality. SMGL M&E efforts drew upon the experience of existing global initiatives designed to standardize data-collection methods for monitoring interventions, making decisions, and developing health policies related to maternal and neonatal outcomes and care.

The SMGL M&E Framework included a range of indicators designed to measure program achievements in Phase 1. These indicators can be grouped into four broad categories:

- **Impact**—such as changes in the number of maternal and newborn deaths.
- **Outcomes**—such as percentage of deliveries in health facilities and rates for Cesarean sections (C-sections).
- **Outputs**—such as the number of EmONC signal functions performed, HIV tests conducted, and PMTCT (prevention of mother-to-child HIV transmission) services provided.
- **Processes**—such as hiring and training personnel, upgrading facilities, and stockpiling life-saving medicines.

Several M&E methods were used to assess the various aspects of SMGL during Phase 1. The most important of these processes were

- **Health Facility Assessments (HFAs):** HFAs were conducted before and after Phase 1 at all facilities that provide delivery services in

3. SMGL baseline assessments generally covered the period before SMGL interventions started in June 2012. Endline assessments covered the first year of SMGL implementation, but varied by data source. Details are provided when data methods are presented.

SMGL-supported districts in both Uganda and Zambia. In Uganda, HFAs were conducted in 16 hospitals or Level IV health centers (high-level advanced care facilities), 72 Level III health centers (middle-level facilities), and 19 Level II health centers (lower-level primary care facilities), for a total of 107 facilities. In Zambia, HFAs were conducted in 6 hospitals, 91 health centers (middle-level facilities), and 16 health posts (lower-level facilities), for a total of 113 facilities.

The HFAs gathered baseline and endline data on maternity care infrastructure; EmONC availability and use; human resources; and drugs, equipment, and supplies. (See the Emergency Obstetric and Newborn Care Access and Availability report for more detail.)

■ **Routine Health Information Systems:**

Existing Health Management Information Systems (HMIS), which collect monthly statistics from health facilities, were used to monitor access to and quality, efficiency, and use of maternal and child health (MCH) services. For example, one health information system supported by the President's Emergency Plan for AIDS Relief (PEPFAR) monitors MCH and HIV-related indicators. (See the Emergency Obstetric and Newborn Care Access and Availability report for more detail.)

■ **Facility-Based Pregnancy Outcome**

Monitoring: To track key facility indicators, Uganda and Zambia intensified existing efforts to document maternal and neonatal outcomes accurately and completely. These outcomes included maternal complications, the use of life-saving interventions such as C-sections, and more thorough identification and investigation of maternal deaths.

In Zambia, reductions in maternal mortality were monitored through routine identification and investigation of deaths that occurred in facilities before and during SMGL Phase 1. (See later sections of this report, Maternal and Perinatal Outcomes in Health Facilities, for more detail.)

■ **Community-Based Maternal Mortality**

Identification: In Uganda, SMGL built on the existing data-collection infrastructure of the Village Health Teams (VHTs) to collect information on maternal deaths in the four SMGL-supported districts. To obtain baseline information, one member of the VHT visited each household in his or her village. If any households reported deaths of women of reproductive age (WRA) during the baseline period, health personnel at the parish level followed up. If the deceased woman had been pregnant at the time of her death or in the 3 months preceding it, a verbal autopsy interview was conducted in the household, followed by death certification and classification of cause of death.

After the SMGL initiative began in June 2012, monitoring switched to a prospective approach. VHTs reported on any death of WRA in the village, and the same procedure was followed. In October 2013, the SMGL partners conducted a second retrospective data collection to identify all deaths of WRA during Phase 1.

Zambia did not have a community-based system to collect health data in place before the SMGL initiative began. It set up a new system of community key informants, who tracked each pregnant woman until the end of the 42-day postpartum period. However, logistical challenges limited the coverage and completeness of the data gathered.

In addition, although a March 2012 census of the four SMGL-supported districts identified maternal deaths during the baseline period, an endline census did not occur. As a result, Zambia only monitored maternal deaths that occurred in health facilities. (See the Maternal Mortality report for more detail.)

Selected Key Findings from SMGL Phase 1

- **Maternal mortality fell sharply** (by 30%) in Uganda's four SMGL-supported districts. (The equivalent population-based maternal mortality ratios could not be calculated for SMGL-supported districts in Zambia.) Maternal mortality also declined by 35% in health facilities that implemented SMGL interventions in both Uganda and Zambia. These improvements are likely due to women's increased access to emergency obstetric care and the effective care they receive once they arrive at health facilities. (See the Maternal Mortality report for more detail.)
- **The percentage of all births in SMGL-supported districts that occurred at health facilities increased** from 46% to 74% in Uganda (a 62% increase) and from 63% to 84% in Zambia (a 35% increase). (See later sections of this report, Maternal and Perinatal Outcomes in Health Facilities, for more detail.)
- **The percentage of all facilities performing specific life-saving interventions called "signal functions" increased.** By the end of Phase 1, both countries had an adequate number of facilities (relative to each district's population) to provide Basic and Comprehensive EmONC. In particular, middle-level health clinics in both countries made substantial gains in their ability to perform more life-saving interventions. The percentage of middle-level facilities that were providing four or more of the recommended seven signal functions increased from 31% to 57% in Uganda and from 27% to 44% in Zambia. (See the Emergency Obstetric and Newborn Care Access and Availability report for more detail.)
- **SMGL-supported districts showed improvement in treatment for HIV-positive mothers and prophylaxis for their infants.** In Uganda, 28% more HIV-positive women received treatment and 27% more infants received prophylaxis. Increases in Zambia were 18% and 29%, respectively. (See the Emergency Obstetric and Newborn Care Access and Availability report for more detail.)

Assessing SMGL's Effect on Maternal and Perinatal Health Outcomes in Facilities

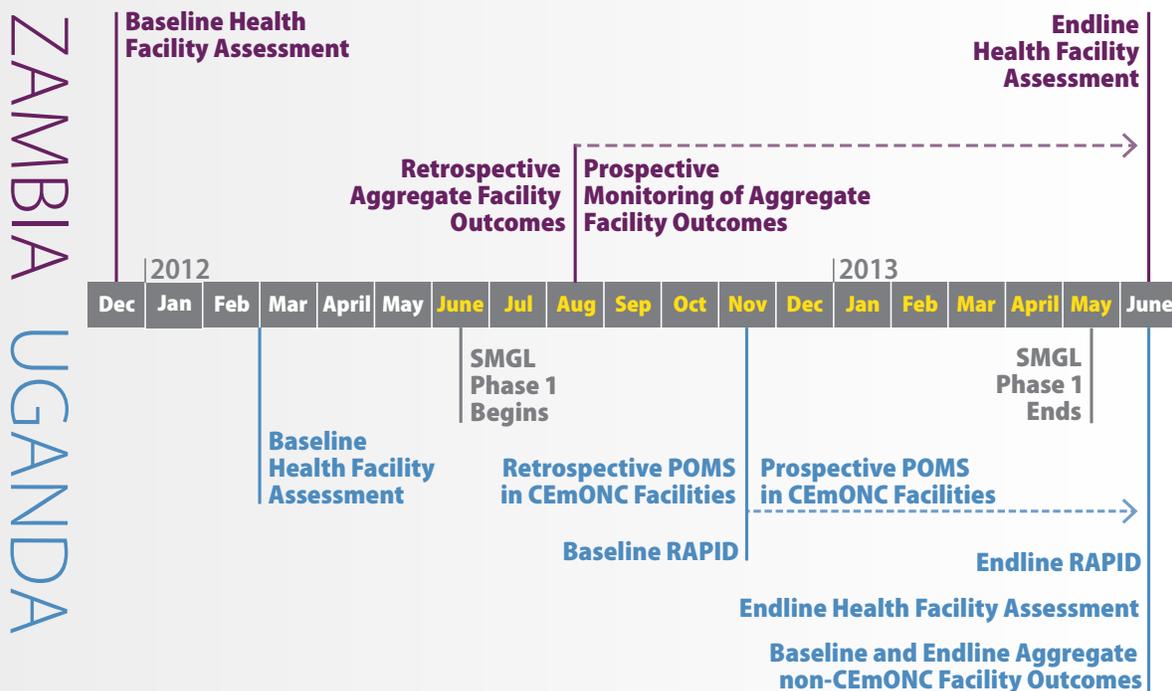
Maternal and perinatal outcome indicators reflect how effective SMGL interventions have been in improving Basic and Comprehensive EmONC in health facilities. SMGL-supported staff tracked several impact and outcome indicators of MCH services, including the following:

- Institutional delivery rate in EmONC facilities.
- Active Management of the Third Stage of Labor (AMTSL) rate.

- C-section rate.
- Met need for EmONC.
- Case fatality rate.
- Maternal mortality ratio.
- Perinatal mortality rate.
- Stillbirth rate.
- Predischarge neonatal mortality rate.

In Zambia, M&E data collection began before the official start-up in June 2012; SMGL-supported staff conducted situation analyses and transitional interventions in 2011. Lessons learned in Zambia were incorporated into the M&E plans for Uganda, where planning activities started in early 2012 (Figure 2).

Figure 2. Data Collection for Maternal and Perinatal Outcomes in Health Facilities in SMGL-Supported Districts in Uganda and Zambia



NOTE: Baseline period is June 2011–May 2012. Endline period is June 2012–May 2013.

POMS = Pregnancy Outcomes Monitoring Survey; RAPID = Rapid Ascertainment Process for Institutional Deaths;

SMGL = Saving Mothers, Giving Life.

For the purposes of monitoring facility outcomes, the baseline and endline periods are defined as 12-month periods that extended before and after the official SMGL launch. The baseline period included outcomes during June 2011–May 2012. The endline period included outcomes during June 2012–May 2013. In Uganda, data collection continued after May 2013 so that selected outcomes from June 2013 could be included.

MCH indicators in both countries were reported quarterly, from January–March 2011 through April–June 2013, to allow immediate feedback to the program. Results for some indicators are presented separately for all health facilities in SMGL-supported districts, as well as for those with Basic or Comprehensive EmONC.

Significance Testing

To determine whether changes between the baseline and endline periods were significant, SMGL evaluation staff calculated a z-statistic for the observed change, which is used to determine the significance levels of the change. These significance levels are presented in Tables 1 and 2 in the Maternal and Perinatal Health Indicators section (pages 27–28).

The data presented in this report are not subject to sampling error because they are complete counts, not samples. However, the data may be affected by random variation. That is, the number of events that actually occurred can be considered as one possible result among many possible results that could have arisen under the same circumstances. Thus, when a change is labeled as significant, it means that the difference is extremely unlikely to be due to random variability. See the Appendix (pages 31–35) for complete data.

