

2019 Pregnancy Outcomes in Health Facilities in Kigoma Region, Tanzania

Final Report

National Center for Chronic Disease Prevention and Health Promotion
Division of Reproductive Health



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2019 Pregnancy Outcomes in Health Facilities in Kigoma Region, Tanzania

Final Report

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Acronyms and Abbreviations

AMTSL	Active Management of the Third Stage of Labor
ASFR	Age-Specific Fertility Rate
AVD	Assisted Vaginal Delivery
BEmONC	Basic Emergency Obstetric and Neonatal Care
BRN	Big Results Now
CDC	U.S. Centers for Disease Control and Prevention
CEmONC	Comprehensive Emergency Obstetric and Neonatal Care
CFR	Case Fatality Rate
CPAC	Comprehensive Post-Abortion Care
C-section	Cesarean Section
DHS	Demographic and Health Survey
DRH	Division of Reproductive Health
EmONC	Emergency Obstetric and Neonatal Care
L&D	Labor and Delivery
M&E	Monitoring and Evaluation
MMR	Maternal Mortality Ratio
MoHCDGEC	Tanzania Ministry of Health, Community Development, Gender, Elderly and Children
MTUHA	<i>Mfumo wa Taarifa za Uendeshaji Hudumaza Afya</i>
NBS	National Bureau of Statistics
OT	Operating Theatre
POMS	Pregnancy Outcomes Monitoring System
RAPID	Rapid Ascertainment Process of Institutional Deaths
RHS	Reproductive Health Survey
WHO	World Health Organization
WRA	Women of Reproductive Age

Executive Summary

Executive Summary

The *Maternal and Reproductive Health in Tanzania Project* aimed to improve maternal and neonatal health through better access to, and availability of, maternal and reproductive health services. Starting in 2006, *The Project* worked in Kigoma Region with the goals of decreasing maternal mortality through strengthening emergency obstetric and neonatal care and improving access to and use of contraception. Project partners Thamini Uhai (an affiliate of Vital Strategies) and EngenderHealth implemented interventions to achieve *The Project's* 3 primary targets for the region:

1. Increase skilled birth attendance to 75% by 2019.
2. Increase met need for emergency obstetric and neonatal care to 60% by 2019.
3. Increase the contraceptive prevalence rate by at least 12 percentage points by 2019.

Project-supported interventions included: upgrading facilities; supplying essential drugs and equipment for family planning and emergency obstetric and neonatal care (EmONC); providing training and supportive supervision in EmONC and contraceptive technology; and ensuring adequate contraceptive supplies.

Since 2012, *Project* partner the Centers for Disease Control and Prevention/Division of Reproductive Health (CDC/DRH) has conducted monitoring and evaluation activities to assess the contributions of *The Project* to the reduction in adverse pregnancy outcomes in Kigoma Region. These activities have addressed 4 objectives:

1. Document changes in EmONC capacity, functionality, coverage, and quality of care.
2. Examine changes in maternal and neonatal care and contraceptive use.
3. Assess changes in facility infrastructure and process indicators to EmONC services.
4. Assess changes in maternal morbidity and mortality and perinatal mortality.

As part of the evaluation activities, CDC conducted periodic data collection from health facilities providing maternity care in Kigoma. In February 2019, CDC-led teams used a pregnancy outcomes monitoring systems (POMS) approach to collect data on maternal and perinatal health outcomes (2019 POMS collected data for the period January–December 2018) in conjunction with conducting a health facility assessment (HFA). This report presents the results of the 2019 Kigoma region endline facility-based evaluation for pregnancy care and delivery indicators, and comparisons with previous POMS data collections. The initial baseline POMS/HFA evaluation was conducted in 2013 (2013 POMS collected data for January 2011–June 2013). Subsequent follow-up POMS/HFA evaluations were completed in 2016 (2016 POMS collected data for July 2013–December 2015) and 2018 (2018 POMS collected data for January 2016–December 2017). Thus, across all four evaluations, the collected data covered the entire time period from January 2011 through December 2018.

This report focuses on indicators related to maternal and perinatal health outcomes during 2011–2018. It adds data collected during the endline of the facility evaluation to the results already documented from the 2013, 2016, and 2018 evaluations. Indicators presented here include data from hospitals, health centers, and dispensaries. Selected indicators are also presented by project support status of hospitals, health centers, and dispensaries, as recorded in 2019. A separate report, *Health Facility Assessment of Emergency Obstetric and Neonatal Care Services in Kigoma Region, Tanzania: Selected Findings, 2019* describes results for these facilities' infrastructure, staffing, equipment and supplies, overall capacity, functionality, and geographic coverage of EmONC services.

Executive Summary

OBSTETRIC CARE RESULTS

Overall, the **institutional delivery rate** increased in Kigoma Region, rising from almost one-half (48.4%) of births occurring in all health facilities (i.e., hospitals, health centers, dispensaries) in 2011 to 84.9% in 2018.

*Virtually all deliveries in facilities are attended by skilled health professionals. Thus, with an institutional delivery rate of 84.9%, The Project's target of **skilled birth attendance** at 75% of births has been met and surpassed.*

The region's **population-based Cesarean section (C-section) rate** also increased from 2.7% in 2011 to 4.5% in 2018. This population-based C-section rate measured from facility reports approaches but continues to be lower than the World Health Organization (WHO) minimum recommended rate of 5%.

From 2011 through 2018, the **facility-based C-section rate** increased slightly from 11.9% to 13.6%. From 2015–2018, the C-section rate increased in hospitals (2015: 14.4%; 2018, 19.8%); in health centers, however, it decreased from 2015 (8.0%) to 2017 (6.8%), but rose again in 2018 (8.6%). These fluctuations may be due to temporary closings and renovations and/or the absence of qualified staff 24/7 to provide surgical care in selected health centers.

The **number of women with direct obstetric complications** (with first trimester adverse outcomes, obstetric hemorrhage, prolonged or obstructed labor, ruptured uterus, sepsis, eclampsia/preeclampsia) **treated in health facilities** increased over the 8-year span. The number of direct obstetric complications including first trimester adverse outcomes attended in facilities with EmONC functionality increased by approximately 65% since 2011 (2011: 4,413 complications; 2018: 7,272 complications). Despite some fluctuations over time, health centers and dispensaries treated more women with direct obstetric complications in 2018 than in any previous year; for hospitals, the total number treated in 2018 was slightly lower than in 2017.

The WHO target for **met need for emergency obstetric care** (or the proportion of expected direct obstetric complications in a population that are treated in health facilities) is 100.0%. Kigoma Region's met need improved over time, reaching 61.3% of women in 2018 treated for direct obstetric complications in all facilities; the corresponding met need in EmONC facilities alone was 48.3% in 2018.

*Over the course of The Project, the increasing availability of emergency obstetric and neonatal care led to an increase in the **met need for EmONC** from 42.8% in 2011 to 61.3% in 2018, thus meeting The Project's target of increasing met need for EmONC to 60%.*

The **direct obstetric case fatality rate (CFR)** remained higher than WHO's maximum level for women with direct obstetric complications treated in all health facilities (WHO maximum: less than 1% of deaths among women with complications treated). In 2018, the CFR for direct obstetric complications, including first trimester complications, was 1.4% in all facilities; this is lower than the CFR of 1.8% in 2011.

MATERNAL MORTALITY RESULTS

The total **number of maternal deaths identified in all facilities** in 2018 was 148. Between 2011 and 2018, the annual total number of maternal deaths in all health facilities varied from a low of 111 in 2012 to a high of 153 in 2017. Approximately 126 of 148 (85%) maternal deaths in 2018 were from direct obstetric causes. Most of the maternal deaths (79.1%) occurred in facilities with EmONC services, where most obstetric complications received treatment.

Executive Summary

The **maternal mortality ratio (MMR)** in all facilities decreased from 363.8 maternal deaths per 100,000 live births in 2011 to 174.0 per 100,000 in 2018. The MMR in EmONC facilities decreased from 874.8 to 377.6 over the same period. This observed decline in maternal mortality in all facilities, including EmONC facilities, may be related to increased access to quality care for direct obstetric complications.

Obstetric hemorrhage was the leading **cause of maternal death** in 2018; it was the cause of 21.0% of all maternal deaths, followed by sepsis (15.5%), uterine rupture (14.9%), and pregnancy-induced hypertension (i.e., eclampsia/preeclampsia) (10.1%).

To estimate the **number of maternal deaths averted** by the health care provided for women with major direct obstetric complications, CDC used data on the regional population, the estimated expected number of births and of direct obstetric complications, and the complications and deaths recorded at all facilities.

The estimated annual number of **maternal deaths potentially averted** through EmONC services ranged from a low of 176 (2013) to 399 (2018) during the 8-year span, resulting in a potential total of 2,100 maternal deaths averted from 2011 to 2018.

Project-supported facilities provided care for 69% of women with major direct obstetric complications who accessed care. As a result, from 2011 to 2018, an estimated 1,450 maternal deaths were potentially **averted through care provided in project-supported facilities**.

PERINATAL MORTALITY RESULTS

The total **institutional stillbirth rate** in all health facilities decreased from 28.0 stillbirths per 1,000 total births in 2011 to 12.8 per 1,000 in 2018.

The **institutional intrapartum stillbirth rate** in all facilities declined from 16.3 fresh stillbirths per 1,000 total births in 2011 to 6.0 per 1,000 in 2018. Close to one-half (47.2%) of all stillbirths in all facilities in 2018 were fresh stillbirths, due to complications that occurred during labor or delivery, down from (58.0%) in 2011. As fresh stillbirths are related to timely access to and quality of delivery care, the decline may be associated with improvements in obstetric care.

The **pre-discharge neonatal mortality rate** increased from 5.7 neonatal deaths per 1,000 live births in 2011 to a peak of 11.7 per 1,000 in 2015, and has since declined to 7.6 per 1,000 in 2018. In this analysis, the pre-discharge neonatal mortality rate covers the period from birth to the time of facility discharge, usually within 24 hours of birth.

The **perinatal mortality rate** includes both stillbirths and pre-discharge neonatal deaths. Primarily due to declining stillbirth rates, the perinatal mortality rate in Kigoma facilities declined from 33.6 perinatal deaths per 1,000 total births in 2011 to 20.3 per 1,000 in 2018.

Introduction

Introduction

Contributing two-thirds of the world's total maternal deaths in 2015, sub-Saharan Africa experiences a higher maternal mortality ratio (MMR) than any other region (world, 216 maternal deaths per 100,000 live births; sub-Saharan Africa, 546 maternal deaths per 100,000 live births) (World Health Organization (WHO), 2015). Recent national MMR levels reported by the 2015-2016 Tanzania Demographic and Health Survey show that maternal mortality remains high at 566 maternal deaths per 100,000 live births (National Bureau of Statistics (NBS), 2016). United Nations Sustainable Development Goal 3 aims to reduce the global MMR to less than 70 maternal deaths per 100,000 live births by 2030 (United Nations, 2019). The World Health Organization (WHO) estimated that approximately 8,200 maternal deaths occurred in 2015 in Tanzania – the sixth highest number in the world – corresponding to a maternal mortality ratio of 398 maternal deaths per 100,000 live births in 2015 (WHO, 2015a).

Strategies to improve maternal and newborn health were delineated in the *National Roadmap Strategic Plan to Accelerate Reduction of Maternal, Newborn, and Child Deaths in Tanzania 2008–2015* (the “*One Plan*”) (MoHSW, 2008). They were updated in 2014 (*Sharpened “One Plan*”) and a framework and milestones for reducing maternal and perinatal mortality in Tanzania was added (MoHSW, 2014). The *Sharpened One Plan* prioritized accelerated progress in the Lake and Western Zones (including Kigoma Region), where reproductive, maternal, and newborn health outcomes remain poorer than other parts of the country. In 2016, the Tanzania Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) revised the strategy and framework and released *One Plan II (2016–2020)* (MoHCDGEC, 2016). The country aims to ensure that, by 2020, 100% of hospitals can provide comprehensive emergency obstetric and neonatal care (EmONC) services, and that 100% of health centers and 50% of dispensaries can provide basic EmONC services (MoHCDGEC, 2016).

Additionally, the country introduced the *Big Results Now (BRN)* initiative which includes reproductive, maternal, newborn, and child health as 1 of the 4 critical components of health improvements in the country (MoHSW, 2014, 2015a, World Bank, 2014). Other critical components include human resources, health facilities, and health commodities. *BRN's* strategies for reducing maternal and perinatal mortality focus on scaling up basic EmONC (BEmONC) services in strategic low-level facilities, expanding comprehensive EmONC (CEmONC) services in high-level facilities, and improving the availability of safe blood for transfusions in CEmONC facilities. Similar to the *Sharpened One Plan*, *BRN* also prioritizes efforts in the Lake and Western Zones.

The *Maternal and Reproductive Health in Tanzania Project*^{*} (hereafter referred to as *The Project*) aimed to accelerate progress towards the maternal health targets of the *One Plan II*, *BRN*, and United Nations *Sustainable Development Goals* (MoHSW, 2014, 2015a; DPG, 2014; World Bank, 2014, UN, 2015). Because quality EmONC services can prevent maternal and perinatal deaths, *The Project* sought to increase demand for maternal and reproductive health services and to strengthen capacity to provide quality care. Project-supported interventions included upgrading facilities; supplying essential drugs and equipment for family planning and EmONC; providing training and supportive supervision in EmONC and contraceptive technology; and ensuring adequate contraceptive supplies.

The Project included rigorous monitoring and evaluation (M&E) methods as key components needed to inform decision-making and identify opportunities for scale-up of quality health care services. In doing so, *The Project* sought to establish a model for maternal and reproductive health care in Tanzania and ultimately transition full program ownership to the Government of Tanzania in 2019.

Since 2010, the U.S. Centers for Disease Control and Prevention's Division of Reproductive Health (CDC/DRH) has collaborated with Bloomberg Philanthropies, Foundation H&B Agerup, President's Office-Regional Administration and Local Government (PO-RALG), and the Tanzania MoHCDGEC to address the contributions of *The Project* to the reduction in adverse pregnancy outcomes in several regions of Tanzania. Since 2013, the CDC evaluation focused

^{*} The *Maternal and Reproductive Health in Tanzania Project* is formerly known as the *Reducing Maternal Mortality in Tanzania Project*. Financial support for CDC's participation in *The Project* was provided through the CDC Foundation with a grant from Bloomberg Philanthropies and Fondation H&B Agerup.

Introduction

on Kigoma region, where *The Project* partners Thamini Uhai (an affiliate of Vital Strategies) and EngenderHealth implemented interventions to achieve the following 3 targets for the region:

1. Increase skilled birth attendance to 75% by 2019.
2. Increase met need for EmONC to 60% by 2019.
3. Increase the contraceptive prevalence rate by at least 12 percentage points by 2019.

PROJECT DESCRIPTION

The Project began in 2006 in Kigoma, with a targeted approach to train assistant medical officers (AMOs), build and equip operating theaters, and provide obstetric surgeries in health centers, an approach implemented for the first time in Tanzania. The approach quickly gained popularity and expanded in underserved communities in 3 additional regions of Tanzania (Morogoro, Pwani and Singida). These 4 regions were selected at the direction of the Tanzanian government, with the vast majority of investment channeled to Kigoma region, which at the time had among the poorest maternal health indicators in the country (MoHSW, 2006; NBS, 2005). Between 2006 and 2013 (Phase 1), *The Project* provided support to 17 health facilities in these 4 regions: 6 health centers and 3 hospitals in Kigoma, 3 health centers and 1 hospital in Morogoro, 1 health center and 1 hospital in Pwani, and 2 health centers in Singida (support for Singida ended in 2011). During Phase 2, *The Project* added family planning and comprehensive post-abortion care (CPAC) to all supported facilities and transitioned the Morogoro and Pwani facilities that received project support during Phases 1 and 2 to government oversight. Support in Kigoma expanded in Phases 2 and 3 and continued through April 2019 (Table 1).

Table 1 Overview of Project Activities and Priorities by Project Phase

Phase 1 (2006–2013)	Phase 2 (2013–2015)	Phase 3 (2015–2019)
Increase access to EmONC services in Pwani, Morogoro, Singida, and Kigoma Regions by upgrading health facilities and training non-physician clinicians	Integrate FP and CPAC services into health facilities and increase EmONC availability in more facilities	Concentrate efforts in high-burden areas (Kigoma Region) and on immediately attainable goals, like increased contraceptive use and skilled birth attendance

The Project was implemented by Vital Strategies/Thamini Uhai in all regions. Activities included upgrading facility infrastructure; equipping facilities with essential drugs and supplies; providing personnel training, supportive supervision, and mentorship; and creating demand for EmONC services (Table 2). Phase 2 marked the introduction to *The Project* of EngenderHealth-supported activities, which targeted provision of supplies and personnel training for family planning and CPAC in health facilities.

In Kigoma, *The Project* aimed to increase EmONC capacity and generate community demand for facility deliveries and family planning services in all districts. *The Project* started supporting 9 health facilities in Phase 1 (6 health centers and 3 hospitals) and ended with support to 13 health centers, 3 hospitals and 70 dispensaries in 2017–2018.[†]

[†] In this report, three levels of health facilities are described: dispensaries, health centers, and hospitals. Dispensaries are the first levels of care, providing primary outpatient care that includes maternal and child health services. Health centers are the first levels of referrals for dispensaries. They provide both outpatient and inpatient care, including maternal and child health services. Health centers may also have operating theatres and mortuaries. Hospitals are the highest levels of care and serve as the referral centers for dispensaries and health centers. Hospitals provide outpatient and inpatient care and contain various wards: medical, surgical, obstetric/gynecological, pediatric, and outpatient. (MoHSW, 2014) Statistics presented in the report by the project-support status are not strictly comparable across the years, as *The Project* expanded its support. The count of facilities receiving project support each year is available in the 2019 Health Facility Assessment report (CDC, 2019b).

Introduction

It should be noted, however, that not all of these facilities received assistance in CPAC, EmONC, and routine obstetric services. *The Project* provided CPAC assistance in 3 hospitals, 13 health centers, and 26 dispensaries, and EmONC and routine obstetric care in 18 dispensaries, 12 health centers, and 3 hospitals. An additional 14 dispensaries received targeted support in referral services. A comprehensive listing of the project-support type each health facility received can be found in the 2019 Health Facility Assessment Report (CDC, 2019b).

Phase 3 also established the 3 specific targets for *The Project* in Kigoma (skilled birth attendance, met need for EmONC, and contraceptive prevalence) through the activities implemented by Vital Strategies/Thamini Uhai and EngenderHealth.

KIGOMA REGION

Since 2013, all programmatic (EngenderHealth, Thamini Uhai, and Vital Strategies) and evaluation (CDC/DRH) efforts focused on Kigoma Region, recognized as one of the most disadvantaged regions in Tanzania and prioritized by the government for immediate improvements (MoHSW, 2014). Table 2 shows the key reproductive health indicators for the Kigoma Region in 2014 and 2018, and the same indicators for the Western Zone (which includes Kigoma) and Tanzania nationally in 2015–2016.