Data Sources

Because of differences in existing data availability before SMGL, Uganda and Zambia used different data-collection approaches and tools to monitor their maternal and perinatal health outcomes. Although the definitions of indicators were standard, the differences in the primary data used to compute these indicators are substantial, and their direct comparison is not advisable.

In Uganda, data were collected through the following methods:

- A Pregnancy Outcomes Monitoring Survey (POMS) in Comprehensive EmONC (CEmONC) facilities that collected individual-level data on all pregnancy outcomes.
- An aggregation of all pregnancy outcomes data from non-CEmONCs (POMS aggregate).
- The RAPID (Rapid Ascertainment Process for Institutional Deaths) method, which was developed by Immpact, a global research initiative. The RAPID method identifies unreported maternal deaths in health facilities by reviewing all facility records relating to deaths among women of reproductive age (aged 15–49 years), and then identifying those that are pregnancy-related (Immpact, 2007). This approach minimizes the underreporting of maternal deaths that occur outside the obstetric area, which can be missed in routine reporting.
- Population data from a mini-census in the four SMGL-supported districts.
- A Reproductive Age Mortality Study (RAMOS) cross-checked with facility data.

In Zambia, data were collected through the following methods:

- Routine, facility-level aggregated data collected monthly or quarterly.
- Population data from the 2010 national census.
- SMGL baseline census to identify women of reproductive age, followed by verbal autopsies. For endline data, deaths were reported by community key informants, cross-checked with facility monitoring reports.

Details about these collection methods are described in more detail in the following sections.

Uganda

Pregnancy Outcomes Monitoring Survey

The baseline HFA found that pregnancy outcome events were poorly captured in the routine health information system. To correct for this problem, SMGL-supported staff conducted a retrospective POMS in November 2012 in 16 CEmONC facilities (hospitals and Level IV health centers), collecting data from the period January 2011 - October 2012. From November 2012 on, POMS collected data prospectively.

The POMS captured individual-level data on the outcomes of pregnant women who received care at these facilities. Births at the 16 CEmONC facilities accounted for about 59% of all births in SMGL-supported health facilities that provide delivery care in 2011, according to the baseline HFA data.

The POMS collected individual-level data from the 16 CEmONC facilities on the following:

- Maternal age.
- Parity.
- Type of delivery.
- Presentation and position.
- Plurality (e.g., twins, triplets).
- Pregnancy outcome.
- Apgar scores.
- Maternal and newborn complications.
- Weight at birth.
- Provision of AMTSL.
- Obstetric surgeries and pregnancy terminations.

The POMS' data-collection tools and standard operating procedures were designed to extract individual-level data from the following primary data sources:

- Maternity registers.
- Operation theater registers (obstetric and general theaters).

- Registers from women's inpatient wards (obstetrics, gynecology, and female wards), including admission and discharge registers, daily report registers, and nurses' "round books."
- Maternal death notification forms and audit forms.

For each patient, up to three maternal complications were recorded, with the most immediately life-threatening complication listed first.

Aggregated Data from Non-CEmONC Facilities

SMGL-supported staff collected aggregate pregnancy outcome data from nine Basic EmONC (BEmONC) facilities and 103 non-EmONC facilities from data collection forms used as part of a point-in-time HFA questionnaire (Averting Maternal Death and Disability Program, 2010).

These data were retrospective, covering 29 months (January 2011–May 2013), and were collected in conjunction with the endline HFA. Data were also actively collected from maternity registers, typically the only data source in lower-level facilities.

The aggregate HFA pregnancy outcome data and the individual-level POMS data were summed for each month to provide estimates for the main indicators of obstetric care in EmONC facilities. The aggregate pregnancy outcomes were the only source of estimates of obstetric care in non-EmONC facilities.

Population Data

Population data were needed to estimate the number of births, which was used in the denominator of many of the SMGL indicators. In the absence of a recent Uganda census (the last one was in 2002), establishing population estimates for SMGL-supported districts was a challenge.

This challenge was compounded by variations in population projections issued and used by different institutions in Uganda. Thus, SMGL-supported staff decided to conduct a four-district census at the end of Phase 1, using the existing VHTs to collect data.

Trained interviewers counted all women of reproductive age (WRA) and their live births during June 2012–May 2013. They also counted all deaths of WRA that occurred during the same period. Virtually all villages (98%) in the four districts were included. This process was part of the endline RAMOS conducted in October–November 2013. Baseline and endline RAMOSs are described in the SMGL report on Maternal Mortality.

The four-district census counted about 400,000 WRA, a figure similar to the district-level WRA population estimates for the four districts. The number of live births counted in the census was about 35% lower than what had been estimated from the results of the 2011 Uganda Demographic and Health Survey (Uganda Bureau of Statistics and ICF International Inc., 2012). Thus, 2011 age-specific fertility rates were applied to the WRA and stratified by age group to estimate the number of live births at endline and baseline.

Maternal Death Identification

All community-level maternal deaths identified during the RAMOS (baseline and endline) were cross-checked with WRA deaths identified in EmONC facilities (detected by the RAPID method in CEmONC facilities and by HFAs in other health facilities). Maternal deaths from both sources were matched by age, residence, date of death, place of death, and cause of death, when available.

When a facility maternal death was reported in a RAMOS but not identified through facility reviews, it was added to the count of facility maternal deaths. This method improved the case detection of facility maternal deaths and contributed to changes in the notification and reporting of maternal deaths in medical records in both Uganda and Zambia. The SMGL initiative has also raised awareness about the importance of routine maternal death notifications and audits, and facility reporting of maternal deaths improved during Phase 1.

RAMOS and facility death reports provided data on case fatality rates and other estimates related to maternal deaths that are facility-related.

Zambia

Routine Program Monitoring

SMGL implementing partners in Zambia conducted routine monthly or quarterly facility-level data collection, focusing on pregnancy outcomes in facilities in SMGL-supported districts. SMGL-supported staff and mentoring midwives were responsible for routinely collecting data from clinical registers.

The country also reviewed various indicators related to MCH and updated the recording registers. SMGL-supported headquarters staff trained the field staff and performed quality improvement exercises to strengthen the district's data-collection system.

M&E teams in Zambia collected aggregated data on maternal and perinatal outcomes from all health facilities in SMGL-supported districts as part of the baseline HFA. Once the SMGL interventions were introduced, M&E data collection occurred monthly or quarterly. The data were used to calculate a standard set of core indicators, based on those recommended by the World Health Organization (WHO). Official Ministry of Health registers were the source of information for the number of

- Vaginal deliveries.
- C-section deliveries.
- Live births.
- Stillbirths.
- Neonatal deaths.
- Maternal and neonatal complications.

Population Data

In Zambia, data from the 2010 census were used to calculate district populations. The total number of expected births was estimated by applying the crude birth rate of 40 live births per 1,000 population reported in the

2010 census. Projections of the population and number of births at endline were based on the population growth in each district.

Maternal Death Identification

Similar to the efforts in Uganda, maternal deaths were identified in health facilities in Zambia through two sources: facility-based data and community-based data, which were then cross-checked with facility information. Data reports included deaths from direct and indirect obstetric causes that were captured in the routine monitoring of pregnancy outcomes (monthly or quarterly) in health facilities in SMGL-supported districts.

To verify the number of maternal deaths in facilities at baseline (before the SMGL intervention began), SMGL-supported staff used information on the place of death collected in a baseline mortality household census conducted during March–April 2012. (See the SMGL report on Maternal Mortality for more information about this survey.)

Maternal deaths reported to have occurred in facilities in SMGL-supported districts were cross-checked with facility monitoring reports of maternal deaths. If a facility death was reported in the household survey but was not recorded in the facility's monthly monitoring statistics, the death was identified as facility-based.

Similarly, cross-checks were performed for deaths that occurred during SMGL Phase 1, but were limited to a smaller number of maternal deaths identified by community key informants. This information included 30 confirmed maternal deaths. Deaths reported to have occurred in facilities were cross-checked with the facility monitoring reports. As with the baseline data, unmatched deaths were added to the facility counts of maternal deaths.

Maternal and Perinatal Health Indicators

To significantly reduce maternal mortality, women with delivery complications must have access to emergency obstetric care. As predicting which women will experience obstetric complications is nearly impossible, the SMGL model is designed to improve access to EmONC for all women in labor.

EmONC facilities include those with Basic (BEmONC) and Comprehensive (CEmONC) levels of care. Basic care interventions include administration of parenteral antibiotics, uterotonics, and anticonvulsants; manual removal of placenta; removal of retained products; assisted vaginal delivery; and basic neonatal resuscitation. Comprehensive care interventions include all basic functions, plus obstetric surgery and blood transfusion.

In both Uganda and Zambia, only a few middle-level health facilities provide full BEmONC services. Nearly all hospitals (and a few high-level health centers in Uganda) provided CEmONC.

Data for the indicators discussed in this section are summarized in Tables 1 and 2 (pages 27–28).

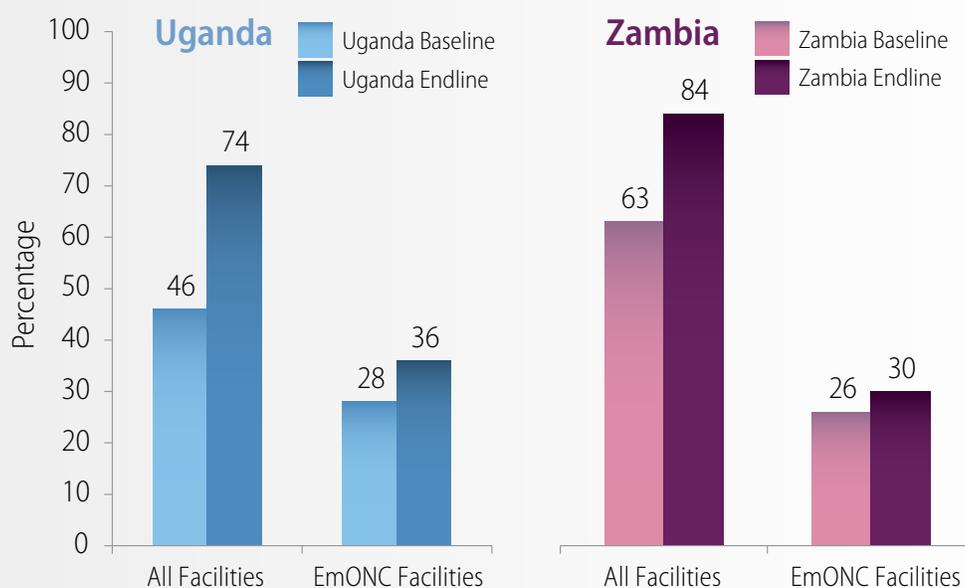
Institutional Delivery Rate

The SMGL initiative increased the number of women delivering at health facilities in the pilot countries by encouraging communities to promote facility delivery, improving transportation, and preparing facilities for an increased demand in their services.

In Uganda, the proportion of deliveries that took place at any health facility increased by 62%, from 46% at baseline to 74% at endline (Figure 3). In Zambia, the proportion increased by 35%, from 63% at baseline to 84% at endline.

Most of this increase in the institutional delivery rate came from the higher use of middle-level and low-level health facilities staffed with

Figure 3. Percentage of Births That Took Place in Health Facilities in SMGL-Supported Districts in Uganda and Zambia, by Facility Type, Before and After SMGL



EmONC = Emergency Obstetric and Newborn Care; SMGL = Saving Mothers, Giving Life.

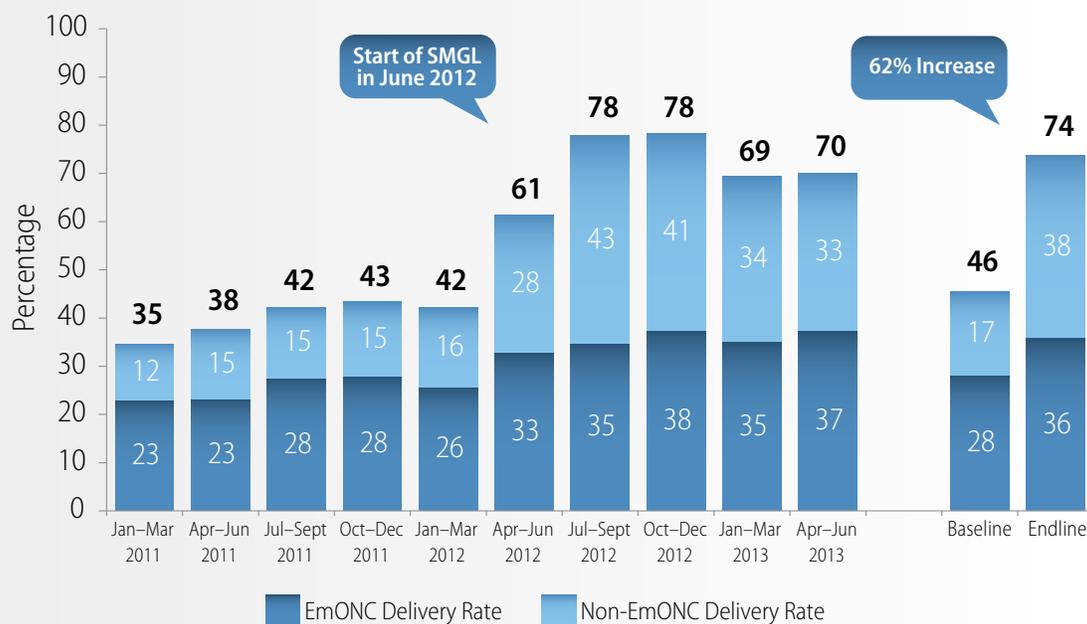
skilled birth attendants—that is, Level II and III health centers in Uganda and health centers and health posts in Zambia. This change in usage allows higher-level EmONC facilities to focus on providing better care for more complicated cases.

Ideally, all births should occur in an EmONC facility. However, a period of transition may be needed, during which women who want to deliver in a health facility receive care from a skilled birth attendant in a facility that may not be able to perform all seven BEmONC functions, but has transportation available in case of an emergency.

Proportion of All Births in EmONC Facilities

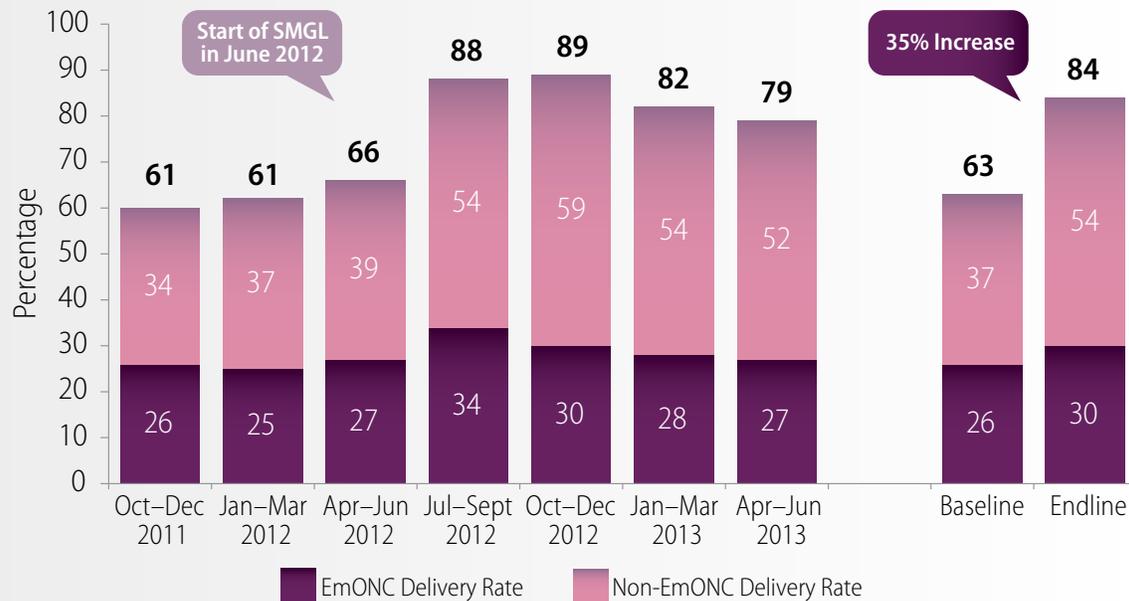
The proportion of all births that take place in an EmONC facility serves as a crude indicator of the capacity of a country’s health system to respond to obstetric and newborn emergencies. Because most complications are hard to predict, the goal of the SMGL initiative is for all women in labor to be able to access EmONC services within 2 hours. The proportion of births delivered in EmONC facilities increased from 28% at baseline to 36% at endline in Uganda and from 26% to 30% in Zambia (Figures 4 and 5).

Figure 4. Percentage of Births That Took Place in Health Facilities in SMGL-Supported Districts in Uganda, by Facility Type and Quarter



EmONC = Emergency Obstetric and Newborn Care; SMGL = Saving Mothers, Giving Life.

Figure 5. Percentage of Births That Took Place in Health Facilities in SMGL-Supported Districts in Zambia, by Facility Type and Quarter



EmONC = Emergency Obstetric and Newborn Care; SMGL = Saving Mothers, Giving Life.

Active Management of the Third Stage of Labor

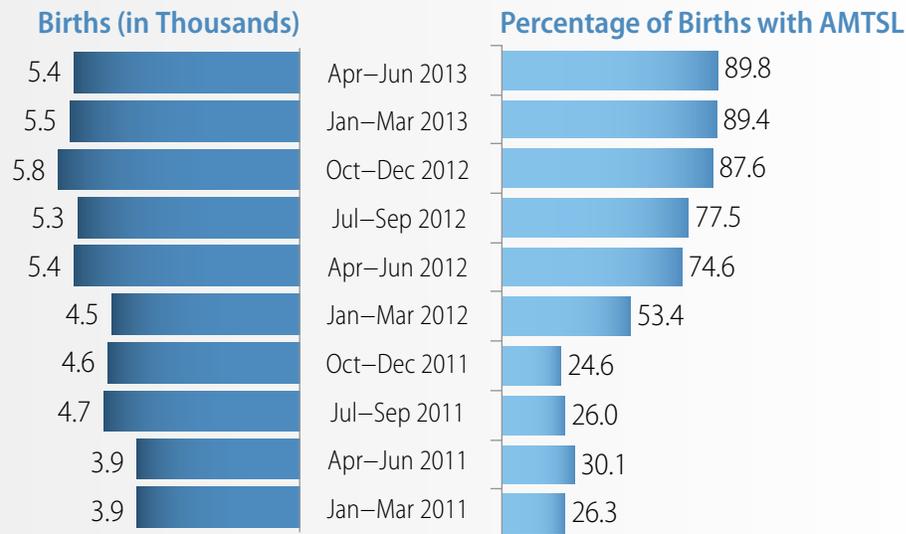
Postpartum hemorrhage (PPH) is the leading cause of maternal mortality worldwide. More than one of four maternal deaths is caused by PPH, which is defined as blood loss of more than 500cc after vaginal birth and more than 1,000cc after C-section (World Health Organization, 2000). WHO recommends Active Management of the Third Stage of Labor (AMTSL) as a critical intervention to prevent PPH.

AMTSL should be a routine standard of care in facilities that provide delivery care. AMTSL involves giving a prophylactic uterotonic drug to a woman after her baby is delivered, as opposed to “expectant management,” which means waiting for the placenta to separate and be delivered spontaneously.

This intervention can prevent a retained placenta and PPH, both of which can lead to rapid maternal death, by causing the uterus to contract after the placenta is delivered.

Because the use of AMTSL may be incompletely documented in lower-level facilities, its use was only examined in CEmONC facilities in Uganda (where individual birth data were collected for 30 months). In Uganda, the percentage of births that used AMTSL in CEmONC facilities doubled, from 42% at baseline to 85% at endline. This increase occurred at the same time as a sharp increase in the number of births in CEmONC facilities. This change shows the ability of these facilities to increase the use of life-saving interventions while also responding to increased demand for institutional delivery (Figure 6).

Figure 6. Number of Births in CEmONC Facilities and Percentage of Births with AMTSL in CEmONC Facilities in SMGL-Supported Districts in Uganda, by Quarter



CEmONC = Comprehensive Emergency Obstetric and Newborn Care; AMTSL = Active Management of the Third Stage of Labor; SMGL = Saving Mothers, Giving Life.

Cesarean Sections as a Proportion of All Births

Cesarean sections (C-sections) can prevent both maternal and perinatal deaths, as well as severe maternal health complications such as obstetric fistula. The population-based C-section rate (number of C-sections performed as a proportion of all births) is an indicator of access to life-saving obstetric care. WHO recommends that C-sections make up 5%–15% of all births (World Health Organization, 1985).

A C-section rate of less than 5% suggests that women in need of this life-saving procedure are not able to access it. Lack of access is an important contributor to high maternal and perinatal death rates in resource-limited settings.