Table 2 Key Reproductive Health Indicators for Kigoma Region (2014 and 2018), Western Zone (2015–2016) and Tanzania (2015–2016)

Women Age 15–49 Years, Tanzania

Indicator	Tanzania (2015/16) ^a	Western Zone (2015/16) ^a	Kigoma Region 2014 ^b	Kigoma Region 2018 ^c
Total fertility rate (births per woman)	5.2	6.7	6.7	6.3
Attended at least 4 antenatal care visits during pregnancy	50.6%	N/A	42.1%	57.7% ^d
Delivered in a health facility	62.6%	49.7%	47.1%	77.0% ^d
Delivered by Cesarean section	5.9%	3.2%	3.5%	5.2%
Currently using modern contraception (women in union)	32.5%	19.3%	15.6%	21.0%
Want to delay the next birth by at least 2 years (women in union)	42.2%	N/A	51.7%	52.7%
Unmet need for family planning (women in union)	22.0%	24.2%	39.2%	35.1%

N/A: Data are not available.

^a 2015–16 Tanzania Demographic and Health Survey (NBS, 2016)

^b 2014 Kigoma Reproductive Health Survey (CDC, 2015)

^c 2018 Kigoma Reproductive Health Survey (CDC, 2019a)

Previous evaluations of health facilities conducted by CDC in 2013, 2016, and 2018 identified critical gaps in infrastructure, human resource capacity, and availability and distribution of EmONC services (CDC, 2014, 2016, 2018). In 2013, for example, less than half of deliveries (48.8%) in Kigoma Region occurred in a health facility, and only 19.3% were provided care at birth in facilities with EmONC capabilities (CDC, 2016b). If obstetric complications arise, women delivering outside of a health facility do not have rapid access to life-saving resources and health personnel capable of identifying and treating serious complications. Facility and community surveys since 2013 have detected a slow but continuous increase in institutional delivery and Cesarean section rates and a gradual decline in the overall facility-based maternal mortality and case fatality rates, primarily through a reduction in obstetric hemorrhage and obstructed labor deaths.

Methods

Methods

KIGOMA MONITORING AND EVALUATION IN HEALTH FACILITIES

To support evidence-based programmatic decision-making, Bloomberg Philanthropies and Fondation H&B Agerup have drawn on the technical assistance of CDC/DRH. CDC/DRH's monitoring and evaluation efforts in health facilities address 4 objectives:

1. Document changes in EmONC capacity, functionality, coverage, and quality of care.
2. Examine changes in maternal and neonatal care and contraceptive use.
3. Assess changes in facility infrastructure and process indicators to EmONC services.
4. Assess changes in maternal morbidity and mortality and perinatal mortality.

During the Phase 2 baseline evaluation that CDC/DRH conducted in August 2013, EmONC capacity, EmONC functionality, and maternal and neonatal health outcomes were assessed in all hospitals and health centers and in the majority of dispensaries providing delivery care in the region (CDC, 2014a). The results were critical to programmatic planning in Phase 2, as well as in deciding to scale up *The Project* in Kigoma region and establishing goals and objectives for Phase 3. CDC conducted 3 follow-up facility-based evaluations in January 2016, January 2018, and February 2019. The evaluations included an expanding number of dispensaries visited, as the region made routine delivery care available in more health facilities.

The facility-based evaluation used a multi-method approach:

- Health facility assessment (*Health Facility Assessment* report).
- Documentation of geographic coordinates of all health facilities (*Health Facility Assessment* report).
- Extraction of pregnancy outcomes, surgery information, and information about pregnancy loss from multiple data sources using a pregnancy outcome monitoring system (POMS) approach.
- Documentation of facility-based maternal and perinatal deaths through the Rapid Ascertainment Process of Institutional Deaths (RAPID) (IMMPACT, 2007), a validated method that increases the identification of maternal deaths in facilities.

This report focuses on indicators related to maternal and perinatal health outcomes during 2011–2018 that were documented through POMS and RAPID data collection. It adds data collected during the last wave of the facility evaluation (in February 2019) to the results already documented from the 2013, 2016, and 2018 evaluations. Indicators presented here include data from hospitals, health centers, and dispensaries. A separate report, *Health Facility Assessment of Emergency Obstetric and Neonatal Care Services in Kigoma Region, Tanzania: Selected Findings, 2019* describes results for infrastructure, staffing, equipment and supplies, overall capacity, functionality, and coverage of emergency maternal and neonatal health services (CDC, 2019b). As in the health facility assessments, the results in this report are presented by facility type and by project-support status documented at the time of each evaluation.

DATA COLLECTION

In each evaluation, CDC/DRH teams retrospectively collected individual data on all facility deliveries, including maternal characteristics, pregnancy outcomes, delivery details, and obstetric and newborn interventions that occurred in facilities during the evaluation period.

Methods

The 2019 evaluation collected outcomes for the period January–December 2018. It employed a POMS method approach, which was first developed by CDC/DRH in 2012 to collect detailed pregnancy outcomes information in Morogoro Region for a Phase 1 pilot evaluation (CDC, 2013). This is the same methodology used for the 3 previous CDC evaluations conducted in Kigoma. In 2013, the evaluation included pregnancy outcomes for the period January 2011–June 2013; in 2016, it included pregnancy outcomes for the period July 2013–December 2015 (outcomes in facilities newly added in 2016 were also collected for the period January 2011–December 2013); and in 2018, it included outcomes for the period January 2016–December 2017.

One notable difference in methodology is the adaptation of data extraction tools to respond to the changes in the labor and delivery register (3 new versions issued from 2013 to 2018) and the addition of new data sources documenting pregnancy outcomes in health facilities. CDC expanded its review of perinatal deaths in 2016 and added a RAPID component for the enumeration of perinatal deaths starting with the 2018 evaluation. These steps were dictated by the changes in the official maternity registers—which no longer had a column to prompt recording if a delivery resulted in a neonatal death—and the introduction of new registers that captured perinatal deaths (i.e. ward/facility death registers, morgue perinatal death register, neonatal intensive care registers, Kangaroo Mother Care registers). Thus, the enumeration of neonatal deaths is likely to be more complete for the period 2016–2018 than for earlier periods. Despite an increase in case ascertainment, both perinatal and neonatal mortality rates were lower in 2018 compared to their 2013 levels.

POMS and RAPID use a package of standardized tools to collect comprehensive maternal and reproductive health information through several methods:

1. Abstracting all the individual pregnancy outcomes found in labor and delivery (L&D) registers.
2. Cross-checking all data on complications and obstetric surgeries, including complications during the first trimester, from obstetric registers and adding that information to the record for each individual woman (triangulation).
3. Documenting all maternal and perinatal deaths occurring in health facilities.

POMS

The method aims to link individual information about mothers and their pregnancies across multiple data sources by using unique identifiers. The main data source is the individual patient information on all women and babies recorded in facilities' L&D Registers (Table 3).

Information from the L&D registers are next cross-checked with patient information recorded in the operating theatre (OT) register (where available), admission and discharge registers, case notes, in-patient postpartum care registers, nurses' report books, obstetric wards' daily reports, and general facility report books. To address this step, the CDC team developed standard abstraction forms and operation procedures; CDC shared the tools and conducted data quality improvements trainings with the regional monitoring and evaluation officers, which likely led to improvements in tracking routine service delivery indicators as part of the regional health information system data platform (DHIS2, 2019).

Methods

Table 3 Information Abstracted from Labor and Delivery Registers

All Health Facilities, Kigoma Region, Tanzania

Mother Variables	Baby Variables	Delivery Variables
<ul style="list-style-type: none"> • Age • Parity • Maternal complications • Alive or dead at discharge 	<ul style="list-style-type: none"> • Pregnancy outcome • Birthweight • Apgar scores • Breastfed within one hour of delivery • Fresh or macerated stillbirth • Baby complications • Alive or dead at discharge 	<ul style="list-style-type: none"> • Date of delivery • Mode of delivery • Performance of neonatal resuscitation • Administration of uterotonic drugs • Performance of blood transfusion

Obstetric complications and procedures are matched to individual women, including up to 3 complications. To ensure completeness, the data are triangulated to gather additional details from multiple sources about labor, delivery, and the early postpartum period. Data sources differ depending on whether the complications occur at the time of delivery, soon after birth, or in the first trimester.

POMS also includes an Abortion Tally Tool to count the monthly number of women who sought care for complications of pregnancy loss, as recorded in admission and discharge, OT, outpatient, and/or CPAC registers in hospitals and health centers. Aggregate numbers of pregnancy losses were also collected in dispensaries for 2018 because manual vacuum aspiration procedures are now conducted in those facilities. All evacuation procedures and surgeries related to first and second trimester pregnancy loss were counted with the assumption that virtually all of these procedures were performed for complications; the severity of complications could not be assessed.

Additionally, POMS includes an Obstetric Surgery Tally that collects monthly counts of obstetric surgeries recorded in major and obstetric OT registers, where available. Abstracted surgery data included unspecified Cesarean section (C-section), emergency C-section, C-section with bilateral tubal ligation, manual removal of the placenta, laparotomy and repair, hysterectomy for obstetric complications, surgery for ectopic pregnancy, evacuation of retained products performed in the major OT, hysterotomies, and laparotomy and obstetric complications.

RAPID

Because maternal deaths may still be missed in POMS, all evaluations of pregnancy outcomes included an additional step to improve case ascertainment using a modified RAPID methodology (IMMPACT, 2007). RAPID aims to identify all maternal deaths occurring in a facility by first identifying all deaths to women of reproductive age (WRAs) (15–49 years) and then determining whether each death was pregnancy-related. This process entails reviewing all records in which information on a death to a WRA could be recorded outside the obstetrics and gynecology wards. In addition to sources mentioned above, RAPID included documentation from maternal death audit forms, ward and facility death registers, mortuary logbooks, burial certificates, report books from other wards, and facility daily staff meeting reports, where available.

RAPID collects detailed information on the deaths of WRAs, including diagnosis, cause of death, treatments, procedures, obstetric history, and demographic characteristics, with the intention of classifying these deaths as maternal or non-maternal. In many instances, there is not enough information to determine whether the death was maternal or non-maternal, and a new category of “WRA death, unspecified” is defined, but not included in the maternal death reporting.

Methods

Starting with the 2018 evaluation, the RAPID methodology was expanded to perinatal deaths. For perinatal deaths, supplemental data sources include perinatal death reviews, general or ward-specific death registers, and morgue registers. In the 2018 and 2019 evaluations, data on neonatal deaths were also collected from admission and discharge registers of the recently opened neonatal intensive care unit at Maweni hospital, and the registers maintained in prematurity units opened in all hospitals and selected health centers (Kangaroo Mother Care registers). Further, the 2018 and 2019 evaluations included the review of the perinatal death logbook, a compulsory register introduced by the MoHCDGEC to the mortuary rooms in hospitals and health centers to increase detection of perinatal deaths (largely available only in the governmental hospitals). RAPID data are crosschecked with POMS data and maternal and neonatal deaths that have not already been captured are added to POMS database.

DATA CONSIDERATIONS

A number of considerations must be taken into account when interpreting data and making comparisons with data presented in previous reports on pregnancy outcome indicators:

- The number of health facilities providing delivery care increased over time, as did the number that were captured in the 2016, 2018, and 2019 evaluations as compared to the baseline evaluation in 2013 (Table 4).
- Assessment of EmONC functionality is based on performance in the 3 months prior to the data collection. As seasonality influences the number of deliveries and performance of emergency obstetric care procedures, the months observed for EmONC functionality may influence the classification. In 2013, the EmONC functionality was assessed based on procedures performed in May-July 2013; in 2016, 2018, 2019, the assessment was based on procedures performed in October-December of the year prior to the data collection.
- Provision of delivery care and life-saving obstetric interventions is influenced by temporary closings and renovations as well as by absence of qualified staff 24/7.
- Data collection on pregnancy outcomes was also retrospective and covered one or more years; the 2013 and 2016 evaluations documented outcomes that occurred during 2.5 years prior to each data collection; the 2018 evaluation documented outcomes that occurred during a 2-year period (2016 and 2017) and the 2019 evaluation documented outcomes that occurred during 1 year (2018).
- New registers were introduced in facilities, and existing registers (e.g., L&D register) changed in content.
- Starting with the 2018 evaluation, the data collection for perinatal deaths was expanding by using the RAPID methodology.
- Record keeping and archiving of health information was uneven across facilities and years of observation.
- The population size and the proportion of women of reproductive age (WRA) increased.

NUMBER OF FACILITIES

Data collection on pregnancy outcomes was conducted in all facilities providing at least 90 deliveries per year at the time of the evaluation. From 2013 to 2019, the number of facilities providing delivery care included in the assessment increased by 55% (from 127 to 197) (Table 4). The 2019 evaluation assessed 197 facilities, including all facilities in the 2013, 2016, and 2018 POMS evaluations, with the exception of 3 project-supported dispensaries[‡] that were closed or did not have personnel available at the time of 2019 follow-up evaluation (Table 4). Kagezi Dispensary and Kalya Dispensary were both upgraded to health centers over the span of *The Project*, bringing the total number of health centers to 27.

[‡] Kibuye, Minyinya, Nyaruyoba (Kibondo District Council)

Methods

Table 4 Number of Health Facilities Included in Baseline, Follow-up , and Endline Evaluations by Facility Type and Support Status

All Health Facilities, Kigoma Region, Tanzania

	Baseline (July 2013)	Follow-up (January 2016)	Follow-up (January 2018)	Endline (February 2019)
Project-supported				
Hospital	3	3	3	3
Health Center (ongoing support)	6	6	6	6
Health Center (newly supported)	0	6 ^a	6	7 ^b
Dispensary (newly supported)	0	66 ^c	68 ^b	67
Total project-supported	9	81	83	83
Non-project-supported				
Hospital	2	3	3	3
Health Center	17	13	14	14
Dispensary	99	77 ^b	97	97
Total non-project-supported	118	93	114	114
Total Facilities	127	174^d	197	197

^a Project support began between 2013 and 2016

^b Includes Kalya Health Center

^c Project support began between 2016 and 2018

^d Data collection in facilities added to the 2016 evaluation included pregnancy outcomes for the period 2011–2015.

Source: CDC, 2019b

All data presented in this report are based on a merged database that includes pregnancy outcomes documented in previous evaluations and the recently collected data for the period January–December 2018. Outcome data are presented as annual rates and ratios, usually stratified by facility type, project support, and EmONC functionality. Facility characteristics and EmONC functionality are documented in detail in the CDC’s Health Facility Assessment of Emergency Obstetric and Neonatal Care Services in Kigoma Region, Tanzania: Selected Findings, 2019 (CDC, 2019b).

Of note, the 2016 evaluation collected data from the health facilities added since the baseline 2013 evaluation to allow for comparison of the indicators. The 2018 and 2019 evaluations collected data from 23 additional non-project-supported dispensaries providing altogether approximately 3,000 deliveries per year. These dispensaries were not included in the previous evaluations because they did not meet the inclusion criteria for minimum deliveries per year (90 deliveries or more) at that time. We were unable to collect data from these dispensaries for the 2011–2015 period, so only the pregnancy outcomes in 2016–2018 include data collected from these additional 23 dispensaries.

However, their inclusion more accurately reflects the pregnancy outcomes in Kigoma health facilities, and it is important to capture the current situation in all delivery facilities for evaluating the regional trends and the relative contribution to facility deliveries by health facilities supported by *The Project*. It is inherent to increases in facility deliveries and other obstetric services to have more health facilities providing substantial care, and the evaluation has to adapt to capture as accurately as possible the full scope of this care. All analyses in this report were conducted using data collected in all facilities (including the 23 dispensaries added in the 2018 evaluation).

Methods

EMONC FUNCTIONALITY

We examined maternal and perinatal health outcomes by various levels of EmONC services during each evaluation. These levels of EmONC status are based on the facilities' performance of certain procedures (known as signal functions) in the 3 months before the evaluation (e.g., October-December 2018 for the 2019 evaluation) (CDC, 2019b). This may not represent a facility's EmONC status for the whole time period during which maternal and perinatal health outcomes were assessed. A facility providing all EmONC signal functions at one point in time may not perform these same functions at other points in time. Among many reasons, this could be due to changes in the availability of trained staff, facility caseload, or patients' need for emergency obstetric and neonatal care. Similarly, some facilities not previously classified as EmONC in one evaluation may perform more signal functions that qualify them as EmONC facilities in a subsequent evaluation. This could be due to improvements in infrastructure, equipment, staffing, and training. As such, comparisons across years by facility EmONC status should be interpreted with caution, both within and between evaluation cycles.

POPULATION DENOMINATORS

Some indicators require population-based estimates of annual number of births rather than facility births only. These include the institutional delivery rate, population Cesarean section rate, and met need for EmONC. To determine the overall number of births at the time of each evaluation, we used a combination of the 2012 National Bureau of Statistics (NBS) Population and Housing Census projections (NBS, 2013) and data provided by the Kigoma Region population-based Reproductive Health Surveys (RHS) (CDC 2015, 2017, 2019a). We first computed the crude birth rate according to a statistical methodology used by Demographic and Health Survey (DHS) (Rutstein & Rojas, 2006). The crude birth rate is the annual average number of births per 1,000 total population in the 3 years preceding each of the Kigoma RHS administrations.

The crude birth rate was calculated by first multiplying age-specific fertility rates (ASFR) from the Kigoma RHS with the weighted proportion of women in each age group among the total surveyed household population in Kigoma Region (CDC, 2015, 2017). The resulting products were summed to obtain annual estimated crude birth rates.

Using the total population figures for Kigoma Region from the 2012 Population and Housing Census (NBS, 2013), we used direct census population figures for year 2012; for all other years, we projected the base 2012 population using the region-wide growth coefficient derived from the intercensal population growth (NBS & Office of Chief Government Statistician, 2013). For year 2011, we reverse-projected the population by subtracting the population growth from the 2012 total population. For years 2013, 2014, 2015, 2016, 2017, and 2018 we applied yearly population growth to obtain the total population for each year (2011–2018). Lastly, we multiplied the annual population with the crude birth rate to obtain the number of births estimated to have occurred annually between 2011 and 2018.[§]

[§] Projected 2011: 83,399; actual 2012: 85,400; projected 2013: 87,450; projected 2014: 89,548; projected 2015: 91,698; projected 2016: 91,014; projected 2017: 93,198; projected 2018: 100,037.

Methods

DATA RECORDING

Data collection and analysis techniques in the 2019 study have been revised since the 2013, 2016, and 2018 studies, given the recent changes to the L&D registers in Tanzania. In the 2013 study, all L&D data were recorded in the Mfumo wa Taarifa za Uendeshaji Hudumaza Afya book 12, a primary data collection register introduced in 1993.

The Government of Tanzania has since introduced several new versions of the L&D register (revisions of 2013, 2014 and 2016). Each new register allowed recording of substantially more information on women and their deliveries than its previous version. Data collection based on multiple versions of the L&D registers introduces ascertainment bias in comparisons of indicators over time.

Some information that was included in the old 1993 L&D register, however, is no longer collected in the new registers. For example, “Neonatal Death within 24 hours” post-delivery and “Neonatal death at 24+ hours” post-delivery are no longer recorded in the new registers. In addition, other variables that had existed in the old register now have different response categories and abbreviations.

Furthermore, although the amount and type of information collected in the two new versions of the register is nearly identical, the order in which these data are recorded in the register differs. Thus, the 2019 study utilized 3 different data collection tools corresponding to the 3 different versions of the L&D registers. We carefully merged data sets resulting from each evaluation after reconciling these differences so that all L&D data for 2011–2018 could be analyzed in one dataset.

Among the differences in terminology and content between the 3 registers, several data quality implications exist:

- Removal of neonatal death variable from new versions of registers
- Change from English to Swahili abbreviations for mothers’ and babies’ status at discharge
 - English: D (discharged), DD (dead at discharge)
 - Swahili: H (hai/alive), A (amefariki/dead)
- Introduction of variables requiring a ‘yes’ or ‘no’ answer
 - H = hapana (no)
 - N = ndiyo (yes)

The similarities between the handwritten capital letters ‘H’ and ‘A’, as well as similarities between the capital letters ‘H’ and ‘N’, may have introduced recording bias. Facility personnel recording information in L&D registers may have accidentally recorded ‘A’ for a mother or baby’s status at discharge, when the intention was to record that mother or baby as ‘Alive’ rather than ‘Dead’ (‘Amefariki’). Similarly, personnel may have recorded ‘N’ for certain variables when the intention was to record ‘No’ rather than ‘Yes’ (‘Ndiyo’).

Under the RAPID methodology, deaths classified as maternal deaths that were found only in the L&D register were further verified against all other data sources. Because switching to the new registers introduced the potential for misclassification of deaths, maternal deaths that were identified only in the L&D registers (i.e., mother’s status at discharge = ‘A’) and no other sources were subjected to additional scrutiny. This entailed communication and verification with facility personnel, investigations into any evidence that a pregnancy-related death occurred (e.g., complications listed, obstetric surgery performed), and cross-checking to ensure the woman was not double-counted (i.e., admitted with complications at one facility and died at another facility).

A detailed description of the changes to registers and their data implications can be found in Annex A.

Methods

MISSING DATA

Due to inadequate storage practices for registers, as well as misplacement of the old registers after transitioning to new versions, some L&D data could not be collected in earlier evaluations. We used the average number of monthly deliveries in the past 5 years in each facility with missing register months. To estimate the institutional delivery rate in 2011–2017, we created imputed numbers of deliveries for the months with missing documentation.

All other indicators presented here were calculated using unadjusted data. The 2019 evaluation did not encounter any missing L&D registers and did not require any imputations.

Selected Findings

Selected Findings

EMONC SERVICES

EmONC services consist of 7 to 9 life-saving clinical interventions, called signal functions, which prevent and treat causes of maternal deaths (Table 5) (Bailey, 2002; WHO et al., 2009). Seven signal functions make up BEmONC; CEmONC includes all 7 BEmONC signal functions plus blood transfusion and obstetric surgery. For most signal functions, facilities were assessed based on their actual performance of each signal function, rather than whether they reported the ability to perform it (CDC, 2019b). The facilities in Kigoma Region were classified as BEmONC or CEmONC based on whether they performed each of the required signal functions in the 3 months prior to the data collection, per WHO guidelines (WHO et al., 2009). The report 2019 Health Facility Assessment of Emergency Obstetric and Neonatal Care Services in Kigoma Region, Tanzania: Findings from the Endline Evaluation describes in further detail the methodology for assessing EmONC functionality (CDC, 2019b).

Table 5 Basic^a and Comprehensive^b Emergency Obstetric Care Signal Functions and Proxy Indicators

No.	Signal Function	Proxy Indicator
1	Administer parenteral antibiotics	Facility reported parenteral use of antibiotics in the past 3 months; if did not report use, the facility has gentamicin, injectable ampicillin or its equivalent in stock (no stock-out during last 30 days)
2	Administer uterotonic drugs	Facility administered uterotonic drugs at least once in past 3 months, as documented in L&D register; if it did not report use, facility has oxytocin or misoprostol in stock (no stock-out during last 30 days)
3	Administer parenteral anticonvulsants	Facility reported use of anticonvulsants in the past 3 months; if it did not report use, facility has magnesium sulfate in stock (no stock-out during last 30 days)
4	Manually remove the placenta	Facility performed manual removal of placenta at least once in past 3 months, as documented in L&D or OT registers
5	Remove retained products	Facility performed removal of retained products at least once in past 3 months, as documented in L&D, OT, and/or registers where information on complications of pregnancy loss were recorded
6	Perform assisted vaginal delivery (AVD)	Facility has performed assisted vaginal delivery at least once in past 3 months, as documented in L&D register
7	Perform neonatal resuscitation	Facility performed any neonatal resuscitation techniques (stimulation, bag and mask, suction) at least once in past 3 months, as documented in L&D register
8	Perform surgery (e.g., Cesarean section)	Facility performed Cesarean section at least once in past 3 months, as indicated in L&D and/or OT register
9	Perform blood transfusion	Facility performed blood transfusion at least once in past 3 months, as indicated in L&D register

^a BEmONC services include signal functions 1–7.

^b CEmONC services include all signal functions, 1–9.

One basic obstetric intervention—the AVD using either forceps or vacuum extractor—is relatively uncommon in Tanzania. Training and equipment are not actively supported in public facilities, particularly in lower-level facilities. This means that many of the lower-level facilities would not qualify as BEmONC according to the WHO criteria and even some of the hospitals may not qualify, since the procedure is rarely performed. For this analysis, therefore, we decided not to discount EmONC facilities that routinely perform all other life-saving functions but have not performed AVD in the past 3 months. These facilities are labeled CEmONC minus one (CEmONC-1) and BEmONC minus one (BEmONC-1).

Selected Findings

Observation of signal function performance over 3 months was outside the scope of the study and information about performance was based on self-reports and direct verification of facility records. Thus, we developed proxy indicators for signal function performance, which rely on documented evidence of these interventions.

As described in the companion HFA report and in Table 5, information from the HFA, L&D registers, OT registers, and registers where complications of pregnancy loss are documented (e.g., admission/discharge) contributed to the development of proxy indicators to determine BEmONC and CEmONC service provision. Inconsistent or poor documentation in these data sources may contribute to an underrepresentation of facilities' actual provision of EmONC services.

The WHO recommends that a minimum of 5 EmONC facilities, including one CEmONC facility, are available per 500,000 population (Olsen et al., 2005; WHO et al., 2009). As the health care delivery system is organized at the district level, each district should have at least one CEmONC facility.

Information about performance of life-saving interventions (signal functions) in health facilities allows us to examine if Kigoma Region has adequate EmONC coverage per capita (based on population size in the year preceding the assessment). The measurement of EmONC functionality takes into account whether a health facility performed the core set of signal functions in the 3 months prior to the health facility assessment.

For each district, we first calculated the minimum recommended number of EmONC and CEmONC facilities by dividing the estimated district population by 100,000 and rounding up to the nearest integer (Table 6, left panel). We used the district structure of the region at the time of the 2013 data collection. Since then, some districts split and the current administrative structure now includes 6 districts and 2 town councils. We projected the population and examined EmONC coverage based on the baseline administrative structure.

Next, we estimated the number of EmONC and CEmONC facilities in each district, according to performance of signal functions in the last 3 months prior to each data collection (Table 6, right panel). Lastly, we compared the recommended number of EmONC and CEmONC per district with the observed number of EmONC and CEmONC facilities to evaluate whether existing coverage meets the minimum recommendation (number in parentheses). All but 1 EmONC facility were hospitals and health centers.

- Compared to 2013, the number of observed EmONC facilities almost doubled, from 11 in 2013 to 21 in 2019. In 2019, *The Project* supported 12 out of 21 EmONC health facilities, compared to 7 out of 11 in 2013. Between the 2013 and 2019 data collections, Kigoma Region increased the overall number of available EmONC facilities by 6 CEmONC (from 9 in 2013 to 15 in 2019) and 4 BEmONC facilities (from 2 in 2013 to 6 in 2019).
- Increases in EmONC availability vary by district. Since 2013, Kigoma Urban district gained a second CEmONC facility (when the Baptist hospital in Kigoma started to provide delivery care) and gained 1 BEmONC facility; Kigoma Rural gained 1 CEmONC facility and continues to have only one BEmONC facility; Kasulu district gained 1 facility with CEmONC status and 3 with BEmONC status during the same period (from 4 CEmONC and 1 BEmONC in 2013 HFA to 5 and 4, respectively in 2019 HFA); Kibondo district gained 3 CEmONC facilities (from 1 to 4), but continues to have no functional BEmONC facility.
- As a result, the gap between recommended and observed EmONC per capita narrowed between 2013 (-12) and 2019 (-5), despite the population growth that increased the minimum number of recommended EmONC facilities between 2013 (23) and 2019 (26).

Selected Findings

Table 6 Recommended and Observed Number of EmONC^a Facilities per 500,000 Population in the 3 Months Prior to Assessment by District
Kigoma Region, Tanzania, 2013–2019

		Recommended minimum number of EmONC ^c facilities		Number of observed EmONC facilities		
2013 HFA	Population in 2013 ^b	All EmONC	CEmONC	All EmONC	CEmONC	BEmONC only
Kigoma Urban	220,629	3	1	1 (-2)	1 (0)	0
Kigoma Rural	609,491	6	2	4 (-2)	3 (+1)	1
Kasulu	909,701	9	2	5 (-4)	4 (+2)	1
Kibondo	439,179	5	1	1 (-4)	1 (0)	0
TOTAL	2,179,000	23	6	11 (-12)	9 (+3)	2
Project-supported				7	6	1
2016 HFA	Population in 2015 ^b	All EmONC	CEmONC	All EmONC	CEmONC	BEmONC only
Kigoma Urban	231,346	3	1	3 (0)	2 (+1)	1
Kigoma Rural	639,098	7	2	3 (-4)	2 (0)	1
Kasulu	953,891	10	2	5 (-5)	4 (+2)	1
Kibondo	460,513	5	1	1 (-4)	1 (0)	0
TOTAL	2,284,847	25	6	12 (-13)	9 (+3)	3
Project-supported				4	4	0
2018 HFA	Population in 2017 ^b	All EmONC	CEmONC	All EmONC	CEmONC	BEmONC only
Kigoma Urban	242,584	3	1	2 (-1)	2 (+1)	0
Kigoma Rural	670,142	7	2	4 (-3)	3 (+1)	1
Kasulu	1,000,227	11	3	5 (-6)	3 (0)	2
Kibondo	482,883	5	1	4 (-1)	1 (0)	3
TOTAL	2,395,836	26	7	15 (-11)	9 (+2)	6
Project-supported				11	7	4
2019 HFA	Population in 2018 ^b	All EmONC	CEmONC	All EmONC	CEmONC	BEmONC only
Kigoma Urban	248,406	3	1	3 (0)	2 (+1)	1
Kigoma Rural	686,226	7	2	5 (-2)	4 (+2)	1
Kasulu	1,024,232	11	3	8 (-2)	5 (+2)	4
Kibondo	494,472	5	1	4 (-1)	4 (+3)	0
TOTAL	2,453,336	26	7	21 (-5)	15 (+8)	6
Project-supported				12	10	2

EmONC = emergency obstetric and neonatal care; BEmONC = basic EmONC; CEmONC = comprehensive EmONC

^a Includes BEmONC and CEmONC facilities that may or may not have performed AVD in past 3 months (i.e., BEmONC-1 and CEmONC-1).

^b Population projections based on the 2012 National Census (NBS, 2013)

^c WHO recommends minimum level of 5 EmONC facilities per 500,000 population, including at least one CEmONC facility (WHO et al., 2009).

() Numbers in parenthesis represent the difference between the observed and recommended number of EmONC and CEmONC facilities.

Source: 2013, 2016, 2018, and 2019 Health Facility Assessments of Emergency Obstetric and Neonatal Care Services in Kigoma Region, Tanzania (CDC, 2014; CDC, 2016; CDC, 2018)

Selected Findings

EMERGENCY OBSTETRIC AND NEONATAL CARE INDICATORS

CDC/DRH used a set of common EmONC indicators to evaluate EmONC capacity and functionality and maternal and neonatal health outcomes in Kigoma Region (Table 7). These indicators have corresponding life-saving interventions that can be provided in EmONC settings. Calculating and tracking these indicators provides an opportunity to review where these life-saving interventions are working well or may need to be strengthened.

Table 7 Emergency Obstetric and Neonatal Care (EmONC) Indicators^a and Delivery Care Indicators

All Health Facilities, Kigoma Region, Tanzania

Indicator	Definition
Availability of EmONC ^a	The number of facilities providing EmONC ^b per 500,000 total population
Institutional delivery rate	The number of women who delivered in health facilities divided by the expected number of live births in the area of observation
Proportion of all births in EmONC facilities ^a (%)	The number of women who delivered in EmONC ^b facilities divided by the expected number of live births in the area of observation
Population-based C-section rate ^a (%)	The number of Cesarean sections performed in health facilities for any reason divided by the expected number of all births in the area of observation
Facility C-section rate (%)	The number of Cesarean sections performed in health facilities divided by the number of births in facilities with operating theatres
Met need for EmONC services ^a (%)	The number of women who delivered in health facilities and were treated for major direct obstetric complications divided by the expected number of women with major direct obstetric complications
Direct obstetric case fatality rate ^a (%)	The number of women who died of direct obstetric complications in facilities divided by the number of women diagnosed with or treated for direct obstetric complications in the same facilities (includes severe first trimester complications)
Proportion of indirect maternal mortality ^a (%)	The number of maternal deaths from indirect obstetric causes in facilities divided by the number of maternal deaths of direct and indirect obstetric causes in the same facilities
Institutional maternal mortality ratio	The number of maternal deaths from direct and indirect obstetric causes in facilities divided by the number of live births in the same facilities, expressed per 100,000 live births in facilities
Institutional stillbirth rate	The number of stillbirths in facilities divided by the number of total births in the same facilities, expressed per 1,000 births in facilities
Institutional intrapartum stillbirth rate	The number of intrapartum stillbirths in facilities divided by the number of total births in the same facilities, expressed per 1,000 births in facilities
Institutional pre-discharge neonatal mortality rate	The proportion of pre-discharge neonatal deaths in facilities divided by the number of live births in the same facilities, expressed per 1,000 live births in facilities

^a Indicators recommended for monitoring EmONC care (WHO et al., 2009).

^b EmONC facilities include both comprehensive (CEmONC) and basic (BEmONC) facilities.

Selected Findings

SUMMARY OF EMONC INDICATORS

Making EmONC lifesaving interventions widely available can help to minimize maternal and neonatal morbidity and mortality. WHO recommends a set of process and outcome indicators that allow for monitoring of maternal and child health care improvements through emergency obstetric care (WHO et al., 2009). Table 8 summarizes these indicators in Kigoma Region for selected years during *The Project* and compares them with the levels recommended by the WHO.

Detailed information about changes in these key EmONC indicators and other indicators that document maternal and newborn care over time are included in the next section of the report.

Table 8 EmONC Indicators

All Health Facilities, Kigoma Region, Tanzania

Indicator	Kigoma 2013	Kigoma 2015	Kigoma 2017	Kigoma 2018	Recommended Level ^a
Availability of EmONC per 500,000 population ^b	2.6	2.6	3.1	4.3	At least 5
Availability of CEmONC per 500,000 population ^b	2.1	2.0	1.9	3.1	At least 1
Proportion of institutional deliveries	48.8%	55.0%	71.9%	84.9%	>80% ^c
Proportion of all births in EmONC facilities	19.3%	22.7%	20.9%	21.4%	N/A
Population-based Cesarean section (C-section) rate	2.6%	3.1%	4.1%	4.5%	5–15%
Facility C-section rate, % institutional births	11.7%	11.9%	12.4%	13.6%	N/A
Met need for EmONC services (all facilities)	44.0%	47.7%	58.0%	61.3%	100%
Direct obstetric case fatality rate (excluding first trimester complications) in all facilities ^c	2.4%	2.7%	2.4%	2.1%	<1%
Direct obstetric case fatality rate (including first trimester complications—abortion and ectopic) in all facilities ^d	1.8%	1.7%	1.6%	1.4%	<1%
Institutional intrapartum stillbirth rate (per 1,000 total births in facilities)	14.4	11.6	9.8	6.0	N/A
Institutional pre-discharge neonatal mortality rate (per 1,000 live births in facilities)	10.7	11.7	9.8	7.6	N/A
Institutional maternal mortality ratio (per 100,000 live births in facilities)	303	277	244	174	N/A
Proportion of indirect maternal mortality ^d	13%	22%	18%	14%	N/A

Abbreviations: Health Facility Assessment, HFA; EmONC, Emergency Obstetric and Newborn Care; CEmONC, Comprehensive EmONC; N/A, not available.

^aWHO et al., 2009

^bAssessed in the 2013 HFA (Kigoma 2013), 2016 HFA (Kigoma 2015), 2018 HFA (Kigoma 2017), and 2019 HFA (Kigoma 2018)

^cRecommended by Tanzania Ministry of Health, Community Development, Gender, Elderly and Children (MoHSW, 2014).

^dIncludes maternal deaths due to unspecified cause proportionally reallocated between direct and indirect causes.

Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

Selected Findings

INSTITUTIONAL DELIVERY RATE

Although some women are known to be at high risk for complications during labor and delivery, not all obstetric complications can be predicted. It is thus recommended that all women deliver under the care of skilled providers. Skilled birth attendants in Kigoma Region are doctors, nurses, or midwives who are located at health facilities. Many dispensaries are staffed by medical attendants who may not be technically considered skilled birth attendants by the Government of Tanzania.

The institutional delivery rate provides insight into the proportion of women with access to skilled providers who can recognize, treat, and, when necessary, refer for obstetric complications and ultimately save lives.

The institutional delivery rate is the number of women who received skilled care in health facilities divided by the expected number of births in the area of observation over a period of time, usually 1 year. Targets for the institutional delivery rate are included in Tanzania's road map for maternal and neonatal mortality and morbidity reduction. Tanzania aims to have 80% of all births attended by skilled birth attendants (MoHSW, 2014).

In each evaluation, we computed the institutional delivery rate using the number of women who received delivery care in all health facilities surveyed. We collected information on all women recorded in L&D registers, but excluded from the numerator women who delivered prior to presenting at a health facility (i.e., birth before arrival). We divided the number of facility deliveries by the estimated annual number of live births in the entire region (using the 2012 census population data and crude birth rates calculated from the Kigoma Reproductive Health Surveys) (CDC, 2015, 2017, 2019a). In all but the current 2019 evaluation (when all facilities had all maternity registers for 2018 available), we imputed deliveries in facilities with missing registers (between 1% and 10% of facility-month data were imputed, as described in the methods section).

Other than the institutional delivery rate, no other indicators presented in this report have been adjusted for numbers of deliveries for the months with missing documentation.