C-section requires skilled staff and adequately supplied facilities, both of which increased and improved as a result of the SMGL interventions. The interventions that contributed to higher numbers of C-sections in Uganda and Zambia included

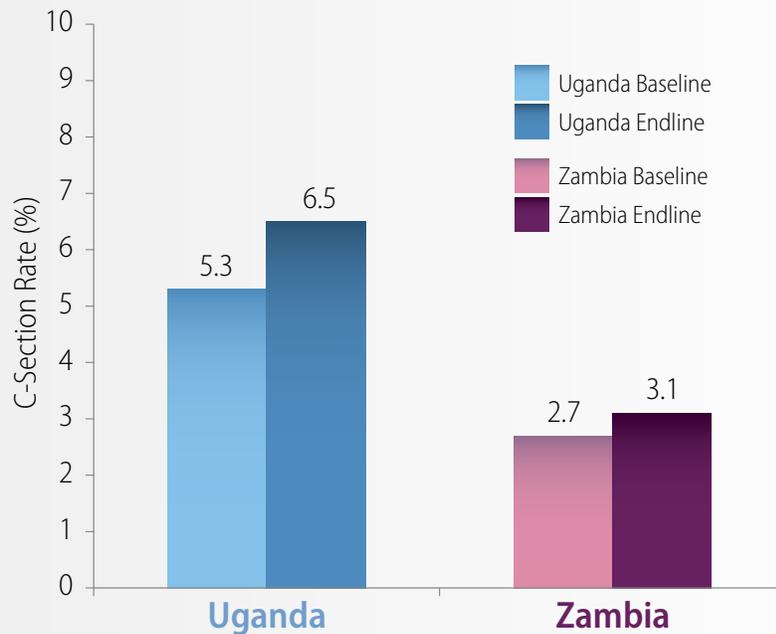
- More CEmONC facilities.
- Improved transportation.
- Improved emergency referrals from lower to higher levels of care for women with complications.

In Uganda’s SMGL-supported districts, the population-based C-section rate increased by 23%, from 5.3% at baseline to 6.5% at endline. In Zambia, the rate increased by 15%, from 2.7% at baseline to 3.1% at endline (Figure 7).

Although Uganda’s rates fall within the optimal 5%–15% range, Zambia’s rates remain lower than 5%. One challenge in Zambia has been a shortage of clinicians with surgical skills. However, improvements in transport and referral capabilities as part of the SMGL initiative helped increase access to neighboring district hospitals with obstetric surgical care, particularly for women with complicated deliveries.

In addition, the C-section rate in Zambia may have been underestimated because of referrals from SMGL-supported districts to

Figure 7. C-Section Rate^a as a Proportion of All Births in SMGL-Supported Districts in Uganda and Zambia, Before and After SMGL



C-Section = Cesarean section; SMGL = Saving Mothers, Giving Life.

^a Number of C-sections performed in health facilities divided by the expected number of live births in that area during the same period; expressed as a percentage.

neighboring non-SMGL-supported districts. For example, pregnant women living in the northern part of the SMGL-supported district of Kolomo, a rural region far from any CEmONC facility, are referred to Choma Regional Hospital in a neighboring non-SMGL-supported district. C-sections performed at this facility would not have been counted in the SMGL assessments.

In Uganda, the increase in C-sections during Phase 1 of the SMGL Initiative was primarily due to system upgrades that SMGL introduced in Level IV (high level) health centers (Figure 8). These included renovations and increased staffing, training, equipment, and supplies. Level IV health centers reported a 2.5-fold increase in the proportion of deliveries by C-section and, at endline, accounted for more than 40% of C-sections in SMGL-supported districts (Figure 8).

The most common reason reported for performing C-sections in Uganda was obstructed labor (more than 50%). This complication occurs when the fetus cannot enter or advance through the birth canal despite sustained

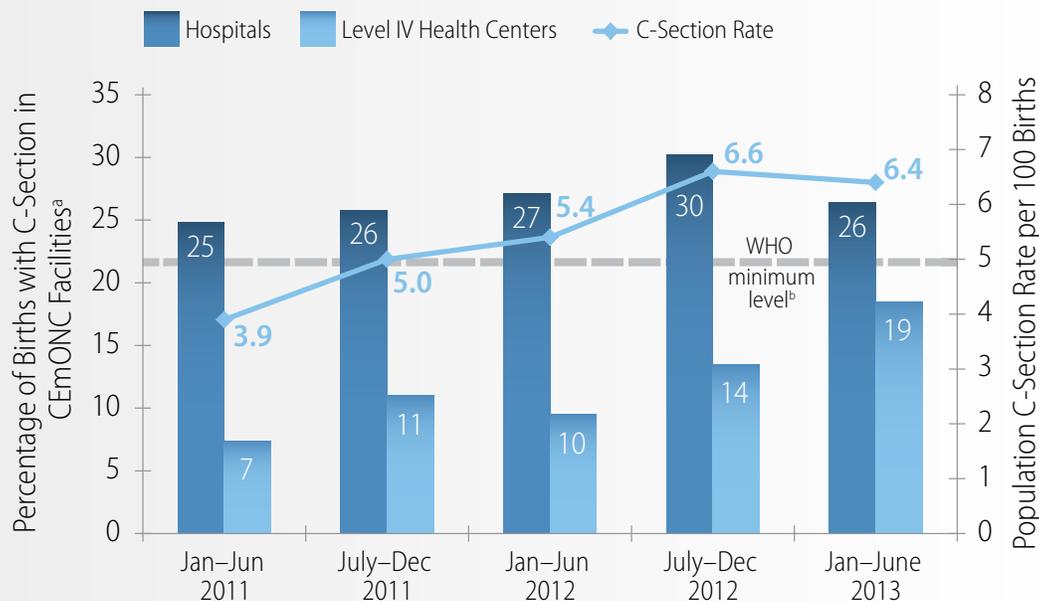
labor contractions. Without access to C-section, women with obstructed labor have a high risk of death at delivery, postpartum sepsis, or obstetric fistulas (one of the most devastating birth injuries). Lack of access to C-sections can also adversely affect perinatal outcomes.

Met Need for EmONC

The met need for EmONC is the proportion of all women with major obstetric complications who are treated in EmONC facilities. It is an indicator of whether the coverage and use of EmONC services are adequate. WHO recommends use of the met need indicator in two settings: all health facilities and EmONC facilities (World Health Organization, 2009).

The numerator for this indicator is women admitted with or who develop direct or major obstetric complications while delivering in a health facility. The denominator is the estimated number of women with severe obstetric complications in the same geographical area

Figure 8. Percentage of Deliveries by C-Section in Hospitals and Level IV Health Centers and Population C-Section Rate in SMGL-Supported Districts in Uganda



CEmONC = Comprehensive Emergency Obstetric and Newborn Care; SMGL = Saving Mothers, Giving Life.

^a Includes hospitals and Level IV health centers.

^b The World Health Organization recommends that C-sections make up 5%–15% of all births.

and time period. An estimated 15% of pregnant women will develop obstetric complications that require medical care to avoid death or disability (World Health Organization, 2009). Because the number of pregnant women may be difficult to ascertain, the number of live births is used as a proxy. Direct or major obstetric complications include

- Hemorrhage (antepartum, intrapartum, or postpartum).
- Prolonged or obstructed labor.
- Ruptured uterus.
- Postpartum sepsis.
- Complications of abortion.
- Preeclampsia or eclampsia.
- Ectopic pregnancy.

In both Uganda and Zambia, information on major complications is typically recorded

in facilities' maternity registers or labor and delivery logbooks. To ensure completeness, the SMGL-supported staff working in EmONC facilities in Uganda gathered information on obstetric complications from maternity wards and from other hospital wards and registers (e.g., gynecology wards, surgical wards, morgues). To avoid double counting, only complications associated with the delivery and immediate postpartum periods were recorded.

Trends in met need reflect changes in access and use of EmONC services among women who need them the most. They are also typically correlated with changes in population-level maternal mortality.

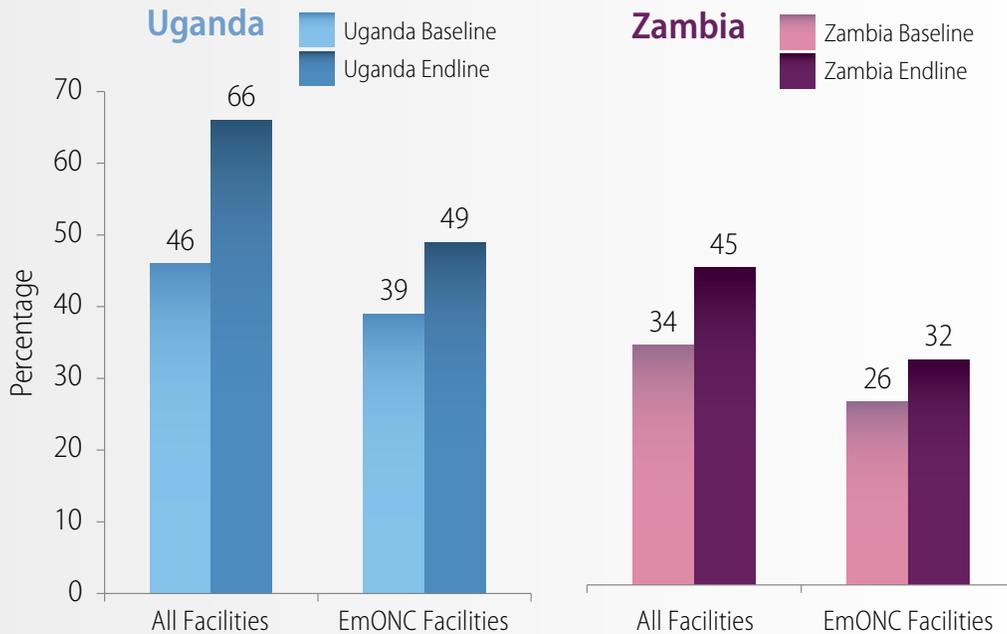
Ideally, all women with obstetric complications should receive the medical care they need—that is, met need should be 100%—but this goal is hard to meet in low-resource settings. Progress toward this goal is

an important sign of improvements in the availability and accessibility of EmONC services. Estimating met need is an important way to monitor improvements in these services.

Experts recommend that the met need indicator be calculated with and without abortion complications. Abortion complications are not included in the calculation of met need data presented for Uganda. If they had been, the met need for EmONC would have been higher.

When all health facilities were examined, met need increased by 42% in Uganda (from 46% at baseline to 66% at endline) and by 31% in Zambia (from 34% to 45%) (Figure 9). When only EmONC facilities were examined, the increase was 25% in Uganda (from 39% to 49%) and 23% in Zambia (from 26% to 32%).

Figure 9. Percentage of Met Need for EmONC^a in Health Facilities in SMGL-Supported Districts in Uganda and Zambia, by Facility Type, Before and After SMGL



EmONC = Emergency Obstetric and Newborn Care; SMGL = Saving Mothers, Giving Life.
^a Per 100 expected complications.

Direct Obstetric Case Fatality Rate

The direct obstetric case fatality rate (CFR) represents the proportion of women with direct obstetric complications admitted to delivering facilities who died. This rate serves as a quality of care indicator. A strong correlation generally exists between CFRs and rates for facility-based maternal mortality.