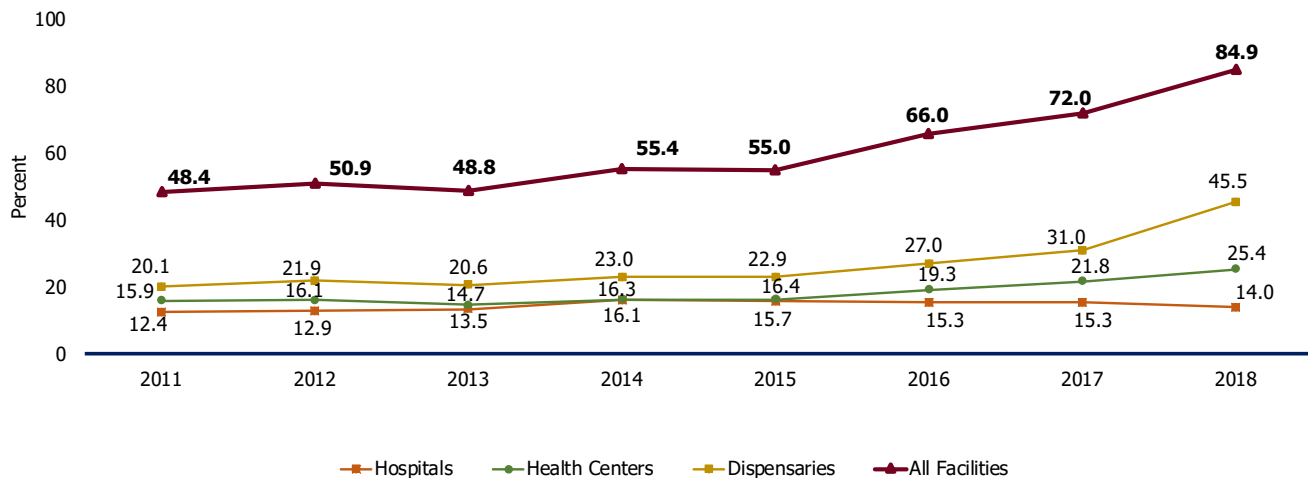
Changes in institutional delivery rates from 2011 to 2018 are presented in Figures 1–3. In 2018, 84.9% of births in Kigoma Region were estimated to have occurred in health facilities, compared to 48.4% in 2011—a 75% increase (Figure 1). Thus, 15.1% of deliveries in 2018 were estimated to have occurred at home or elsewhere without skilled obstetric care, compared to 51.6% in 2011.

Deliveries gradually increased in all types of facilities, but dispensaries continue to be the most common place of delivery throughout the 2011–2018 period. Dispensary delivery rates increased from 20.1% of all estimated births in 2011 to 45.5% in 2018, health center delivery rates increased from 15.9% to 25.4%, and hospital delivery rates increased from 12.4% to 14.0%. As a result, dispensary delivery care contributed 53.6% of the facility deliveries in 2018, compared to 41.5% in 2011, a 29% increase (Figure 1).

Selected Findings

Figure 1 Institutional Delivery Rate by Facility Type, 2011–2018

All Health Facilities, Kigoma Region, Tanzania



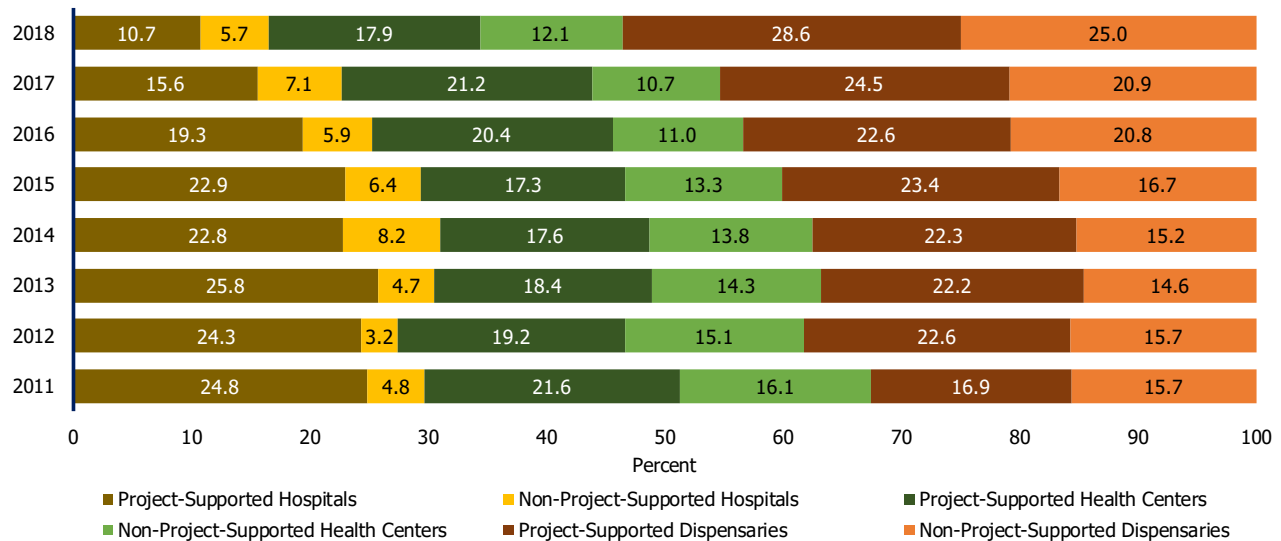
Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

The number of deliveries occurring in health facilities in our evaluation is conservative. Facilities with very low delivery volume (less than 90 deliveries per year) were not initially visited in the first round of POMS data collection. With increasing number of deliveries taking place in health facilities, the proportion of dispensaries with low volume declined over time. Subsequent evaluations increased the number of health facilities visited (Table 4). In 2019, only 36 dispensaries providing delivery care in Kigoma were not included in the evaluation. Collectively, they provided care for about 4,000 deliveries, accounting for 4.5% of the facility deliveries, according to the District Health Information System, version 2 (DHIS2, 2019). If we included deliveries reported by DHIS2 in these dispensaries in 2018, the resulting institutional delivery rate in Kigoma would be 88.9% in 2018 and the dispensary delivery rate would be 49.5%.

Figure 2 shows the percent distribution of institutional deliveries by facility type and project support status. From 2011 to 2018, the proportion of facility deliveries taking place in hospitals decreased from 29.6% to 16.4% (deliveries in project-supported hospitals declined from 24.8% in 2011 to 10.7% in 2019, although deliveries in non-project-supported hospitals increased from 4.8% in 2011 to 5.7% in 2018). The proportion of facility deliveries occurring in project-supported health centers steadily declined from 21.6% in 2011 to 17.9% in 2018, as it did in non-project-supported health centers (16.1% in 2011 to 12.1% in 2018) while the proportion of project-supported dispensaries saw an increase (from 16.9% in 2011 to 28.6% in 2018) as did non-project-supported dispensaries (15.7% in 2011 to 25.0% in 2018). The increased rates in these lower-level facilities are due to the increased number of women seeking delivery care in the facilities nearest to their homes.

Selected Findings

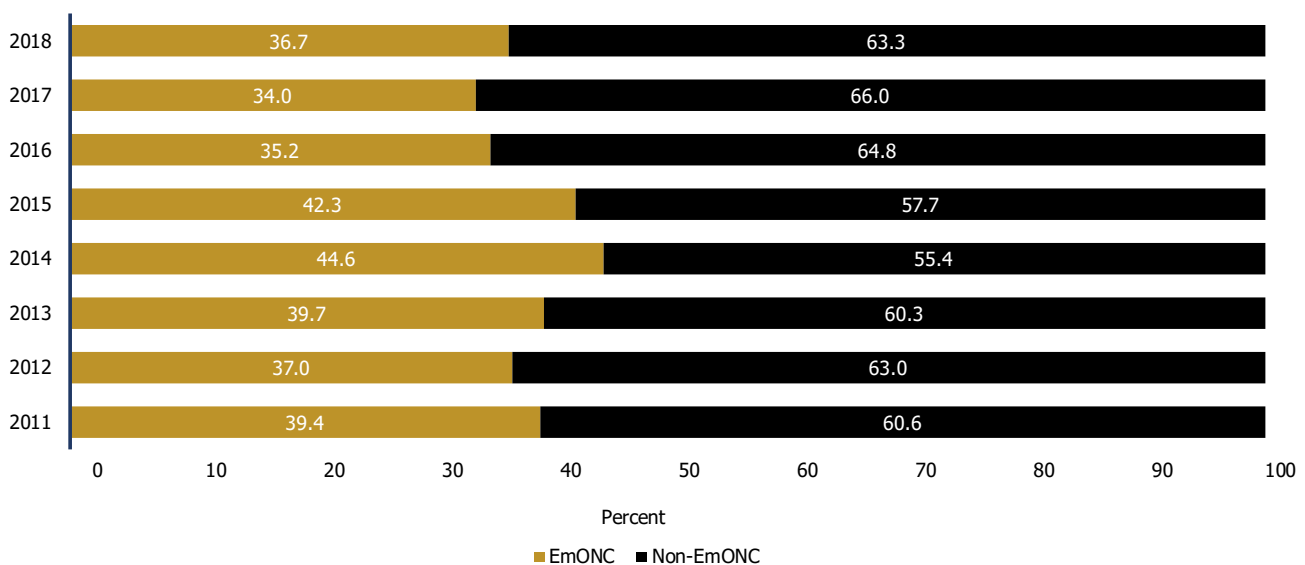
Figure 2 Percent Distribution of Deliveries by Project Support Status, 2011–2018
All Health Facilities, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

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. In each year, the institutional delivery rate in facilities providing EmONC services is considerably smaller than the rate in non-EmONC facilities (Figure 3).

Figure 3 Percent Distribution of Deliveries by EmONC Status, 2011–2018
All Health Facilities, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

Selected Findings

ACTIVE MANAGEMENT OF THE THIRD STAGE OF LABOR

Postpartum hemorrhage (PPH) is commonly defined as a blood loss of 500 mL or more from the genital tract after vaginal birth and 1,000 mL or more after C-section within 24 hours post-delivery (WHO, 2012a). PPH is the leading cause of maternal mortality worldwide. Globally, PPH affects approximately 11% of all women who deliver and is responsible for approximately one-quarter of all maternal deaths (Calvert et al., 2012). Prevalence of PPH after vaginal birth is estimated to be much higher in Africa (26%) compared to the global prevalence (10.8%) (Calvert et al., 2012).

Active management of the third stage of labor (AMTSL) is recommended by WHO for all deliveries (WHO, 2012a). One key aspect of AMTSL is administering a prophylactic uterotonic drug after the delivery of the baby, 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 by causing the uterus to contract to help expel the placenta and to prevent bleeding after the placenta is delivered. In addition to the administration of a prophylactic uterotonic drug after delivery, AMTSL also includes controlled traction of the umbilical cord and postpartum abdominal uterine tone assessment for early identification of atony.

Capturing AMTSL use in facility registers has changed over time. Prior to 2013, the L&D register did not capture information about administration of uterotonics. Several modifications to the L&D register have been introduced since 2013. Only the most recent register introduced in 2016 includes a direct question about use of AMTSL at delivery, while previous versions only captured the overall administration of uterotonics at birth (either for prevention or treatment). In this report, when the data come from registers that did not directly capture use of AMTSL at delivery, we used the percentage of births for which uterotonic drugs were administered as a proxy to determine AMTSL performance (Figure 4). For facilities using the newest register, we used the direct information about administration of AMTSL at delivery. We present AMTSL performance for deliveries in hospitals and health centers only in 2013–2018, when all hospitals and health centers were using registers that captured this information.

In 2018, AMTSL (i.e., uterotonic drug administration after delivery) was performed for 92.1% of births in all hospitals, health centers, and dispensaries. This is a large increase from 2013, when AMTSL was performed for only 13.9% of births in all facilities.

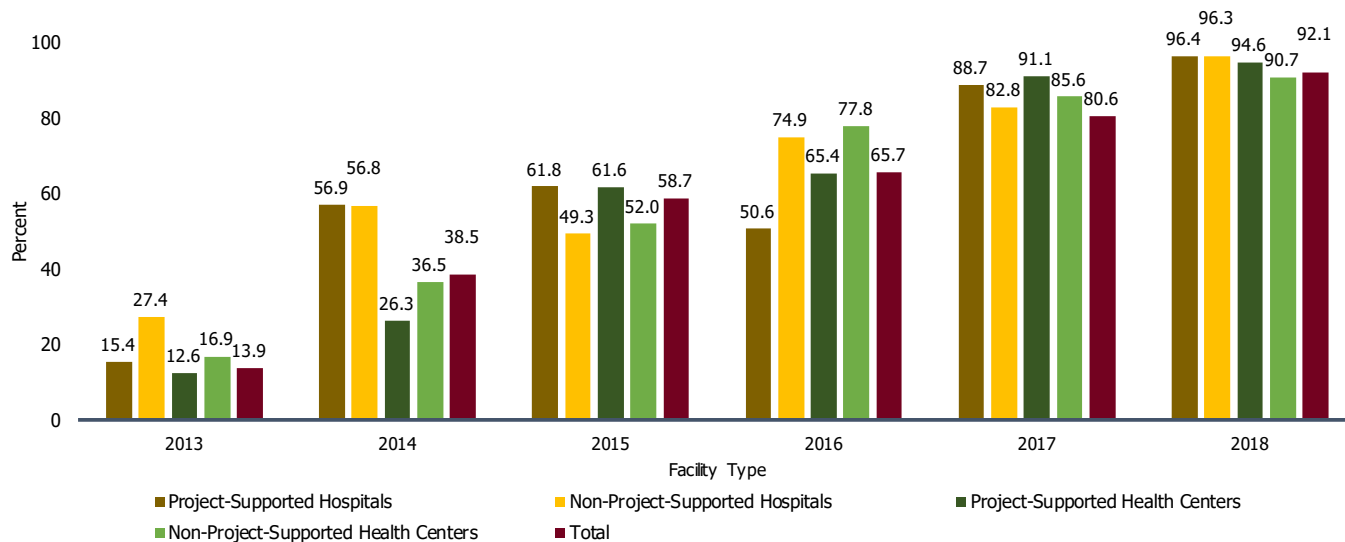
AMTSL performance increased in all hospitals and health centers, regardless of project support (Figure 4); these increases were greatest in project-supported facilities, with a six-fold increase in the percentage of project-supported hospitals performing AMTSL (from 15.4% in 2013 to 96.4% in 2018) and a seven-fold increase among project-supported health centers (from 12.6% to 94.6%). Non-project-supported facilities also increased their performance of AMTSL during the same period; non-project-supported hospitals had a three-fold increase (27.4% to 96.3%) and non-project-supported health centers had a five-fold increase (from 16.9% to 90.7%).

AMTSL performance measured by administration of uterotonics may be under-reported because including this information in L&D registers is a new requirement; it may also be over-reported due to lack of understanding of what AMTSL means. Facility personnel may perform the procedure but not record information accurately or consistently. Further, having multiple editions of the L&D registers in use may lead to errors in completion. Lastly, recording practices vary from one facility to another or sometimes among health providers at the same facility, with some providers only recording uterotonics administration for treatment purposes while others record it for all purposes.

The direct information on AMTSL performance at birth included in the most recent version of the L&D register yields more accurate results about the preventive use of uterotonics. Unfortunately, its recent addition to the register prevents us from looking at trends over time.

Selected Findings

Figure 4 Births with Uterotonic Drugs Administered by Project Support Status, 2013–2018
All Hospitals and Health Centers, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

CESAREAN SECTION RATE

Access to providers who can perform C-sections can prevent maternal and perinatal deaths, as well as serious maternal health complications, like obstetric fistulae. Kigoma Region is the first place in Tanzania where obstetric surgeries were made available in health centers, performed by non-physician clinicians (e.g., Assistant Medical Officers). Phase 1 of *The Project* supported CEmONC expansion and task-shifting in several health centers. Increased availability of this life-saving intervention may have contributed to declines in maternal mortality in the region.

The population-based C-section rate is the number of C-sections performed in health facilities as a proportion of all estimated births in the population. The number of births per year were estimated by population projections using data from the census (NBS, 2016) and 2018 Kigoma Reproductive Health Survey (CDC, 2019a). The WHO recommends an optimal C-section rate range of 5–15%; rates below 5% suggest limited access to this life-saving procedure (WHO, 2015b).

In 2018, Kigoma’s population-based C-section rate was 4.5% (Figure 5, trend line), which is lower than the WHO minimum recommended C-section rate of 5%, but part of an overall increase since 2011 (2.7%).

The facility-based C-section rate is the proportion of C-sections among all births in facilities with operating theatres (Figure 5, vertical bars). This includes all hospitals (Baptist, Heri, Maweni, Kabanga, Kasulu, and Kibondo) and health centers with surgical capacity: Bitale, Buhingu, Ilagala, Kakonko, Kalya, Kifura, Kiganamo, Mabamba, Matyazo, Muyama, Nguruka, Nyanzige, Nyenge, Shunga, and Ujiji. Note that not all health centers provided surgical care throughout the evaluation intervals.[¶]

[¶] Kakonko’s OT was under renovation October–December 2015 and was not performing surgeries at that time. It began performing surgeries again in January 2016. Mabamba OT was under renovation in 2017 and was not performing surgeries for most of that year. Kiganamo, Muyama, Nyanzige and Ilagala started to provide surgical care in 2016, and Nyanzige OT was closed since June 2018.

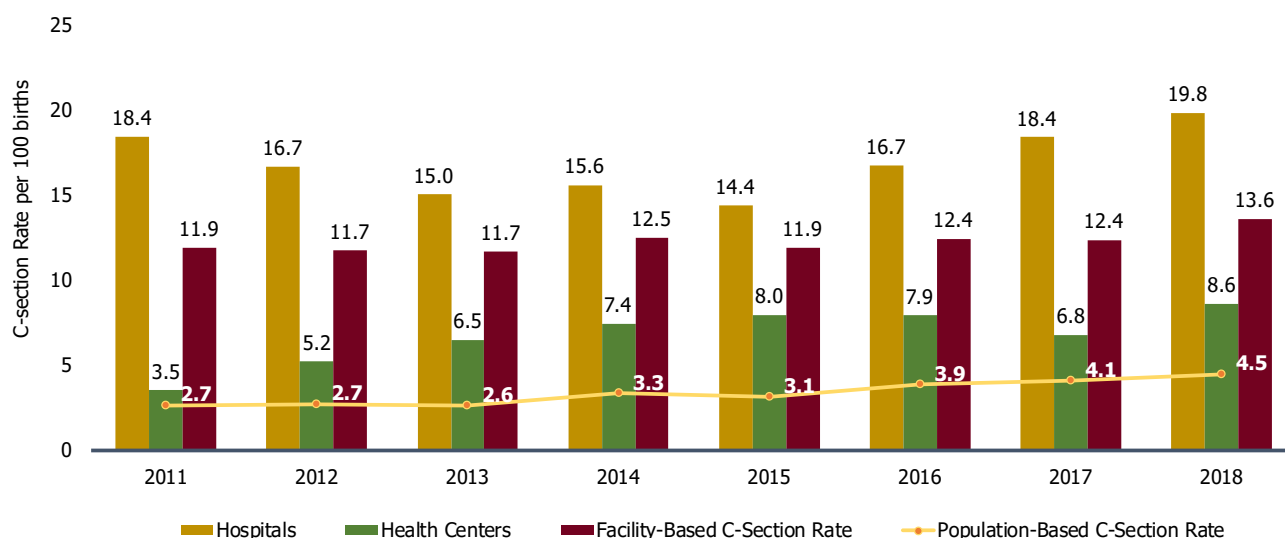
Selected Findings

The overall facility-based C-section rate in 2018 was 13.6%. This is the highest in Kigoma Region since these data were first collected in 2011 (11.9%).

In 2018, 19.8% of births in all hospitals were delivered by C-section; 8.6% of births in health centers performing C-sections were delivered by C-section, representing the highest estimates for both hospitals and health centers over the period 2013–2018 (Figure 5).

Figure 5 Facility and Population Cesarean Section Rates, 2011–2018

All Hospitals and Health Centers, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

Changes in facility C-section rates should be interpreted with caution. C-section performance relies on the availability of surgical teams and skills. Facilities that undergo renovations or whose minimal surgical staff are intermittently absent may experience decreases in C-section rates for that time period.

OBSTETRIC COMPLICATIONS

An estimated 15% of women will experience obstetric complications during their pregnancy (WHO et al, 2017). Direct obstetric complications include obstetric hemorrhage (antepartum, intrapartum, or postpartum), prolonged or obstructed labor, ruptured uterus, sepsis, eclampsia/preeclampsia, complications of pregnancy loss, and ectopic pregnancy. These complications require treatment in EmONC facilities. We reviewed, identified, and classified the total number of direct complications, as recorded in facility records. CDC calculated obstetric complications using two approaches: a) taking into account only the care provided for direct obstetric complications during labor, delivery, and early postpartum, and b) adding the surgical post-pregnancy loss care and surgical treatment for ectopic pregnancies (referred to here as first trimester complications).

In 2018, 9,217 women presented in health facilities in Kigoma with serious direct obstetric complications including first trimester complications (Annex B, Table B1). If first trimester complications are not included, this number falls to 5,916 women (Annex B, Table B2).

Selected Findings

EmONC facilities provided care for most of the direct obstetric complications; in 2018, EmONC facilities provided care for 78.9% of direct obstetric complications including first trimester complications (Annex B, Table B1) and 83.6% of direct obstetric complications without first trimester complications (Annex B, Table B2).

The number of direct obstetric complications attended in facilities with complete EmONC functionality increased by approximately 65% since 2011 (2011: 4,413 complications; 2018: 7,272 complications) (Annex B, Table B1).

Despite some fluctuations over time, hospitals, health centers, and dispensaries all treated more direct obstetric complication cases in 2018 than in any previous year since 2011 (Annex B, Tables B1 and B2).

MET NEED FOR EMONC

Met need refers to the proportion of women receiving EmONC services for serious obstetric complications among those expected to experience serious pregnancy complications (i.e., the proportion of women who need EmONC services whose needs have been met). 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 serious obstetric complications in the same geographical area and time period. Determining the met need for EmONC provides insight into whether pregnant women with complications might not be accessing or using EmONC services.

The exact expected number of complicated pregnancies in a population is difficult to ascertain. Following the WHO recommendations, it is usually estimated at 15% of live births** (estimated by applying the crude birth rate to the population of the region) (WHO et al., 2009). Direct or major obstetric complications primarily include: hemorrhage (antepartum, intrapartum, or postpartum), prolonged or obstructed labor, ruptured uterus, postpartum sepsis, complications of pregnancy loss, eclampsia or preeclampsia and ectopic pregnancy. The severity of complications due to first trimester complications (complications of pregnancy loss and ectopic pregnancy) are difficult to ascertain; therefore, we calculated met need both including (Annex B, Table B1) and excluding first trimester complications (Annex B, Table B2).

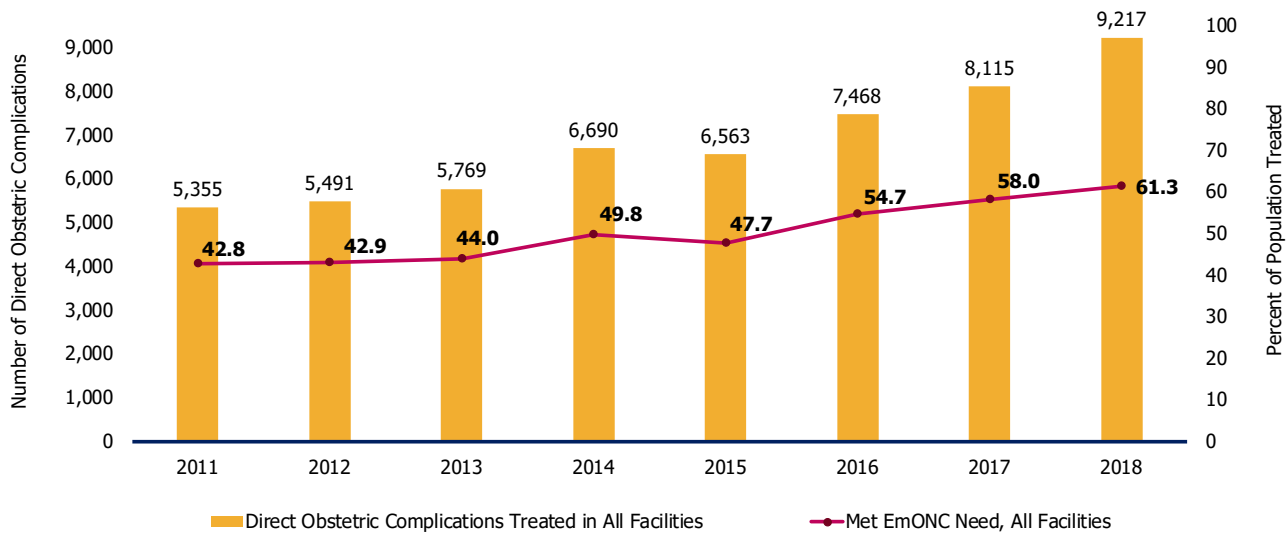
The WHO target for met need is 100%; that is, all women with serious direct obstetric complications should receive treatment in EmONC facilities (WHO et al., 2009). WHO also recommends using the met need indicator in two settings: all health facilities and EmONC facilities.

** Population, live births and expected number of obstetric complications for Kigoma are shown in Table 9.

Selected Findings

Figure 6 Number of Direct Obstetric Complications (including First Trimester Complications) and Met Need for EmONC, 2011–2018

All Health Facilities, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

From 2011–2018, the met need rate (the proportion of estimated expected direct obstetric complications, including first trimester complications, that received treatment) in all facilities gradually increased, from 42.8% (2011) to 61.3% (2018); this represents a 43% increase (Figure 6). When looking at obstetric complications excluding first trimester complications, in 2018, 39.3% of estimated expected complications in all facilities received treatment for direct obstetric complications, which is also slightly higher than previous years (range: 28.1%–37.0%) (Annex B, Table B2).

The proportion of estimated expected direct complications, including first trimester complications, receiving treatment in EmONC facilities also increased over time. The met need in EmONC facilities increased by 37% (from 35.3% in 2011 to 48.3% in 2018) (Annex B, Table B1). Despite progress in met need, a substantial proportion of women expected to develop obstetric complications still do not receive treatment for complications in EmONC facilities.

Each year, the care provided in project-supported hospitals and health centers contributed to most of the met need for EmONC in the region (65% on average) (Annex B, Table B1).

DIRECT OBSTETRIC CASE FATALITY RATE

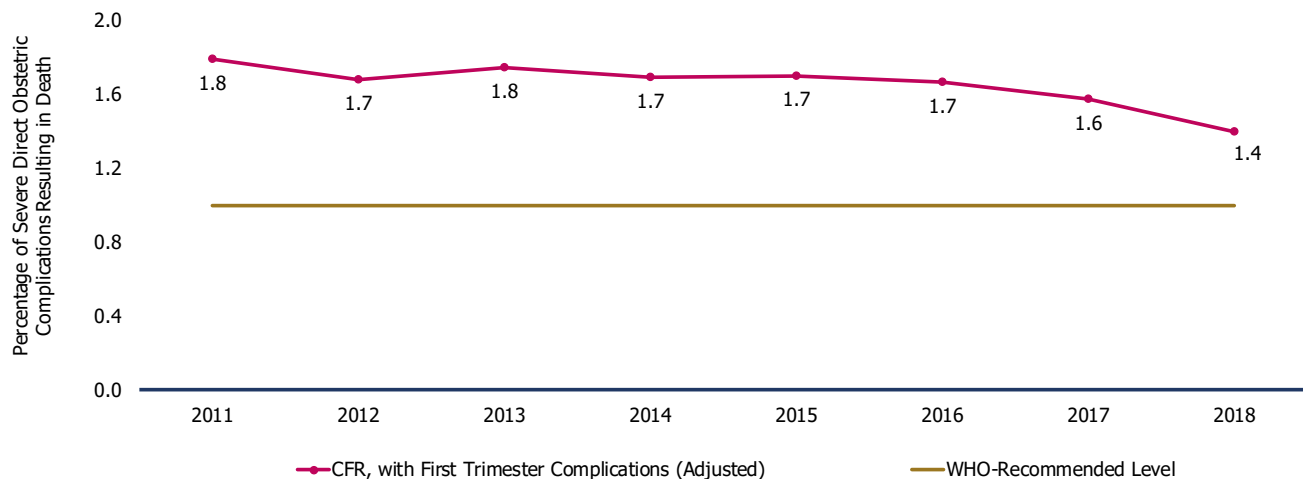
The case fatality rate (CFR) is the proportion of facility-treated women with serious direct obstetric complications who die in facilities despite receiving care. The CFR is often used as a proxy for facility-based quality of care; however, this should be used cautiously as a facility has no control over the condition in which a woman arrives. For example, hospitals may receive more serious cases than other types of facilities. Additionally, some women may present at facilities only when their complications have advanced in severity.

Selected Findings

WHO’s acceptable level is a CFR of less than 1% for women with direct obstetric complications in facilities (WHO et al., 2009). The direct CFR is calculated by dividing the number of all the women who die of direct obstetric complications in all facilities by the number of all of the women who presented with or experienced direct obstetric complications in all facilities. Maternal deaths due to unspecified causes were reallocated as direct or indirect based on the percent distribution of direct and indirect obstetric deaths in each year.

In 2018, the CFR for major, direct obstetric complications during labor, delivery, and early postpartum including first trimester complications was 1.4% in all facilities, lower than 1.8% in 2011 (Figure 7). The decrease in CFR in all facilities may be an indication of improved quality of care for obstetric complications. If care for first trimester complications is not included, the direct obstetric CFR in 2018 was 2.1% in all facilities, compared to 2.3% in 2011 (data not shown).

Figure 7 Direct Obstetric Case Fatality Rate, including First Trimester Complications, 2011–2018
All Health Facilities, Kigoma Region, Tanzania



Note: Maternal deaths due to an unspecified cause were proportionally reallocated into direct and indirect maternal deaths.
Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

OBSTETRIC SURGERIES

Cesarean sections constituted the majority of obstetric surgeries provided in hospitals and health centers with operating theater capacity (Annex B, Table B3). In 2018, there were only 119 other surgeries for complex obstetric care, excluding C-sections (Annex B, Table B3). These surgeries included operations for uterine rupture, first trimester complications, surgical treatment for postpartum hemorrhage, and placental removal in the operating theatre. Most of these obstetric surgeries occurred in the project-supported district hospitals (Kasulu, Kibondo and Maweni) and the private hospitals (Heri and Kabanga hospitals in Kasulu District and Baptist hospital in Kigoma Urban).

Procedures related to complications during the first trimester are shown in Table B4. Similar to the pattern observed for major obstetric surgeries, these procedures occurred more often in hospitals and less often in health centers.

Selected Findings

INSTITUTIONAL MATERNAL MORTALITY

The 10th International Classification of Diseases (ICD) applied to deaths during pregnancy, childbirth, and the puerperium (ICD-MM) divides maternal deaths into direct obstetric deaths (i.e., deaths resulting from the obstetric complications of pregnancy, interventions, omissions, incorrect treatment, or a chain of events resulting from any of the above) and indirect obstetric deaths (i.e., deaths resulting from a previous existing disease, or disease that developed during pregnancy that was not due to direct obstetric causes, but was aggravated by physiological effects of pregnancy)(WHO, 2012b). Deaths due to accidental or incidental causes during pregnancy, childbirth, and postpartum are considered coincidental deaths and not included in the definition of maternal death.

Globally, the majority of maternal deaths are directly related to pregnancy, childbirth and postpartum. The most common major direct causes of maternal death are hemorrhage, eclampsia/preeclampsia, sepsis/infection, obstructed labor, and unsafe abortion (Say et al., 2014). The relative contribution of these causes and the levels of maternal mortality depend on what health interventions are available and whether women with obstetric complications are accessing and receiving timely emergency obstetric care.

Causes of indirect obstetric death include communicable and non-communicable diseases and nutritional disorders occurring or aggravated during pregnancy or postpartum. The role of indirect obstetric causes in maternal mortality varies from country to country, according to the epidemiological context and the health system's effectiveness in responding. The proportion of maternal deaths due to indirect causes in sub-Saharan Africa is estimated at 20–25% (WHO, 2015a, Say et al., 2014). Indirect maternal deaths may be of particular importance in sub-Saharan Africa, where pregnancy and childbirth can further impair the health of women who are already living with health issues. The prevalence of HIV, malaria, and tuberculosis are higher than in other regions, and play a greater factor in indirect maternal mortality.

Better understanding of direct and indirect causes can lead to effective health care interventions and strategies to prevent or control maternal morbidity and mortality. Information on the relative contribution of direct and indirect maternal deaths to overall maternal mortality (including analyses of cause-specific mortality) is central in monitoring and evaluation of maternal health programs. This information should be used at the planning stage and during the course of the programs to ensure the optimum allocation of resources, which may ultimately help reduce the total numbers of maternal deaths. While not all maternal deaths are preventable, the majority of deaths due to direct obstetric indications are preventable with early recognition of a problem, access to quality emergency obstetric care, and timely and appropriate treatment.

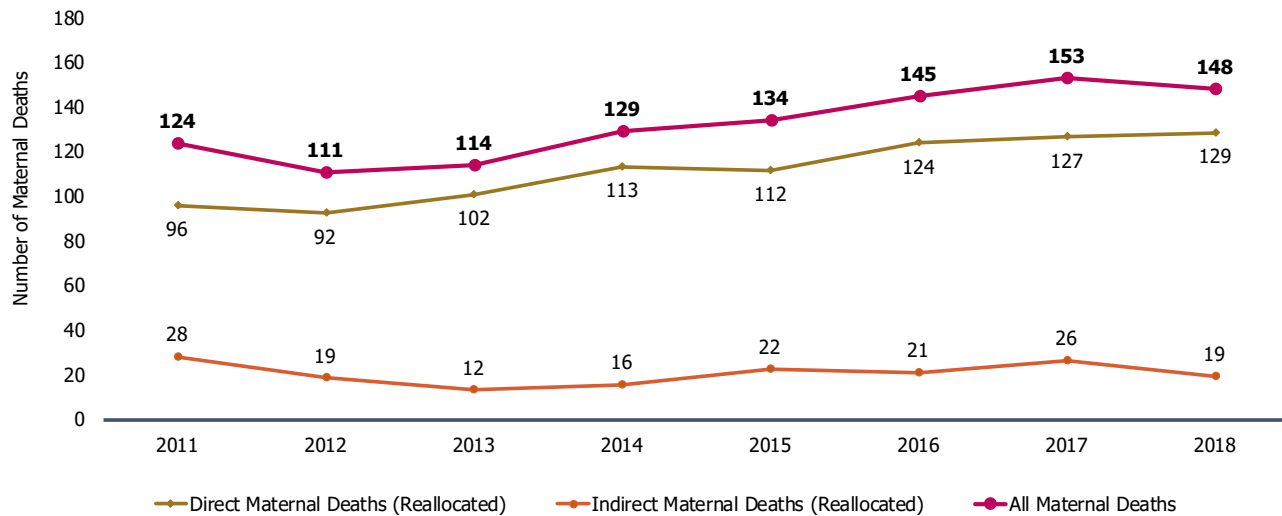
NUMBER OF MATERNAL DEATHS IN HEALTH FACILITIES

CDC/DRH identified the total number of maternal deaths at facilities from a variety of data sources using the RAPID methodology (IMMPACT, 2007). The same methodology and tools were used to identify maternal deaths in all years, but few primary data sources (e.g., maternal deaths reviews, deaths registers) were available until the most recent evaluations (2018 and 2019).

In 2018, the evaluation identified 148 maternal deaths in health facilities in Kigoma region (91 deaths in hospitals; 41 deaths in health centers; 16 deaths in dispensaries; data not shown). Between 2011 and 2018, the number of maternal deaths in all facilities generally increased (Figure 8). The increase was driven by more direct maternal deaths occurring in health facilities.

Selected Findings

Figure 8 Number of Facility Maternal Deaths by Cause of Death, 2011–2018
All Health Facilities, Kigoma Region, Tanzania



Note: Maternal deaths due to an unspecified cause were proportionally reallocated into direct and indirect maternal deaths.
Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

Annually, more than three-quarters of maternal deaths in Kigoma Region were from direct obstetric causes. Most maternal deaths occurred in facilities with EmONC services (2011: 91.9% of maternal deaths were in EmONC facilities; 2012: 92.8%; 2013: 83.3%; 2014: 82.9%, 2015: 84.3%; 2016: 77.2%; 2017: 77.1%; 2018: 79.1% (Figure 9).

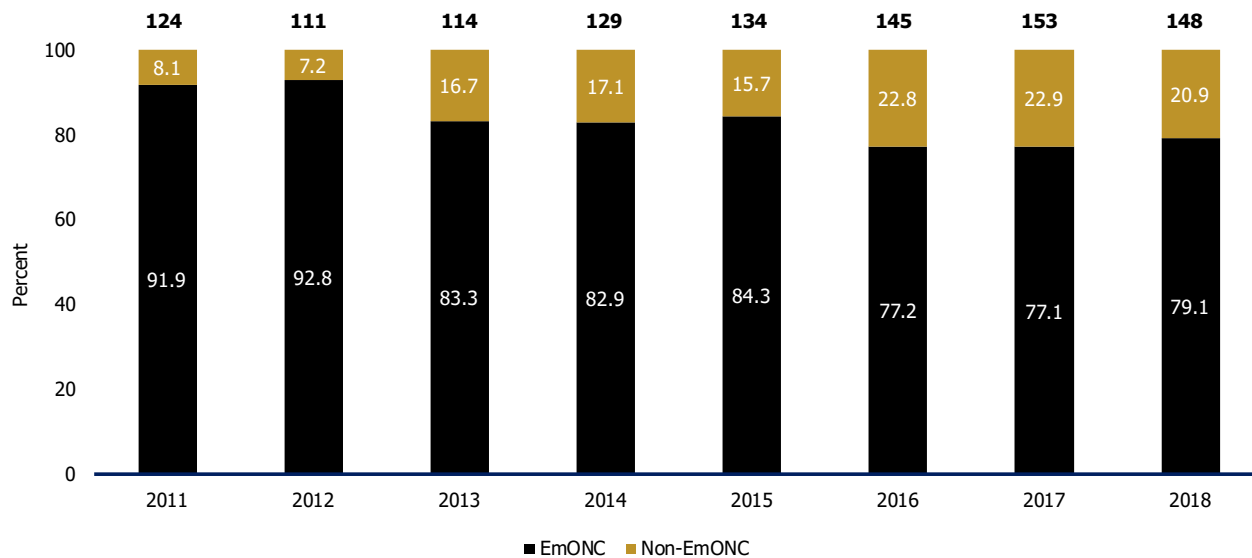
Some variability in the number of maternal deaths is to be expected. This may be attributed to an increase in the annual number of births, an increase in the number of women delivering in health facilities, and improvements in maternal death surveillance. As the facility delivery rate and rate of obstetric complications treated in facilities gradually increased, maternal deaths were more likely to occur in health facilities than at home. The increased numbers of maternal deaths over time may also be related to improved data collection systems. Since 2015, the region introduced the national Maternal Death Surveillance and Response guidelines in all facilities, which likely contributed to improved identification and documentation of maternal deaths in facilities (MoHSW, 2015b).