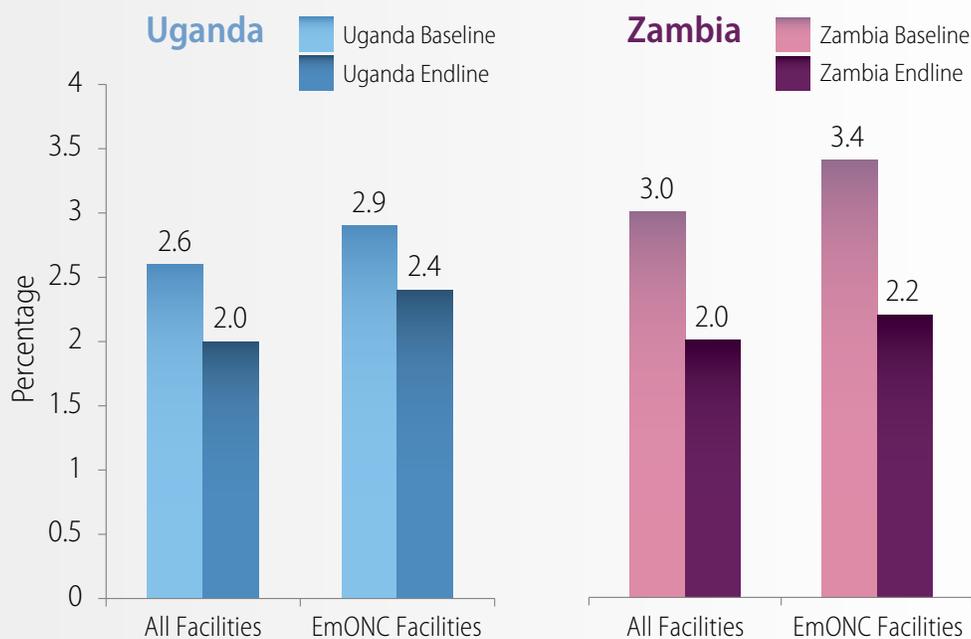
Researchers are particularly interested in whether patient case management in higher-level facilities improves over time. Typically, as transportation and referral systems improve, women with more severe complications are referred to higher-level facilities. Thus, CFRs were calculated for all health facilities in SMGL-supported districts, as well as for EmONC facilities. (For details on SMGL-assisted improvements in transportation and quality of care, see the Obstetric Care Services Access and Availability report.)

In both Uganda and Zambia, the direct obstetric CFR fell in all health facilities in SMGL-supported districts after SMGL interventions were implemented (Figure 10). This finding strongly suggests that the quality of care for direct obstetric complications improved.

In Uganda, the all-facility CFR decreased by 25%, from 2.6% at baseline to 2.0% at endline. The CFR for EmONC facilities (those providing either BEmONC or CEmONC) decreased by 18%, from 2.9% to 2.4%. In Zambia, the all-facility CFR decreased by 33%, from 3.0% at baseline to 2.0% at endline. The CFR for EmONC facilities decreased by 35%, from 3.4% to 2.2%.

The reduction of CFR in non-EmONC facilities was even higher, declining by 75% in Uganda (from 3.2% to 0.78%) and by 24% in Zambia (from 2% to 1.5%). (See Appendix on pages 31–35 for complete data.) The steep declines in non-EmONC facilities are likely due to improved transportation and emergency referrals, which led to more women with complications in lower-level facilities being

Figure 10. Direct Obstetric Case Fatality Rate^a in Health Facilities in SMGL-Supported Districts in Uganda and Zambia, by Facility Type, Before and After SMGL



EmONC = Emergency Obstetric and Newborn Care; SMGL = Saving Mothers, Giving Life.
^a Per 100 complications treated.

transferred to EmONC facilities for management of complications. Consequently, there were fewer deaths in non-EmONC facilities.

Maternal Deaths

A maternal death is defined by WHO as the death of a woman while pregnant or within 42 days of the termination of pregnancy, irrespective of the duration or site of the pregnancy, for any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. Maternal deaths can be due to direct or indirect obstetric causes of death (World Health Organization, 1992).

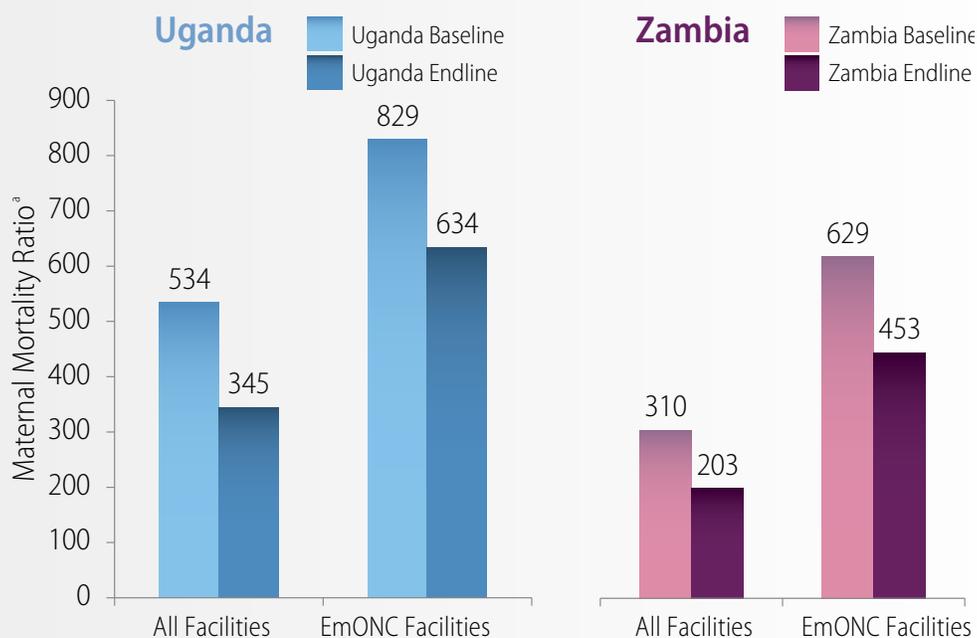
This report describes maternal mortality in health facilities only. Additional analyses that include maternal deaths in the community are presented in the SMGL report on Maternal Mortality.

SMGL-supported staff enhanced the ability of districts in Uganda and Zambia to conduct maternal death audits and reviews by

- Training health staff to identify maternal deaths in facilities.
- Making notification and review forms available in each facility.
- Implementing protocols and guidelines.
- Training district doctors how to certify and code the causes of maternal deaths onsite with the *International Classification of Diseases, 10th Revision* (World Health Organization, 2012). This practice is new in Uganda.

Direct obstetric causes include causes related to pregnancy and its management. The main direct obstetric causes are antepartum and postpartum hemorrhage, uterine rupture, obstructed labor, abortion, preeclampsia or eclampsia, and sepsis. Indirect obstetric causes include tuberculosis, malaria, HIV infection, and cardiovascular diseases that are aggravated by pregnancy, childbirth, or puerperium.

Figure 11. Maternal Mortality Ratio^a in Health Facilities in SMGL-Supported Districts in Uganda and Zambia, by Facility Type, Before and After SMGL



EmONC = Emergency Obstetric and Newborn Care; SMGL = Saving Mothers, Giving Life.
^a Per 100,000 live births.

The maternal mortality ratio (MMR) in facilities is defined as the number of all maternal deaths from direct and indirect obstetric causes in facilities per 100,000 live births delivered in the same facilities during a specific period.

The MMR is related to access to and the quality of obstetric services. It is the ultimate indicator of maternal health and whether interventions designed to improve maternal health have been successful. The facility-based MMR should generally not be viewed as representative of a larger area, such as SMGL-supported districts. It may be higher or lower than the general population-based ratio depending on the mix of patients (with more or fewer complications) and the timeliness of referrals. Further, women from other districts may seek care in SMGL-affiliated facilities.

In Uganda, the MMR for all health facilities in SMGL-supported districts declined by 35%, from 534 maternal deaths per 100,000 live births at baseline to 345 per 100,000 at endline. The

MMR for EmONC facilities declined by 24%, from 829 to 634 maternal deaths per 100,000 (Figure 11). In Zambia, the MMR for all health facilities in SMGL districts declined by 35%, from 310 maternal deaths per 100,000 live births at baseline to 202 per 100,000 at endline. The MMR for EmONC facilities declined by 28%, from 629 to 453 maternal deaths per 100,000.

The declines in MMR correlate with reductions in the all-facility CFR due to major obstetric complications (from 2.6% to 2.0% in Uganda and from 3.1% to 2.0% in Zambia), which indicates that facilities in SMGL-supported districts have improved their quality of care. Most of the declines could be attributed to the reduced risk of dying from direct obstetric complications. The SMGL initiative specifically seeks to reduce maternal deaths in the period around labor and delivery, when major obstetric complications are the most lethal.

Figure 12. Maternal Mortality Ratios^a for Direct Obstetric Causes in Health Facilities in SMGL-Supported Districts in Uganda, Before and After SMGL