Maternal mortality tends to be greater in facilities providing EmONC because women experiencing serious obstetric complications seek treatment at or are referred to these higher-level facilities. Thus, facility-based MMRs should be viewed in the context of the level of care provided by health facilities and their likelihood of receiving complicated cases.

Selected Findings

Figure 9 Percent of Maternal Deaths by EmONC Status, 2011–2018

All Health Facilities, Kigoma Region, Tanzania



Note: Numbers on top of bars indicate the total number of maternal deaths occurring in Kigoma Region that year.
Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

MATERNAL MORTALITY RATIO IN HEALTH FACILITIES

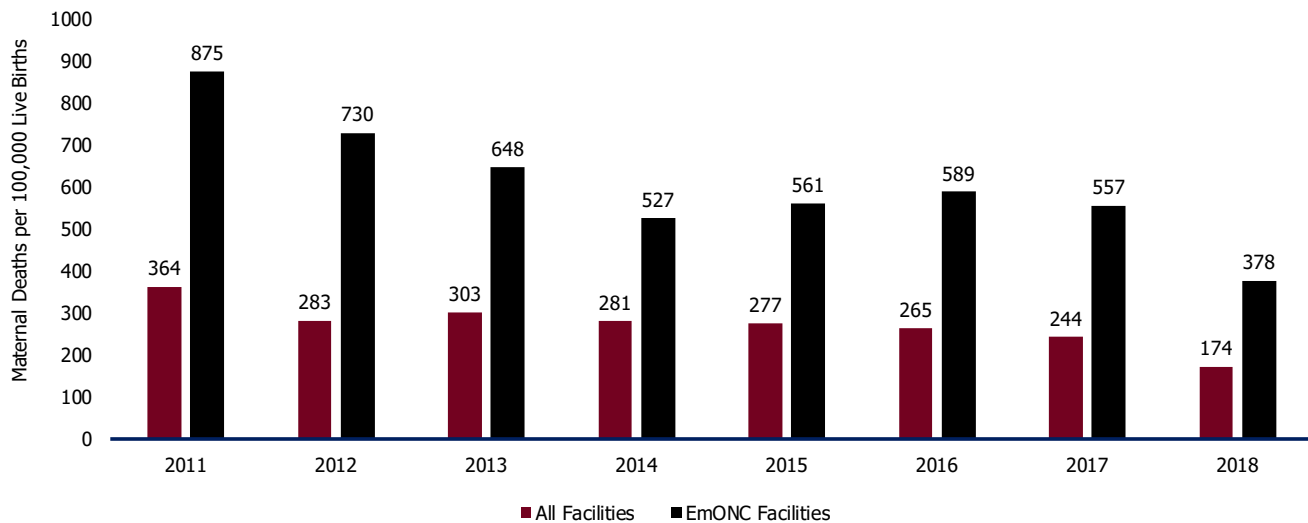
The incidence of maternal death is expressed as the maternal mortality ratio (MMR)—the number of all maternal deaths from direct and indirect obstetric causes per 100,000 live births. MMR is the most widely used indicator for measuring trends in maternal health. The MMR is a measure of women’s access to and the quality of obstetric services. It can also be used to target and monitor interventions. Often it is calculated as a health outcome for women who sought facility care during pregnancy, delivery, and postpartum (facility-based MMR) since it is difficult to estimate the population MMR in the absence of reliable vital registration systems. The facility-based MMR is the number of all facility maternal deaths from direct and indirect obstetric causes per 100,000 live births delivered in the same facilities during a period of time.

Although facility-based MMR data could be used to improve health planning and quality of care, this information should not be viewed as representative of the region as a whole. Facility-based MMRs may be higher or lower than those reported in the general population depending on the proportion of deliveries that occur in facilities, the mix of patients (with more or fewer serious complications), and the timeliness and quality of the health care.

In 2018, the MMR in all health facilities was 174 deaths per 100,000 live births, and the MMR in EmONC facilities was 378 maternal deaths per 100,000 live births (Figure 10). Overall, the MMR was much higher in EmONC facilities than in all facilities. Other studies have shown a similar pattern with women with serious complications, who may be at greater risk of dying, being cared for in higher-level facilities with the capacity to handle serious cases.

Selected Findings

Figure 10 Maternal Mortality Ratio, 2011–2018
All Health Facilities and EmONC Facilities, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

Between 2011 and 2018, the MMR in all facilities gradually decreased (from 364 to 174 maternal deaths per 100,000), a 52% decline. Similarly, the MMR in EmONC facilities decreased from 875 to 378 per 100,000 over that period (a 57% decline) (Figure 10).

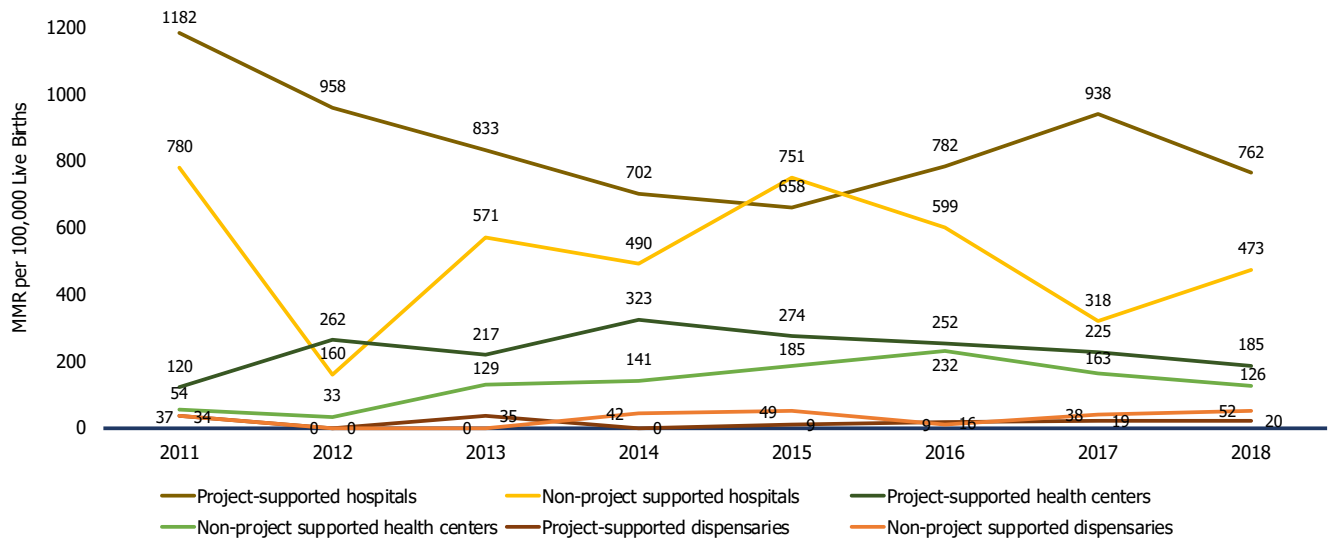
The observed overall decline in the MMR in EmONC facilities from 2011 to 2018 may be the result of reduced risk of dying from direct obstetric complications during labor, delivery, and postpartum, when most obstetric complications occurred.

There was a slight increase in the MMR in EmONC facilities between 2014 and 2017 and a decline in 2018. The increase may be due to factors related to access to care, quality of care, or more accurate reporting with the introduction of Maternal and Perinatal Death Surveillance and Response national policy in health facilities.

Figure 11 shows the MMR by facility type and project support status. As *The Project* supports all public hospitals in Kigoma, with the largest volume of complicated deliveries, the MMR in these facilities is the highest. Non-project-supported hospitals, all private, have the second highest maternal mortality. Their delivery volume is the lowest among all strata and even small changes in the number of maternal deaths per year produce large fluctuations in the MMR. Project-supported health centers consistently report slightly higher MMRs than non-project-supported health centers.

Selected Findings

Figure 11 Maternal Mortality Ratio by Facility Type and Project Support Status, 2011–2018
All Health Facilities, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

MATERNAL MORTALITY RATIOS BY CAUSE

Differentiating between direct and indirect maternal MMR ensures a more effective monitoring and evaluation of interventions for reducing mortality (Cross et al., 2010). Reviewing MMRs by the direct-indirect dichotomy can provide insight into the relative contribution of direct and indirect causes of death to the overall maternal mortality over time, and guide resources to the most effective strategies and interventions. Maternal deaths due to direct obstetric causes are generally more preventable and amenable to reduction through increased access to facility delivery and emergency obstetric care services at birth. Interventions that aim to increase facility deliveries and access to and availability of emergency obstetric care generally have an impact on reducing direct MMR. Monitoring indirect MMR separately draws attention to the need for additional or alternative interventions to combat indirect maternal deaths.

DIRECT OBSTETRIC MMR

During 2011–2018, there was a 46% decline in MMR for direct maternal deaths in all facilities (from 281 to 151 maternal deaths per 100,000 live births) (Figure 12). The proportion of the facility-based MMR due to direct causes ranged from 77% in 2011 to 86% in 2018 of the total annual facility-based MMR (data not shown).

Similarly, the direct obstetric MMR in EmONC facilities declined by 51% (from 675 to 328 maternal deaths per 100,000 live births) (data not shown).

INDIRECT OBSTETRIC MMR

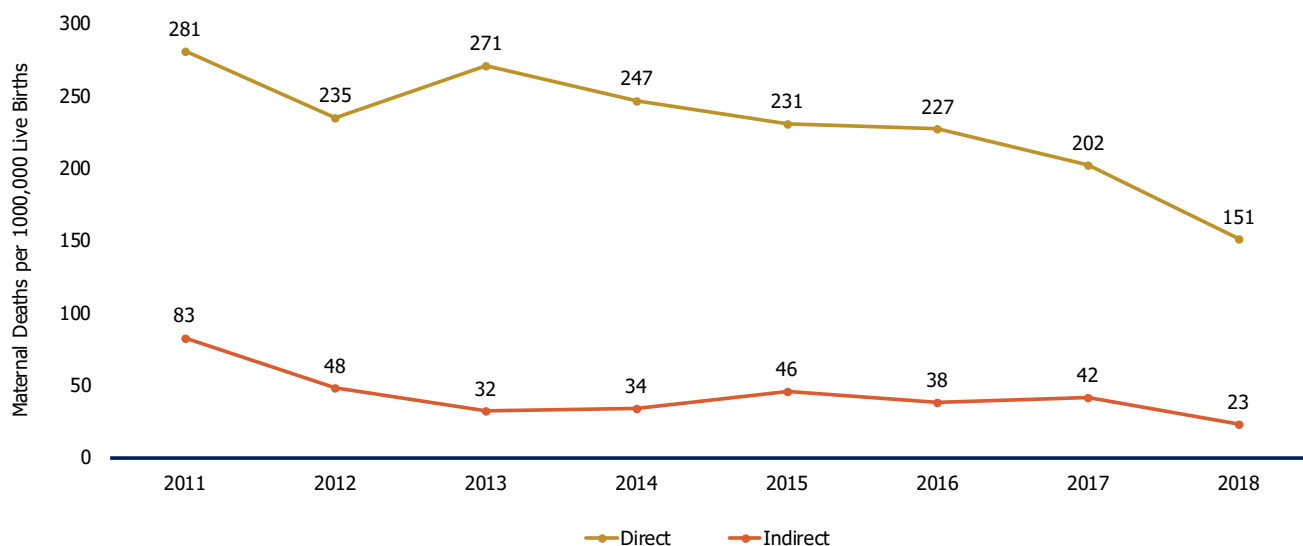
The all-facility MMR in 2018 due to indirect causes was 23 maternal deaths per 100,000 births (Figure 12). A higher indirect MMR (151 deaths per 100,000 births) was documented within EmONC facilities in 2018.

Selected Findings

The facility MMR due to indirect causes decreased between 2011 and 2018, from 83 to 23 per 100,000 in all facilities (Figure 12), and from 176 to 123 per 100,000 in EmONC facilities (data not shown).

The indirect MMR in 2018 was the lowest of all the years covered in the evaluation. A lower indirect MMR may demonstrate a lack of identification of indirect maternal deaths, despite improved case ascertainment in recent years. Intensified efforts in facilities to identify maternal deaths and to minimize underreporting revealed that facilities could identify more deaths that are maternal by expanding their reviews to registers and case notes from all wards, as done by the CDC data collectors. However, no retrospective research of deaths to women of reproductive age could overcome the barrier of missing information about pregnancy or postpartum status, if the deaths occur outside the obstetric wards.

Figure 12 Trends in Direct and Indirect Maternal Mortality Ratios, 2011–2018
All Facilities, Kigoma Region, Tanzania



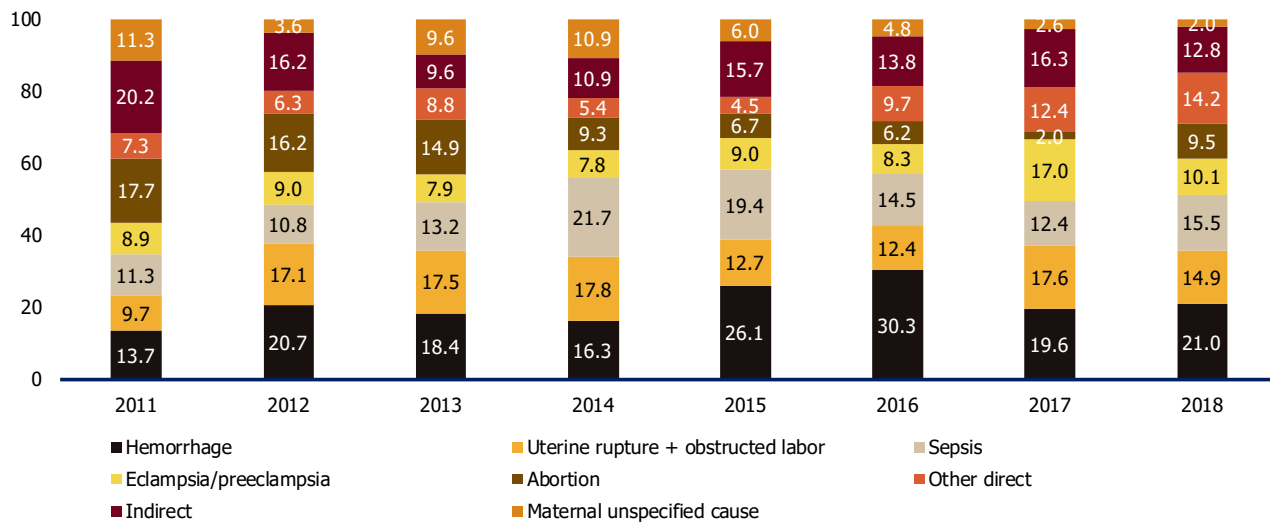
Note: Maternal deaths due to an unspecified cause were proportionally reallocated into direct and indirect maternal deaths.
Source: Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (2013 POMS, 2016 POMS, 2018 POMS, 2019 POMS)

CAUSE-SPECIFIC MATERNAL MORTALITY RATIO

Figure 13 presents the percent distribution by cause of death of the annual MMR documented in Kigoma facilities during 2011–2018. The causes of death identified in this analysis are similar to WHO cause-of-death estimates for sub-Saharan Africa (Say et al., 2014). Obstetric hemorrhage was the leading cause of death in 2018 (21.0%), though its contribution to maternal mortality was lower than in 2015 and 2016, but higher than in 2011. In 2018, sepsis, uterine rupture and pregnancy-induced hypertension (i.e., eclampsia/preeclampsia) followed, accounting for 15.5%, 14.9% and 10.1% of all maternal deaths, respectively.

Selected Findings

Figure 13 Annual Maternal Mortality Ratio by Cause of Death (Percent Distribution), 2011–2018
All Health Facilities, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

MATERNAL DEATHS AVERTED THROUGH EMONC

Information on met need and case fatality rates in EmONC facilities can be used to estimate to what extent the care provided in facilities for women with major direct obstetric complications (DOCs) actually averts maternal deaths in a population (Maine et al., 2005). To calculate the number of maternal deaths averted through EmONC, CDC used regional population and expected births data, the estimated number of yearly expected DOCs in the region (i.e., 15% of births), and data on complications and deaths collected directly from hospitals and health centers (Table 9). Dispensaries were excluded, as they do not currently provide EmONC services (CDC, 2019b).

The benefit of this methodology is that it uses direct EmONC indicators derived from program monitoring to estimate the potential influence on maternal mortality yearly.

The methodology has the following limitations:

- Variability in recording of major obstetric complications. The quality of health information recorded in registers improved as *The Project* included training and mentorship on correct recording of health information.
- Differences in case ascertainment of complications and maternal deaths in facilities are likely to render the number of deaths averted as conservative estimates. Ascertainment of the number and causes of maternal deaths improved from 2011 to 2018. These increases in case ascertainment over time likely resulted in an underestimation of the decline in maternal deaths.
- The need to use the national MMR to estimate the number of maternal deaths occurring outside health facilities. The use of the upper limit of the estimated national MMR (selected here because the region has been identified as having mortality levels much higher than the national average) is likely to overestimate the number of deaths averted.