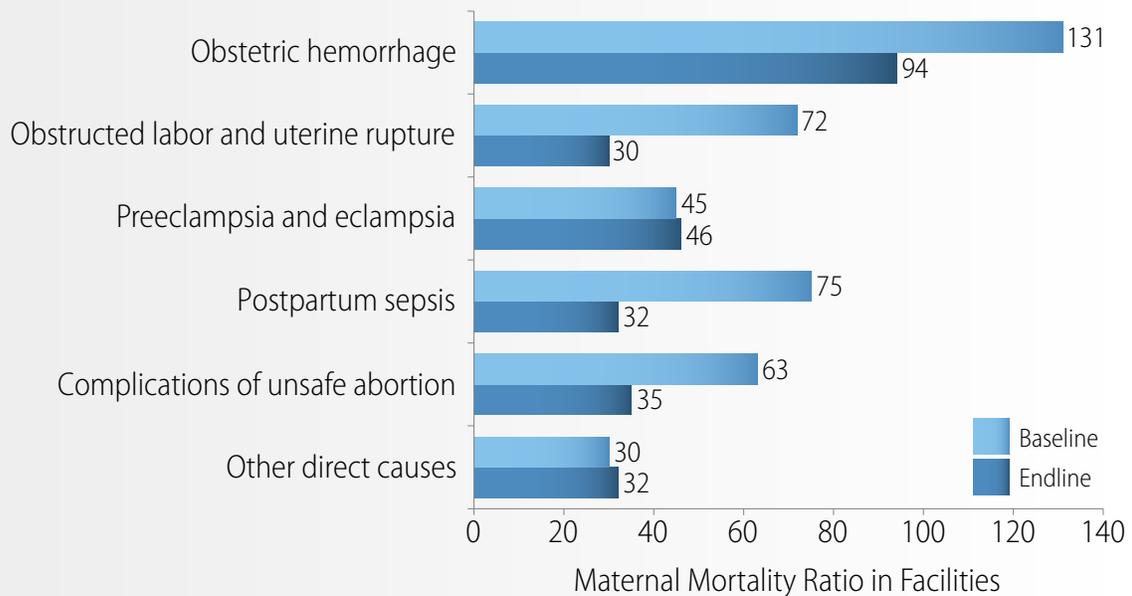
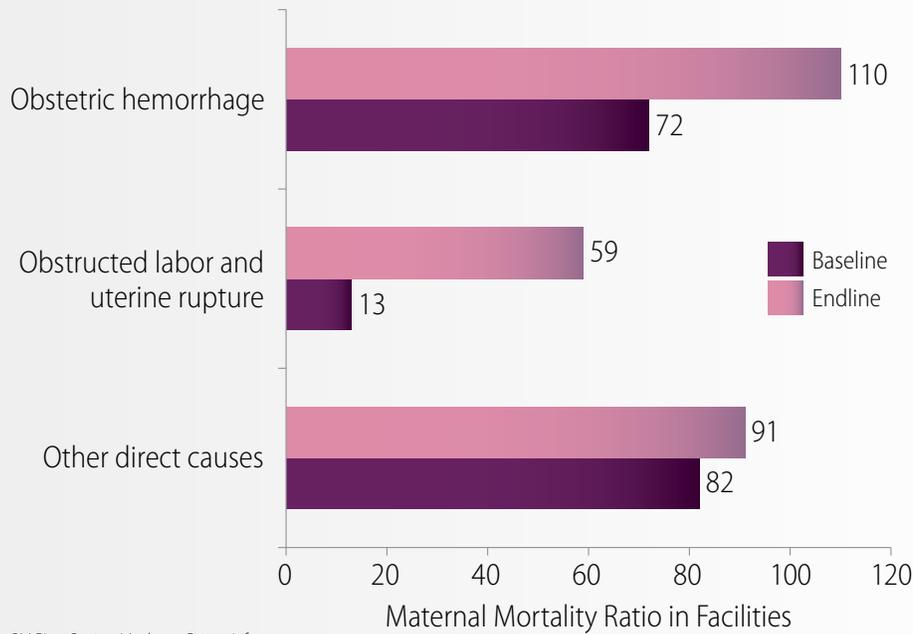


Figure 13. Maternal Mortality Ratios^a for Direct Obstetric Causes in Health Facilities in SMGL-Supported Districts in Zambia, Before and After SMGL



Obstetric hemorrhage was and continues to be the leading cause of maternal death in both Uganda and Zambia (Figures 12 and 13). However, deaths due to hemorrhage declined rapidly—by 29% in Uganda and by 34% in Zambia—during Phase 1 of the SMGL initiative. This finding suggests that the increased access to and availability of CEmONC and the routine practice of AMTSL were able to sharply improve maternal outcomes.

Obstructed labor and its most severe complication, rupture of the uterus, were the second most common contributors to MMRs

from direct obstetric causes in both countries. The MMRs for these causes also declined dramatically during Phase 1—by 58% in Uganda and by 78% in Zambia. The increased use of CEmONC (particularly the availability of obstetric surgery and safe blood) and the provision of parenteral antibiotics most likely contributed to reductions in the number of deaths due to obstructed labor and postpartum infections.

Perinatal Mortality Rate in Health Facilities

The perinatal mortality rate (PMR) combines stillbirths and early neonatal deaths. It provides an overall understanding of what is happening to a fetus or newborn in the continuum from before labor, through labor and delivery, and after birth. The PMR is an overall measure of the antenatal and obstetric care provided during childbirth. It is defined in this report as the number of stillbirths and pre-discharge neonatal deaths divided by the total number of births in the same facilities. It is expressed as per 1,000 births.

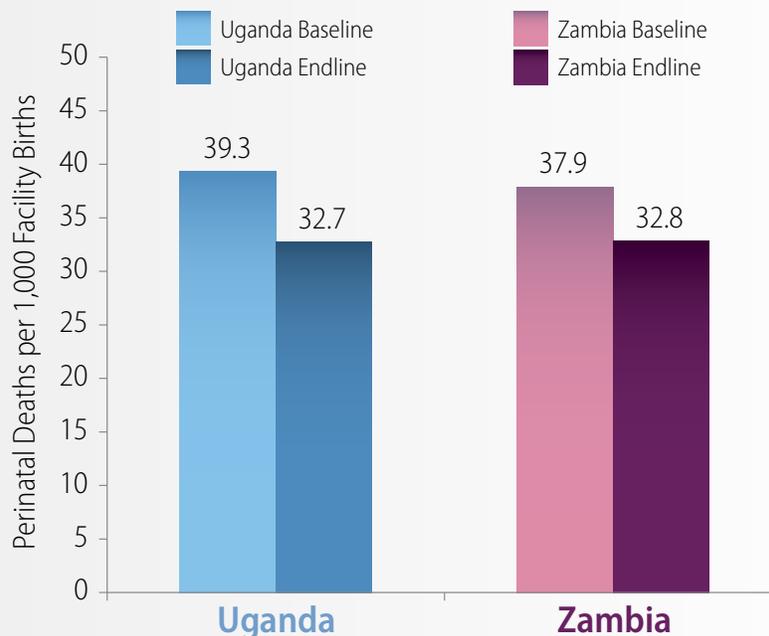
The PMR is important for several reasons. In some settings, a baby that is born alive but dies soon after may be misclassified as a stillbirth, rather than being classified as a live birth resulting in a neonatal death. The PMR minimizes the effect of such

misclassification by capturing all deaths whether they happened before or after delivery.

The PMR can also help researchers understand the holistic effect of perinatal interventions. Rather than focusing on outcomes of stillbirths or neonatal deaths, the PMR integrates the natural continuum between them. This information can be used, for example, to identify perinatal interventions that are able to reduce stillbirths yet are not able to improve the neonatal survival of infants “saved” from being a stillbirth. The PMR captures this potential shift in the timing of the fetal or infant death.

In Uganda, the PMR in health facilities in SMGL-supported districts decreased by 17%, from 39.3 perinatal deaths per 1,000 births at baseline to 32.7 per 1,000 at endline. In Zambia, the PMR decreased by 14%, from 37.9 to 32.8 perinatal deaths per 1,000 (Figure 14).

Figure 14. Perinatal Mortality Rate in Health Facilities in SMGL-Supported Districts in Uganda and Zambia, Before and After SMGL



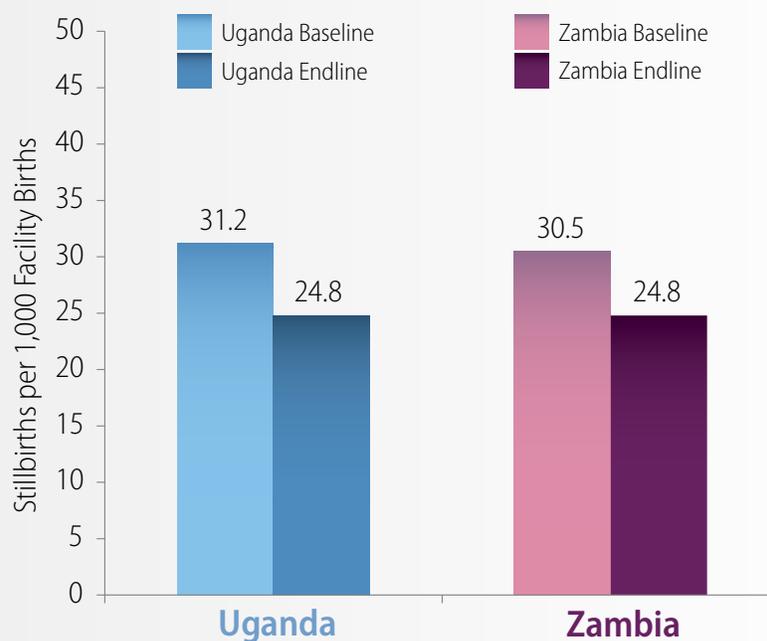
SMGL = Saving Mothers, Giving Life.

Stillbirth Rate in Health Facilities

The total stillbirth rate is the number of stillbirths in health facilities divided by the total number of births in the same facilities during the same period. It is expressed per 1,000 births. Stillbirths are divided into two categories, macerated or fresh, on the basis of their appearance. Macerated stillbirths are typically those that die before labor begins. Fresh stillbirths are those that die intrapartum (during childbirth).

Although not all stillbirths can be prevented, those that occur during labor and delivery are often related to the quality of delivery care and are largely preventable. High-quality obstetric care could prevent stillbirths. Both Uganda and Zambia showed comparable declines in total stillbirth rates in facilities (by 20% and 19%, respectively), which suggests important improvements in the quality of care in health facilities during Phase 1 of the SMGL initiative (Figure 15).

Figure 15. Total Stillbirth Rate in Health Facilities in SMGL-Supported Districts in Uganda and Zambia, Before and After SMGL

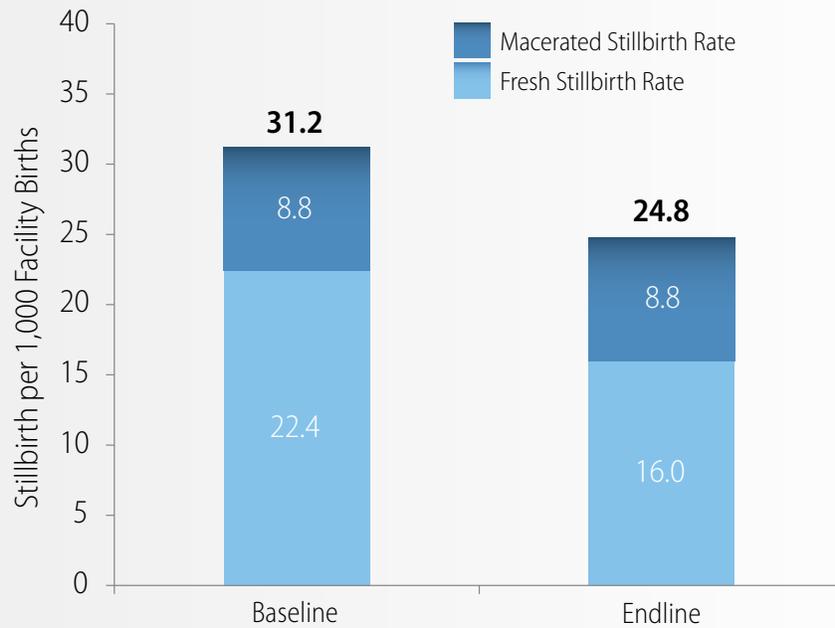


SMGL = Saving Mothers, Giving Life.

Fresh stillbirth data were available for all SMGL-supported districts in Uganda, but in Zambia, macerated and fresh stillbirths were not differentiated. The fresh stillbirth rate in Uganda decreased by 28%, from 22.4

fresh stillbirths per 1,000 births at baseline to 16.0 per 1,000 at endline (Figure 16). This finding also suggests improvement in the quality of delivery care during Phase 1.

Figure 16. Fresh, Macerated, and Total Stillbirth Rate in Health Facilities in SMGL-Supported Districts in Uganda, Before and After SMGL



Predischarge Neonatal Mortality Rate

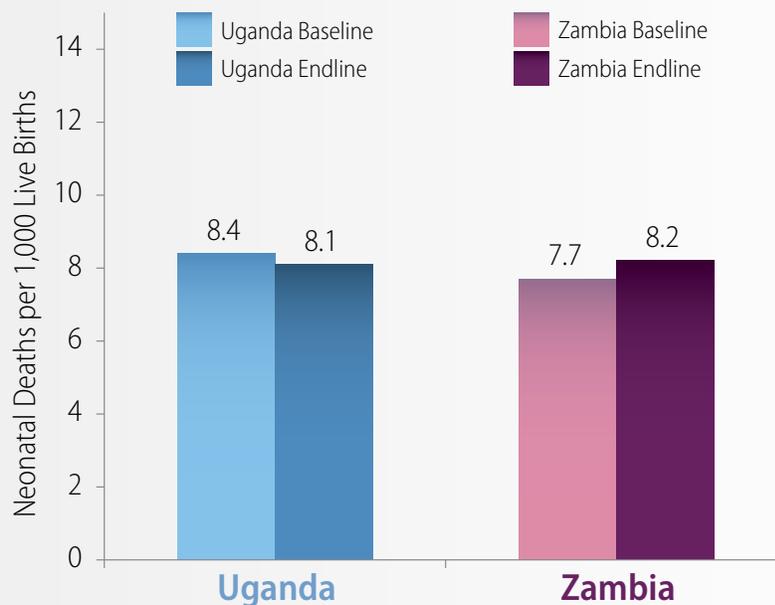
Newborns are most vulnerable in their first hours of life. Even after a live birth, they may require stimulation or help breathing or staying warm. Essential newborn care includes various evidence-based interventions designed to keep newborns alive and healthy.

Although the neonatal period is defined as the first 28 days of life, neonatal outcomes presented in this report only cover the period from birth to the time of discharge from a health facility (usually within 24 hours of birth). The predischarge neonatal mortality rate (NMR) is the number of

predischarge neonatal deaths divided by the number of live births in the same facilities during the same period. It is expressed per 1,000 live births.

The NMR in Uganda and Zambia did not change significantly (Figure 17). Given that the overall PMR decreased, the lack of significant change in the predischarge NMR may be due to the poor survivability of infants saved from being stillbirths. Another possibility is that, because of increased training on neonatal resuscitation conducted as part of the SMGL initiative, infants previously classified as stillbirths were being correctly classified as neonatal deaths.

Figure 17. Predischarge Neonatal Mortality Rate^a in Health Facilities in SMGL-Supported Districts in Uganda and Zambia, Before and After SMGL



SMGL = Saving Mothers, Giving Life.

^a Neonatal deaths that occurred before discharge from a health facility; length of stay after delivery is 24 hours, on average.

Table 1. Summary of Maternal and Perinatal Outcome Indicators for Health Facilities in SMGL-Supported Districts in Uganda

Indicator and Definition ¹	Facility Type	Baseline	Endline	% Change ²	Significance Level ³
Institutional Delivery Rate Proportion of all births occurring in health facilities over a specified time period	All facilities	46%	74%	62%	***
	EmONC facilities	28%	36%	28%	***
Active Management of the Third Stage of Labor (AMTSL) Rate Proportion of all delivering women who received AMTSL in CEmONC facilities over a specified time period	CEmONC facilities	42%	85%	100%	***
Cesarean Sections as a Proportion of All Births Proportion of all births delivered by Cesarean section over a specified time period	All facilities	5.3%	6.5%	23%	***
Met Need for EmONC Proportion of women with major direct obstetric complications treated in health facilities over a specified time period	All facilities	46%	66%	42%	***
	EmONC facilities	39%	49%	25%	***
Direct Obstetric Case Fatality Rate⁴ Proportion of women with major direct obstetric complications who die in health facilities over a specified time period	All facilities	2.6%	2.0%	-25%	**
	EmONC facilities	2.9%	2.4%	-18%	NS
Maternal Mortality Ratio⁴ Number of women who deliver and die in health facilities per 100,000 live births in health facilities	All facilities	534	345	-35%	***
	EmONC facilities	829	634	-24%	**
Perinatal Mortality Rate Number of stillbirths and predischarge neonatal deaths (usually within the first 24 hours) in health facilities per 1,000 births in health facilities	All facilities	39.3	32.7	-17%	***
Stillbirth Rate Number of stillbirths in health facilities per 1,000 births in health facilities	All facilities	31.2	24.8	-20%	***
Predischarge Neonatal Mortality Rate Number of births that result in a predischarge neonatal death (usually within the first 24 hours) in health facilities per 1,000 live births in health facilities	All facilities	8.4	8.1	-4%	NS

CEmONC = Comprehensive Emergency Obstetric and Newborn Care, EmONC = Emergency Obstetric and Newborn Care.

1. Definitions are from World Health Organization resources, including *Monitoring Emergency Obstetric Care: A Handbook*.

2. Percentage change calculations are based on unrounded numbers.

3. Asterisks indicate significance levels calculated with a z-statistic as follows: *** = $P < .01$, ** = $P < .05$, * = $P < .1$, NS = not significant.

4. Baseline maternal deaths in facilities were cross-checked with maternal deaths identified by a Reproductive Age Mortality Study at baseline and at endline.

Table 2. Summary of Maternal and Perinatal Outcomes Indicators for Health Facilities in SMGL-Supported Districts in Zambia

Indicator and Definition ¹	Facility Type	Baseline	Endline	% Change ²	Significance Level ³
Institutional Delivery Rate Proportion of all births occurring in health facilities over a specified time period	All facilities	63%	84%	35%	***
	EmONC facilities	26%	30%	17%	***
Cesarean Sections as a Proportion of All Births Proportion of all births delivered by Cesarean section over a specified time period	All facilities	2.7%	3.1%	15%	***
	EmONC facilities	26%	32%	23%	***
Met Need for EmONC Proportion of women with major direct obstetric complications treated in health facilities over a specified time period	All facilities	34%	45%	31%	***
	EmONC facilities	26%	32%	23%	***
Direct Obstetric Case Fatality Rate⁴ Proportion of women with major direct obstetric complications who die in health facilities over a specified time period	All facilities	3.0%	2.0%	-33%	**
	EmONC facilities	3.4%	2.2%	-35%	**
Maternal Mortality Ratio⁴ Number of women who deliver and die in health facilities per 100,000 live births in health facilities	All facilities	310	202	-35%	**
	EmONC facilities	629	453	-28%	*
Perinatal Mortality Rate Number of stillbirths and predischarge neonatal deaths (usually within the first 24 hours) in health facilities per 1,000 births in health facilities	All facilities	37.9	32.8	-14%	***
	EmONC facilities	30.5	24.8	-19%	***
Stillbirth Rate Number of stillbirths in health facilities per 1,000 births in health facilities	All facilities	30.5	24.8	-19%	***
	EmONC facilities	7.7	8.2	7%	NS
Predischarge Neonatal Mortality Rate Number of births that result in a predischarge neonatal death (usually within the first 24 hours) in health facilities per 1,000 live births in health facilities	All facilities	7.7	8.2	7%	NS
	EmONC facilities	7.7	8.2	7%	NS

CEmONC = Comprehensive Emergency Obstetric and Newborn Care, EmONC = Emergency Obstetric and Newborn Care.

5. Definitions are from World Health Organization resources, including *Monitoring Emergency Obstetric Care: A Handbook*.

6. Percentage change calculations are based on unrounded numbers.

7. Asterisks indicate significance levels calculated with a z-statistic as follows: *** = $P < .01$, ** = $P < .05$, * = $P < .1$, NS = not significant.

8. Baseline maternal deaths in facilities were cross-checked with maternal deaths identified by the 2012 community census. Endline maternal deaths in facilities were cross-checked with community maternal deaths identified by community key informants.

Conclusions

The first year of the SMGL initiative (Phase 1) resulted in dramatic reductions in maternal deaths and improved maternal and perinatal health outcomes in SMGL-affiliated facilities in both Uganda and Zambia.

In both countries, important gains were reported in the following areas:

- Numbers and proportions of deliveries taking place in health facilities, including the proportion of births in EmONC facilities.
- Routine use of AMTSL at delivery in facilities.
- Met need for EmONC services for direct obstetric complications.
- C-section rates.
- Survival of mothers who were treated for direct obstetric complications (declines in CFRs).
- Maternal survival and reduced MMRs.
- Overall perinatal survival and reduced PMRs.

The magnitude of the change in these key usage and quality of care indicators, which in turn led to a significant reduction in maternal mortality, lead to the conclusion that the SMGL initiative was successful. The findings also demonstrate that

- Obstetric care in health facilities, particularly EmONC facilities, in Uganda and Zambia has improved.
- An increasing number of women with obstetric complications are seeking care in health facilities. Thus, the met need for EmONC is increasing.

- At the same time, the CFR from direct obstetric complications has decreased, contributing to substantial declines in MMRs in health facilities.
- Improvements in quality of care, as reflected by greater use of AMTSL and higher C-section rates, likely contributed to the decreased CFR and MMR.

The SMGL initiative also led to improvements in perinatal outcomes. The PMR decreased in both countries, suggesting improvements in the quality of obstetric care at delivery. This conclusion was further substantiated in Uganda, where the fresh stillbirth rate decreased by 27%.

Perinatal data for both Uganda and Zambia showed

- Decreases in overall rates of perinatal mortality.
- Decreases in total stillbirth mortality.

Another achievement was improved processes for identification, notification, and review of maternal deaths at the district level. This change helped local decision makers understand the underlying causes of these deaths so they can find ways to prevent them. By increasing awareness among health care providers and policy makers, this change could also lead to the development of maternal death surveillance and response systems.