Selected Findings

Table 9 Estimation of Maternal Deaths Averted through EmONC, 2011–2018

Kigoma Region, Tanzania

No.	Indicator	2011	2012	2013	2014	2015	2016	2017	2018
1	Estimated population (2012 Census and projections)	2,078,057	2,127,930	2,179,000	2,231,296	2,284,847	2,339,684	2,395,836	2,453,336
2	Expected births (2012 Census and projections)	83,399	85,400	87,450	89,548	91,698	91,014	93,198	100,287
3	Expected complications assuming 15% of pregnancies develop DOCs (line 2*0.15)	12,510	12,810	13,117	13,432	13,755	13,652	13,980	15,043
4	Major DOCs treated in hospitals and HCs (counts from evaluation)	5,156	5,288	5,662	6,612	6,492	7,339	7,908	8,319
5	Met need for EmONC (line 4/line 3)	41.2%	41.3%	43.2%	49.2%	47.2%	53.8%	56.6%	55.3%
6	Maternal deaths due to major DOCs in hospitals and HCs (individual counts collected in the evaluation) ^a	95	92	99	111	108	122	120	117
7	CFR in hospitals and HCs (line 6/line 4)	1.8%	1.7%	1.8%	1.7%	1.7%	1.7%	1.5%	1.4%
8	Estimated MMR ^b (population maternal deaths per 100,000 live births)	740	740	660	660	666	666	666	666
9	Expected number of maternal deaths per year in Kigoma (line 2*line 8)	617	632	577	591	611	606	621	668
10	Expected number of maternal deaths due to DOCs ^c (line 9*.80)	494	506	462	473	489	485	497	534
11	Expected maternal deaths due to DOCs occurring outside hospitals and HCs (line 10-line 6)	399	413	363	362	381	363	377	417
12	Expected DOCs outside hospitals and HCs (line 3-line 4)	7,354	7,522	7,455	6,820	7,263	6,313	6,072	6,724
13	Expected CFR outside hospitals and HCs (line 11/line 12)	5.4%	5.5%	4.9%	5.3%	5.2%	5.7%	6.2%	6.2%
14	Expected maternal deaths if the DOCs treated in hospitals and HCs had the estimated CFR of DOCs in community (line 13*line 4)	280	290	275	351	340	422	490	516
15	Deaths averted through care in hospitals and HCs per year (line 14-line 6)	185	198	176	240	232	300	370	399
16	Deaths averted through care provided in project-supported hospitals and HCs per year ^d (line 15*% of DOCs treated in project hospitals and HCs)	131	139	122	154	151	218	268	267

Abbreviations: DOCs, direct obstetric complications including 1st trimester complications; CFR, case fatality rate; EmONC, emergency obstetric and neonatal care; HCs, health centers; MMR, maternal mortality ratio

^aIncludes maternal deaths due to unspecified cause proportionally reallocated between direct and indirect causes.

^bSource: WHO Global Trends in Maternal Mortality; 2011 & 2012 use 2010 estimates [460 (CI: 190-740)]; 2013 & 2014 use 2013 estimates [410 (CI: 250-660)]; 2015 uses 2015 estimates [398 (CI: 281-570)]/[NBS et al, 2016 CI: 446-666]

^cConsiders that 80% of maternal deaths are due to major direct obstetric complications.

^dProject-supported facilities (3 hospitals and 12 health centers) provided care for 66% of all direct obstetric complications treated in Kigoma facilities, on average (68% in 2013, 67%, 63% in 2014, 56% in 2015, 72% in 2016 and 71% in 2017) (source Table B1, Column 1).

Note: "*" indicates multiplied by; "/" indicates divided by.

Selected Findings

In Kigoma Region, 8,319 women accessed EmONC services in hospitals and health centers in 2018 and received medical or surgical treatment for major DOCs and surgical treatment for first trimester complications (Table 9, row 4). The number of women who died of major DOCs in Kigoma hospitals and health centers in 2011–2018 is displayed in Table 9, row 6. These numbers assume that maternal deaths due to unspecified causes follow the same yearly distribution of direct and indirect causes. As a result, the direct case fatality rate (CFR) in hospitals and health centers from 2011–2018 ranged from 1.8% in 2011 and 1.4% in 2018 (Table 9, row 7). To estimate the regional MMR, we used either the WHO global maternal mortality estimates (WHO, 2010 and 2013) or the national 2015–2016 TZDHS survey (NBS, 2016). Because early studies in Kigoma documented one of the highest levels of maternal mortality in the country (Mbaruku et al., 2003), we used the upper limit of the confidence interval calculated around the country MMRs (740 maternal deaths per 100,000 live births in 2011–2012, 660 per 100,000 for 2013–2014, and 666 per 100,000 for 2015–2018). This MMR was applied to the annual estimated number of live births in the region. Through this approach, we estimated the number of maternal deaths that occurred annually, displayed in Table 9, row 9.

Globally, it is estimated that 80% of maternal deaths are due to DOCs (Say et al., 2014). Thus, the number of direct obstetric deaths in the region was estimated as follows: 494 deaths in 2011; 506 deaths in 2012; 462 deaths in 2013; 473 deaths in 2014; 489 deaths in 2015; 485 deaths in 2016; 497 deaths in 2017; and 534 deaths in 2018 (Table 9, row 10). By subtracting the maternal deaths in hospitals and health centers (Table 9, row 6) from the total estimated maternal deaths due to DOCs (Table 9, row 10), between 363 and 417 maternal deaths are estimated to have occurred annually outside hospitals and health centers during 2011–2018 (Table 9, row 11).

The number of deaths occurring among women with obstetric complications who did not access hospital and health center services (Table 9, row 11) are then divided by the estimated number of women with such complications who did not access these services (Table 9, row 12). This produces the expected CFR for births outside of hospitals and health centers (Table 9, row 13). During 2011–2018, women not accessing care experienced, on average, a CFR about three times higher than women with complications who received care in hospitals and health centers (5.4% vs. 1.7%) (Table 9, row 13 vs. Table 9, row 7).

To estimate the maternal deaths averted through care in hospitals and health centers (Table 9, row 15), we first applied the CFR of women with untreated complications (Table 9, row 13) to the number of women who received specialized care for DOCs (Table 9, row 4). This calculation yielded the number of maternal deaths expected to have occurred in the population if EmONC in hospitals and health centers had not been available (number of expected maternal deaths are shown in Table 9, row 14)

Each year, however, 108 women, on average, die in hospitals and health centers as a result of direct obstetric causes, despite receiving EmONC services (average of Table 9, row 6). The number of facility direct maternal deaths has to be subtracted from the number of potentially averted deaths (Table 9, row 14), yielding the following total of maternal deaths averted through EmONC services in hospitals and health centers each year (Table 9, row 15). Project-supported facilities provide care for about two-thirds of women with major DOCs who had accessed care (Annex B, Table B1). As a result, an estimated 1,450 maternal lives were saved through care provided in project-supported facilities in 2011–2018 (sum of Table 9, row 16; Table 10).

Selected Findings

Table 10 Summary of Potential Number of Maternal Deaths Averted in Hospitals and Health Centers, 2011–2018

All Hospitals and Health Centers, Kigoma Region, Tanzania

Year	Potential Number of Maternal Deaths Averted	Potential Number of Maternal Deaths Averted in Project-Supported Facilities
2011	185	131
2012	198	139
2013	176	122
2014	240	154
2015	232	151
2016	300	218
2017	370	268
2018	399	267
Total	2,100	1,450

Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

PERINATAL OUTCOMES IN HEALTH FACILITIES

STILLBIRTH RATE

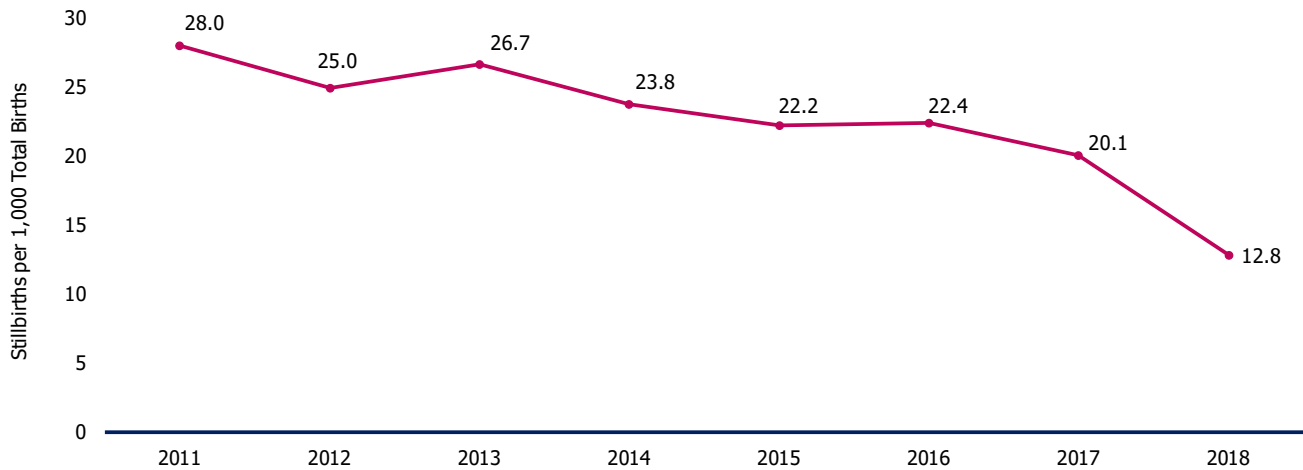
In Tanzania, a stillbirth is a baby born dead at or after 28 weeks gestation. Stillbirths can be categorized as fresh or macerated based on the appearance at time of delivery. Fresh stillbirths can occur right before or during childbirth (intrapartum); macerated stillbirths occur during the pregnancy, preceding the delivery. Although it can be difficult to determine the causes of many stillbirths, fresh stillbirths may be preventable if timely emergency obstetric care is available. The total institutional stillbirth rate is the number of macerated and fresh stillbirths in facilities divided by the total number of births in the same facilities during the same time period. It is expressed as the number of stillbirths per 1,000 total births. The WHO has not set a standard for an acceptable institutional stillbirth rate.

In 2018, the overall stillbirth rate in all facilities was 12.8 stillbirths per 1,000 total births (Figure 14), which was lower than available national estimates of 29–30 per 1,000 total births (Stanton, 2006; Cousens, 2011), and represents a decrease from 2011.

Hospitals had the highest stillbirth rates in 2018, likely related to the fact that hospitals treat more complicated pregnancies than lower-level facilities; non-project-supported hospitals had a lower stillbirth rate (19.4 per 1,000 total births) compared to project-supported hospitals (42.2 per 1,000 total births) (Figure 15). These findings are associated with a higher proportion of complicated deliveries that are cared for in project-supported hospitals (Annex B, Table B2).

Selected Findings

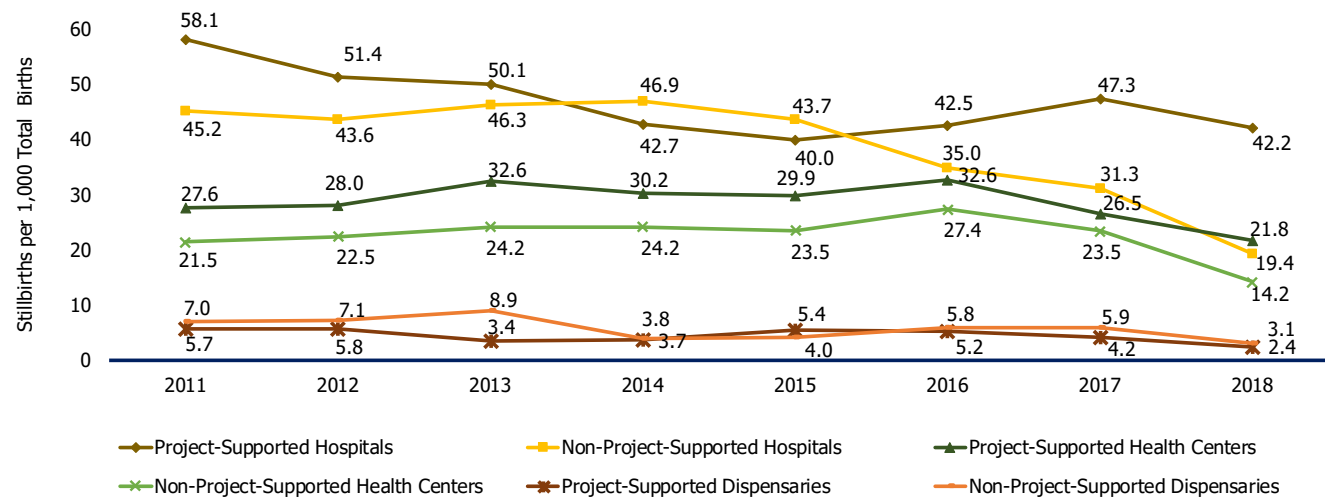
Figure 14 Institutional Stillbirths per 1,000 Births, 2011–2018
All Health Facilities, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

As with hospitals, stillbirth rates in project-supported health centers were higher (14.2 per 1,000 total births in non-project-supported health centers, compared to 21.8 per 1,000 total births in project-supported health centers). Dispensaries had very low stillbirth rates in 2018 (project-supported, 2.4 per 1,000 total births; non-project-supported, 3.1 per 1,000 total births) (Figure 15).

Figure 15 Institutional Stillbirths per 1,000 Births by Facility Type and Project Support Status, 2011–2018
All Health Facilities, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

Selected Findings

INTRAPARTUM STILLBIRTH RATE

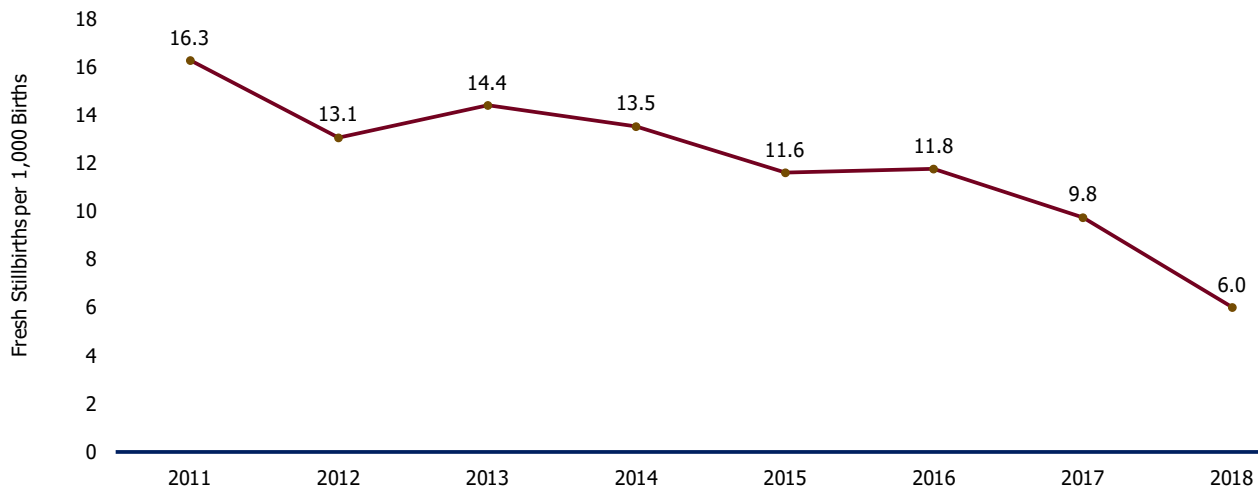
Intrapartum stillbirths, or fresh stillbirths, often occur during labor or delivery. The causes of intrapartum stillbirths may be related to the quality of delivery care, and some stillbirths can be prevented through high quality obstetric care. For women with obstetric complications, many stillbirths are caused by one or more of three delays: the delay in recognizing a problem and deciding to seek care, the delay in reaching a facility, and the delay in receiving care after a woman arrives at a health facility (Thaddeus and Maine, 2004).

The institutional intrapartum stillbirth rate is the number of fresh stillbirths divided by the number of total births in the same facilities; it is expressed as the number of intrapartum stillbirths per 1,000 total births. The WHO has not set a standard for an acceptable institutional intrapartum stillbirth rate.

In 2018, 47.2% of stillbirths in all facilities were fresh stillbirths (data not shown), contributing to an institutional intrapartum stillbirth rate of 6.0 fresh stillbirths per 1,000 total births (Figure 15). The intrapartum stillbirth rate in all facilities declined overall by 63% since 2011 (from 16.3 to 6.0 per 1,000 total births), despite a slight increase between 2012 (13.1 per 1,000 total births) and 2013 (14.4 per 1,000 total births) (Figure 16).

Figure 16 Institutional Intrapartum Stillbirths per 1,000 Births, 2011–2018

All Health Facilities, Kigoma Region, Tanzania



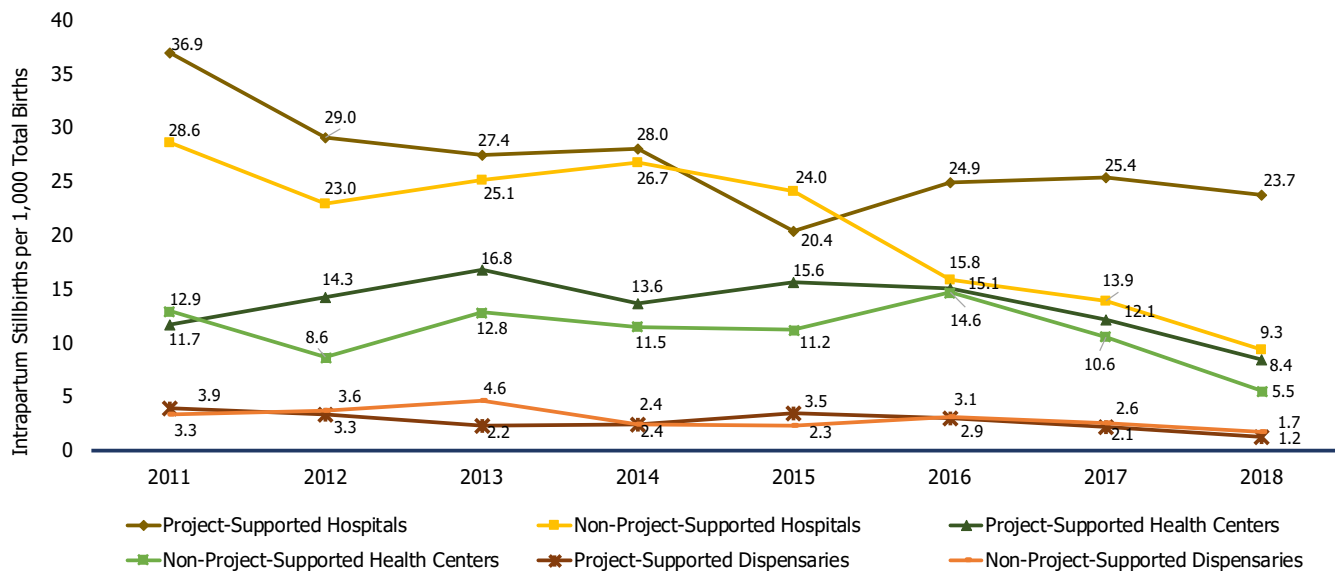
Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

Similar to the total stillbirth rate, hospitals experienced higher intrapartum stillbirth rates than health centers or dispensaries in 2018 (project-supported, 23.7 per 1,000 total births; non-project-supported, 9.3 per 1,000 total births) (Figure 17). The intrapartum stillbirth rate in project-supported health centers (8.4 per 1,000 total births) was similar to that of non-project-supported health centers (5.5 per 1,000 total births). Again, dispensaries experienced low intrapartum stillbirth rates (project-supported, 1.2 per 1,000 total births; non-project-supported, 1.7 per 1,000 total births).