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Appendix:
Maternal and Perinatal Outcomes and
Indicators for All SMGL-Supported Facilities

Table A. Maternal and Perinatal Outcomes and Indicators for Health Facilities in SMGL-Supported Districts in Uganda, by Facility Type and Assessment Period (Baseline and Endline)

	Facility Type															
	All Facilities (N = 128)			EmONC (N = 25)			CEmONC (N = 16)			BEmONC (N = 9) ^a			Non-EmONC (N = 103) ^a			
	Baseline	Endline	% Change	Baseline	Endline	% Change	Baseline	Endline	% Change	Baseline	Endline	% Change	Baseline	Endline	% Change	
OUTCOMES: Maternal	No. of Facility Deliveries ¹	34,460	57,781		21,310	28,100		18,700	21,731		2,610	6,369		13,150	29,681	
	No. of Direct Obstetric Complications	5,256	7,705		4,455	5,739		4,357	5,479		98	260		801	1,966	
	No. of Cesarean Sections							3,981	5,084							
	No. of Maternal Deaths from Direct Obstetric Causes	139	152		131	139		130	132		1	7		8	13	
	No. of Maternal Deaths from Indirect Obstetric Causes	40	43		39	34		37	33		2	1		1	9	
	No. of Maternal Deaths from All Causes	179	195		170	173		167	165		3	8		9	22	
	No. of Maternal Patients with AMTSL							7,913	18,418							
OUTCOMES: Perinatal	No. of Total Births (Stillbirths and Live Births) Delivered	34,569	58,011		21,419	28,330		18,808	21,961		2,611	6,369		13,150	29,681	
	No. of Live Births	33,492	56,571		20,516	27,299		17,949	21,011		2,567	6,288		12,976	29,272	
	No. of Fresh Stillbirths	773	928		645	668		612	611		33	57		128	260	
	No. of Total Stillbirths (Macerated and Fresh)	1,077	1,440		903	1,031		859	950		44	81		174	409	
	No. of Predischarge Neonatal Deaths	283	458		210	334		181	306		29	28		73	124	
INDICATORS: Maternal	Proportion of All Births in All Facilities ²	45.5%	73.8%	62%	28.2%	35.9%	28%									
	Population Met Need for EmONC ³	46.3%	65.6%	42%	39.2%	48.9%	25%									
	Population Cesarean Section Rate ⁴							5.3%	6.5%	23%						
	Direct Obstetric Case Fatality Rate ⁵	2.6%	2.0%	-25%	2.9%	2.4%	-18%	3.0%	2.4%	-19%	1.0%	2.7%	164%	1.0%	0.7%	-34%
	Maternal Mortality Ratio (per 100,000 Live Births) from All Causes ⁶	534.4	344.7	-35%	828.6	633.7	-24%	930.4	785.3	-16%	116.9	127.2	9%	69.4	75.2	8%
AMTSL ⁷							42.3%	84.8%	100%							
INDICATORS: Perinatal	Perinatal Mortality Rate (per 1,000 Births) ⁸	39.3	32.7	-17%	52.0	48.2	-7%	55.3	57.2	3%	28.0	17.1	-39%	18.8	18.0	-4%
	Fresh Stillbirth Rate (per 1,000 Births) ⁹	22.4	16.0	-28%	30.1	23.6	-22%	32.5	27.8	-14%	12.6	8.9	-29%	9.7	8.8	-10%
	Total Stillbirth Rate (per 1,000 Births) ¹⁰	31.2	24.8	-20%	42.2	36.4	-14%	45.7	43.3	-5%	16.9	12.7	-25%	13.2	13.8	4%
	Predischarge Neonatal Mortality Rate (per 1,000 Live Births) ¹¹	8.4	8.1	-4%	10.2	12.2	20%	10.1	14.6	44%	11.3	4.5	-61%	5.6	4.2	-25%

Note: Table footnotes are continued on next page.

SMGL = Saving Mothers, Giving Life; AMTSL = Active Management of the Third Stage of Labor; EmONC = Emergency Obstetric and Newborn Care; CEmONC = Comprehensive Emergency Obstetric and Newborn Care; BEmONC = Basic Emergency Obstetric and Newborn Care.

Adjustment

^a Indicator data for these facilities should be interpreted with caution because they were calculated with low numerator counts.

Definitions

1. The number of women who delivered in health facilities. "All Facilities" includes both EmONC and non-EmONC facilities. "EmONC facilities" includes both BEmONC and CEmONC facilities.
2. The number of women who delivered in health facilities divided by the expected number of live births in a specific area, regardless of where the delivery occurred, during the same time period; expressed as a percentage.
3. The number of women who delivered in health facilities and were treated for direct obstetric complications divided by the expected number of women with direct obstetric complications or 15% of expected live births in a specific area during the same time period; expressed as a percentage.
4. The number of Cesarean sections performed in health facilities for any reason divided by the expected number of live births in that area during the same time period; expressed as a percentage.
5. The number of women in health facilities who died of direct obstetric complications divided by the number of women with direct obstetric complications who were treated or diagnosed in the same facilities during the same time period; expressed as a percentage.
6. The number of maternal deaths (direct, indirect, or all causes) in health facilities divided by the number of all live births in the same facilities during the same time period; expressed per 100,000 live births.
7. The number of women in health facilities who received Active Management of the Third Stage of Labor (AMTSL) divided by the number of women who delivered in the same facilities during the same time period; expressed as a percentage.
8. The number of stillbirths and predischARGE neonatal deaths in health facilities divided by the number of total births in the same facilities during the same time period; expressed per 1,000 births.
9. The number of fresh stillbirths in health facilities divided by the number of total births in the same facilities during the same time period; expressed per 1,000 births.
10. The number of stillbirths in health facilities divided by the number of total births in the same facilities during the same time period; expressed per 1,000 births.
11. The number of predischARGE neonatal deaths in health facilities divided by the number of total live births in the same facilities during the same time period; expressed per 1,000 live births.
12. The number of live births in health facilities weighing <2,500 grams divided by the number of total live births in the same facilities during the same time period; expressed as a percentage.

Table B. Maternal and Perinatal Outcomes and Indicators for Health Facilities in SMGL-Supported Districts in Zambia, by Facility Type and Assessment Period (Baseline and Endline)

	Facility Type									
	All Facilities (N = 120)			EmONC (N = 11)			Non-EmONC (N = 120)			
	Baseline	Endline	% Change	Baseline	Endline	% Change	Baseline	Endline	% Change	
OUTCOMES: Maternal	No. of Facility Deliveries ^{a,1}	22,604	31,398		9,372	11,308		13,232	20,090	
	No. of Direct Obstetric Complications	1,844	2,499		1,398	1,781		446	718	
	No. of Cesarean Sections				973	1,158				
	No. of Maternal Deaths from Direct Obstetric Causes ^b	56	51		47	40		9	11	
	No. of Maternal Deaths from Indirect Obstetric Causes	12	11		9	9		3	2	
	No. of Maternal Deaths from All Causes	68	62		56	49		12	13	
OUTCOMES: Perinatal	No. of Total Births (Stillbirths and Live Births) ^a	22,604	31,398		9,372	11,308		13,232	20,090	
	No. of Live Births ^c	21,915	30,619		8,897	10,815		13,018	19,804	
	No. of Total Stillbirths (Macerated and Fresh)	689	779		475	493		214	286	
	No. of PredischARGE Neonatal Deaths ^d	168	251		143	184		26	67	
INDICATORS: Maternal	Proportion of All Births in All Facilities ^e	62.6%	84.3%	35%	26.0%	30.3%	17%	36.7%	53.9%	47%
	Population Met Need for EmONC ^e	34.1%	44.7%	31%	25.8%	31.9%	23%	8.2%	12.8%	56%
	Population Cesarean Section Rate ^e				2.7%	3.1%	15%			
	Direct Obstetric Case Fatality Rate ^e	3.1%	2.0%	-34%	3.4%	2.2%	-35%	2.0%	1.5%	-24%
	Maternal Mortality Ratio (per 100,000 Live Births) ^e	310.3	202.5	-35%	629.4	453.1	-28%	92.2	65.6	-29%
INDICATORS: Perinatal	Perinatal Mortality Rate (per 1,000 Births) ^g	37.9	32.8	-14%	65.9	59.9	-9%	18.1	17.6	-3%
	Total Stillbirth Rate (Per 1,000 Births) ¹⁰	30.5	24.8	-19%	50.7	43.6	-14%	16.2	14.2	-12%
	PredischARGE Neonatal Mortality Rate (per 1,000 Live Births) ¹¹	7.7	8.2	7%	16.0	17.0	6%	2.0	3.4	73%

Note: Table footnotes are continued on next page.

SMGL = Saving Mothers, Giving Life; AMTSL = Active Management of the Third Stage of Labor; EmONC = Emergency Obstetric and Newborn Care.

Adjustments

- ^a When data for “Facility Deliveries” were missing for a specific district, data for “Total Births” were used as a proxy and vice versa.
- ^b The World Health Organization (2012) lists direct causes of maternal death as hemorrhage, hypertensive diseases, abortion, sepsis or infections, obstructed labor, ectopic pregnancy, embolism, and anesthesia-related death. Not all causes were captured consistently by the four SMGL-supported districts.
- ^c When data for “Live Births” (and commonly “Total Births”) were missing for a specific district, data for “Stillbirths” were subtracted from “Total Deliveries” and used as a proxy.
- ^d Use these data with caution. PredischARGE neonatal status is commonly correlated with the very early neonatal period, but early or late neonatal deaths may also be included. Standards for neonatal death reporting differed by district. Data were aggregated from routine data-collection systems used by three SMGL partners.

Definitions

13. The number of women who delivered in health facilities. “All Facilities” includes both EmONC and non-EmONC facilities. “EmONC facilities” includes both BEmONC and CEmONC facilities.
14. The number of women who delivered in health facilities divided by the expected number of live births in a specific area, regardless of where the delivery occurred, during the same time period; expressed as a percentage.
15. The number of women who delivered in health facilities and were treated for direct obstetric complications divided by the expected number of women with direct obstetric complications or 15% of expected live births in a specific area during the same time period; expressed as a percentage.
16. The number of Cesarean sections performed in health facilities for any reason divided by the expected number of live births in that area during the same time period; expressed as a percentage.
17. The number of women in health facilities who died of direct obstetric complications divided by the number of women with direct obstetric complications who were treated or diagnosed in the same facilities during the same time period; expressed as a percentage.
18. The number of maternal deaths (direct, indirect, or all causes) in health facilities divided by the number of all live births in the same facilities during the same time period; expressed per 100,000 live births.
19. The number of women in health facilities who received Active Management of the Third Stage of Labor (AMTSL) divided by the number of women who delivered in the same facilities during the same time period; expressed as a percentage.
20. The number of stillbirths and predischARGE neonatal deaths in health facilities divided by the number of total births in the same facilities during the same time period; expressed per 1,000 births.
21. The number of fresh stillbirths in health facilities divided by the number of total births in the same facilities during the same time period; expressed per 1,000 births.
22. The number of stillbirths in health facilities divided by the number of total births in the same facilities during the same time period; per 1,000 births.
23. The number of predischARGE neonatal deaths in health facilities divided by the number of total live births in the same facilities during the same time period; expressed per 1,000 live births.
24. The number of live births in health facilities weighing <2,500 grams divided by the number of total live births in the same facilities during the same time period; expressed as a percentage.



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