Selected Findings

Figure 17 Institutional Intrapartum Stillbirths per 1,000 Births by Facility Type and Project Support Status, 2011–2018

All Health Facilities, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

PRE-DISCHARGE NEONATAL MORTALITY RATE

Newborns’ first hours of life are critical to their ultimate survival, and they are most vulnerable during this time. Some newborns may require stimulation, assistance with breathing, or help in keeping warm immediately after birth. The neonatal mortality rate may indicate a need for improved essential newborn care – interventions designed to keep newborns alive and healthy.

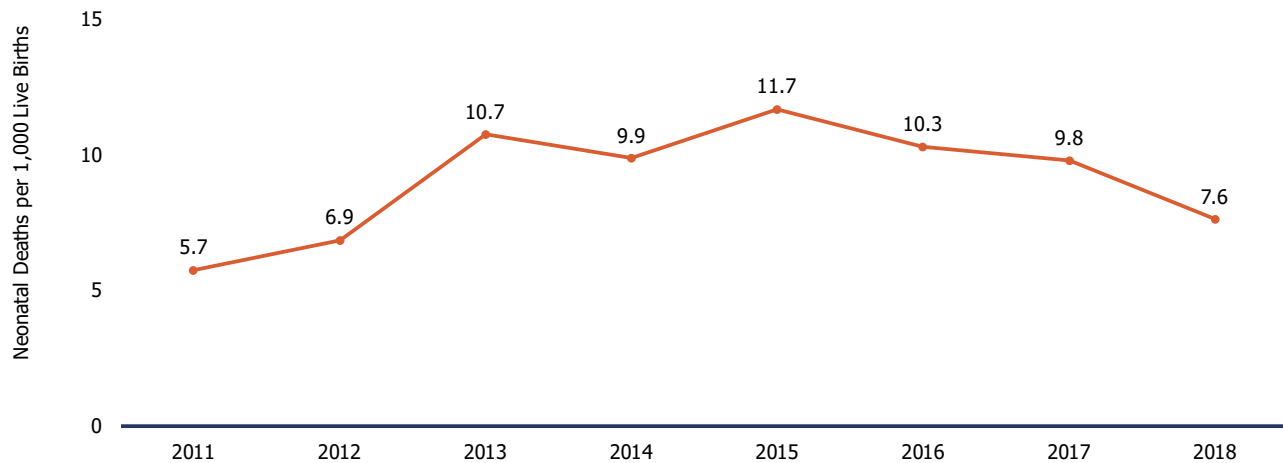
The neonatal period typically refers to the first 28 days of life. This analysis on neonatal outcomes only covers the period from birth to the time of facility discharge (usually within 24 hours of birth). The pre-discharge neonatal mortality rate (NMR) is the number of pre-discharge neonatal deaths divided by the number of live births in the same facilities during the same period. It is expressed as the number of pre-discharge neonatal deaths per 1,000 live births. WHO does not have an international standard for the pre-discharge neonatal mortality rate.

In 2018, the pre-discharge NMR in all Kigoma health facilities was 7.6 neonatal deaths per 1,000 live births. It has been variable since 2011, when the rate was lowest at 5.7 neonatal deaths per 1,000 live births (a 34% increase between 2011 and 2018) (Figure 18). Improvements in case ascertainment may have contributed to this increase. Another contributing factor to the increase may be that improved delivery care may be preventing deaths that otherwise would have occurred before or during delivery (i.e., stillbirths), but current neonatal care may not enable babies in poor health to survive long after delivery. However, if we compare the pre-discharge neonatal mortality rate between 2013 and 2018, there is a notable overall decline of 29% (from 10.7 to 7.6 neonatal deaths per 1,000).

Selected Findings

Figure 18 Total Pre-Discharge Neonatal Deaths per 1,000 Live Births, 2011–2018

All Health Facilities, Kigoma Region, Tanzania



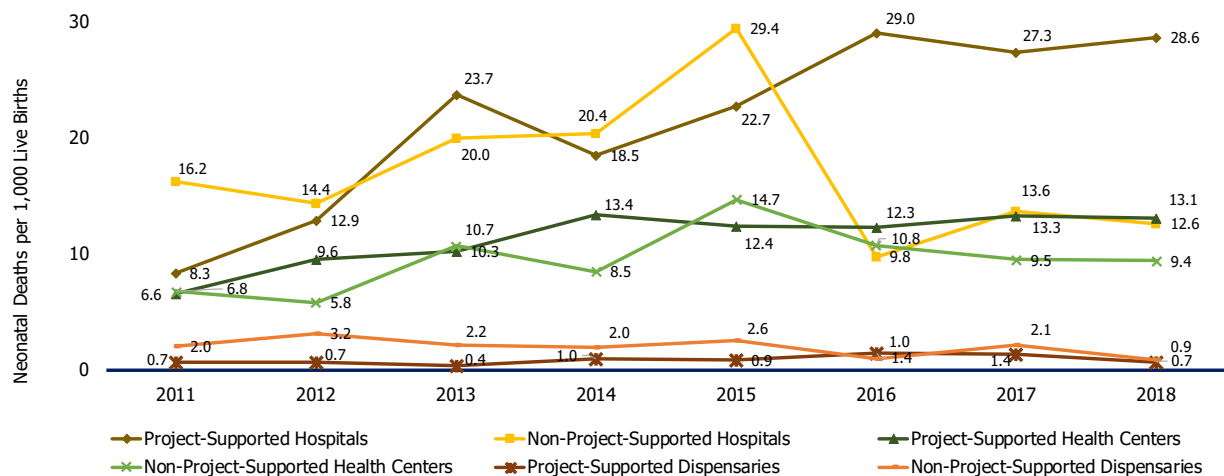
Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

Project-supported hospitals had the highest pre-discharge NMR in 2018; the rate in project-supported hospitals (28.6 per 1,000 live births) was double that of non-project-supported hospitals (12.6 per 1,000 live births; Figure 19). This difference is associated with care for more complicated deliveries in the project-supported hospitals, which are all public sector. Potential differences in client, provider, and hospital characteristics may have further contributed to this finding.

Similarly, project-supported health centers had a higher pre-discharge NMR (13.1 per 1,000 live births) than non-project-supported health centers (9.4 per 1,000 live births). Dispensaries had much lower pre-discharge NMR (project-supported, 0.7 per 1,000 live births; non-project-supported, 0.9 per 1,000 live births); this is understandable given the low overall contribution of these facilities to the care of complicated deliveries.

Figure 19 Pre-Discharge Neonatal Deaths per 1,000 Live Births, by Facility Type and Project Support Status, 2011–2018

All Health Facilities, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

Selected Findings

PERINATAL MORTALITY RATE

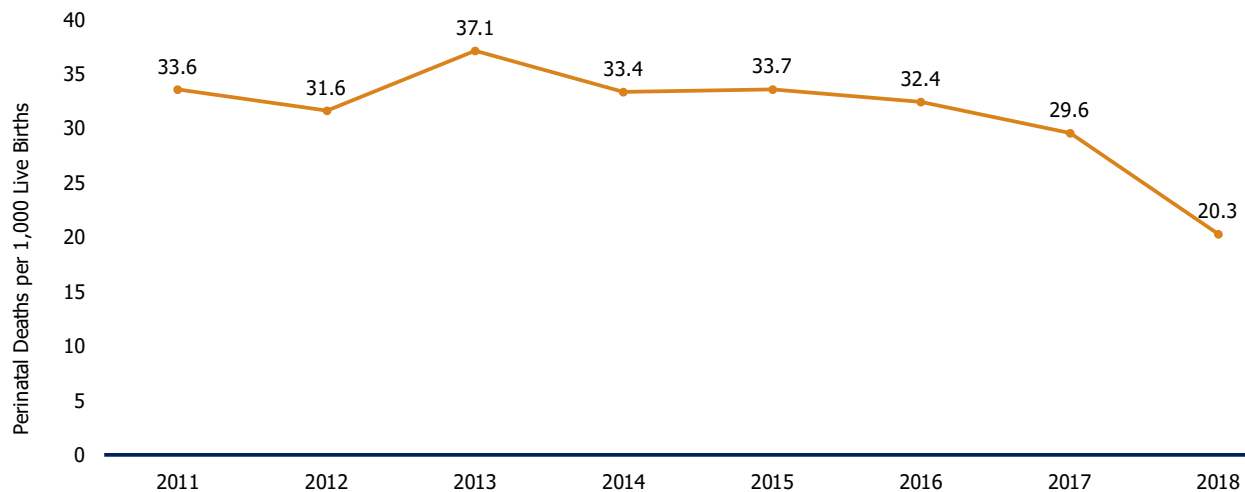
The perinatal mortality rate includes both stillbirths and neonatal deaths, providing an overall understanding of mortality before labor, through labor and delivery, and after birth. Rather than tailoring interventions to prevent either stillbirths or neonatal deaths, the perinatal mortality rate focuses on all perinatal deaths, highlighting the continuum of the periods when stillbirths and neonatal deaths occur.

The institutional perinatal mortality rate is the proportion of stillbirths and pre-discharge neonatal deaths among all births in facilities; it is expressed as the number of perinatal deaths per 1,000 total births.

In 2018, all Kigoma facilities together experienced an institutional perinatal mortality rate of 20.3 stillbirths and pre-discharge neonatal deaths per 1,000 total births (Figure 20). This number represents a decrease from 2011 (33.6 perinatal deaths per 1,000 total births) and it is below the general range of 30–37 perinatal deaths per 1,000 total births seen since 2011.

Figure 20 Total Perinatal Deaths per 1,000 Live Births, 2011–2018

All Health Facilities, Kigoma Region, Tanzania



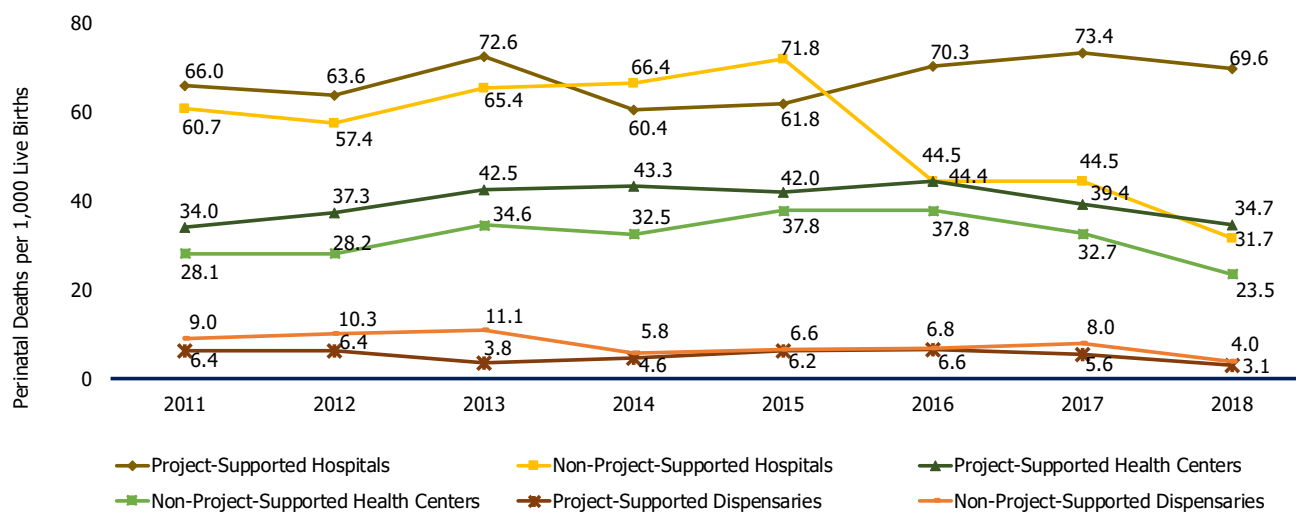
Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

Selected Findings

In 2018, non-project-supported hospitals experienced a much lower institutional perinatal mortality rate (31.7 per 1,000 total births) than project-supported hospitals (69.6 per 1,000 total births) (Figure 21). Similarly, among health centers, project-supported facilities had higher institutional perinatal mortality (34.7 per 1,000 total births) than non-project-supported (23.5 per 1,000 total births). Dispensaries experienced much lower institutional perinatal mortality rates (project-supported, 3.1 per 1,000 total births; non-project-supported, 4.0 per 1,000 total births).

Figure 21 Institutional Perinatal Death Rate per 1,000 Live Births by Facility Type and Project Support Status, 2011–2018

All Health Facilities, Kigoma Region, Tanzania



Source: 2013, 2016, 2018, 2019 Pregnancy Outcomes Monitoring System in Kigoma Region, Tanzania (CDC, 2014b; CDC, 2016b; CDC, 2018b)

Summary and Recommendations

Summary and Recommendations

The *Maternal and Reproductive Health in Tanzania Project* has contributed to an increase in the number of women delivering at health facilities by strengthening EmONC services provided in Kigoma Region. The institutional delivery rate increased substantially between 2011 and 2018 (from 48.4% of all births to 84.9%). However, the proportion of all births taking place in EmONC facilities remains low (21.4% in 2018). The population-based C-section rate is slowly increasing; however, at 4.5% in 2018, it remains lower than the WHO's recommended minimum of 5% of all births (WHO, 2015b). The met need for emergency obstetric care, now at 61.3% of expected DOCs treated, has achieved *The Project's* target of 60% met need. However, the CFR (1.4% for DOCs including first trimester complications) still does not meet the WHO's recommended standard of deaths for fewer than 1% of women with complications treated.

Although declining from 363.8 in 2011, the facility-based maternal mortality ratio remains high (174.0 maternal deaths per 100,000 live births in 2018) and an unknown number of additional maternal deaths occur outside health facilities. Nevertheless, progress in reducing the facility maternal mortality ratio led to an estimated 2,100 maternal deaths averted between 2011 and 2018, including an estimated 1,450 deaths averted in facilities directly supported by *The Project*. Institutional stillbirth rates have declined from 28.0 stillbirths per 1,000 total births in 2011 to 12.8 in 2018, which may suggest improved quality of care during labor and delivery. Project-supported facilities consistently reported high maternal, stillbirth, and neonatal death rates, as they provide care to over two-thirds of complicated pregnancies and deliveries each year. The pre-discharge neonatal mortality rate declined between 2013 and 2018, though it fluctuated over time. Changes in the ways birth outcomes are classified and recorded in facility registers may have contributed to these fluctuations.

SELECTED FINDINGS AND STRATEGIES TO FURTHER IMPROVE OUTCOMES

ACCESS

Improving transportation availability and accessibility could further contribute to increased institutional deliveries and decreased maternal and perinatal mortality, as it would decrease care-seeking delays (e.g., travel time to facility) and help women who live far from a health facility. Most transportation delays can be addressed by a combination of community mobilization activities and an effectively linked communications system that ties all components of the healthcare system together. Another effective approach is to establish a point of contact in each community to coordinate and manage the available transportation resources and alert facilities of incoming complicated deliveries.

Lower-level facilities need protocols for emergency transport, case management guidelines, and drills for immediate care of serious obstetric complications at referral facilities. Future studies can assess the protocols and effectiveness of emergency referrals between low- and high-level health facilities to ensure that women with obstetric complications have timely access to the EmONC services. Such assessments may explore the ability of personnel at low-level facilities to diagnose serious obstetric complications, their knowledge of where and when to refer, how to stabilize patients before transport, and how to communicate, organize, and receive feedback on referrals.

Kigoma continues to have lower than recommended population C-section rates (4.5%), whereas facility C-section rates in hospitals and health centers (13.6%) may suggest that there is adequate provision of this surgery once a pregnant woman reaches specialized care. Many maternal deaths are due to uterine rupture; inadequate access to Cesarean delivery among women giving birth may be a primary contributor.

Issues and findings concerning access are presented in greater detail in the report, *Health Facility Assessment of Emergency Obstetric and Neonatal Care Services in Kigoma Region, Tanzania: Selected Findings, 2018* (CDC, 2019b).

Summary and Recommendations

INFRASTRUCTURE, STAFFING, AND SUPPLIES

The current availability of EmONC facilities (21) does not meet the WHO recommendation (25), given the insufficient number of BEmONC facilities. Kigoma Region currently meets the WHO recommendation of 1 CEmONC facility per 500,000 population, and the addition of 6 more facilities with CEmONC capabilities from 2013 to 2018 increased the availability of obstetric surgeries in the region. Making BEmONC services available in all health centers and in selected dispensaries would contribute to achieving the recommended EmONC targets.

Given the low population C-section rate and high institutional perinatal mortality and direct obstetric case fatality rates, the capacity to perform quality obstetric surgeries may need to be strengthened. The use of operating theatres (OTs) could be critically examined. If OT use is low because of a lack of surgical equipment and supplies, surgical logistic management plans could be developed. Availability of qualified staff is also critical to use of OTs, as smaller facilities with one doctor or anesthetist may experience gaps in surgical service provision during times when the qualified staff are away from the facility. Ways to improve the coverage and quality of surgical services include surgical checklists, maintaining surgical skills of medical personnel, rotating staff from low-volume facilities to facilities with high volume, and supportive supervision.

To increase the ability to carry out other life-saving interventions, a roster of all staff in the mid-level technical cadre could be developed, and staff supported to rotate to other facilities so they may practice obstetric skills at facilities with a higher number of serious obstetric cases. For dispensaries with only 1 or 2 staff, however, such an intervention would leave these facilities without personnel while staff were attending rotations at higher-level facilities.

The documented increase in the volume and complexity of delivery care could be factored into the procurement and logistics of equipment, supplies, essential drugs and blood, infrastructure maintenance, and human resources allocation.

Issues and findings concerning infrastructure, staffing, and supplies are presented in greater detail in the report, *Health Facility Assessment of Emergency Obstetric and Neonatal Care Services in Kigoma Region, Tanzania: Selected Findings, 2019*.

QUALITY OF CARE

PPH remains the leading cause of maternal mortality in Kigoma. Most deaths resulting from PPH occur during the first 24 hours after birth. The majority of these could be avoided by using prophylactic uterotonics during the third stage of labor and by timely and appropriate active management of the third stage of labor. The use of uterotonics also plays a central role in the treatment of PPH to manage retained placenta and uterine atony; other non-surgical approaches include intrauterine balloon tamponade recommended for refractory bleeding. Bimanual uterine compression, external aortic compression, and the use of non-pneumatic anti-shock garments are recommended as stabilizing measures until substantive care is available. Simulation-based training and practice of these non-surgical PPH treatments could be considered for all delivering personnel to improve their skills.

Manual removal of placenta is not commonly performed in EmONC facilities, possibly because the mid-level staff lacks the confidence or skills to perform this intervention (CDC, 2019b). With an estimated PPH prevalence in Africa of 26% (Calvert et al., 2012), this low frequency of performing manual removal requires immediate attention. Low-technology, simulation-based EmONC practice can help to ensure maintenance of skills and improved performance.

Summary and Recommendations

In 2019, puerperal sepsis was the second leading cause of maternal death in Kigoma facilities. Main causes of puerperal infections include endometritis (endomyometritis or endomyoparametritis), peritonitis, abscess, wound infection, mastitis, urinary tract infection, and septic thrombophlebitis. Risk factors include home birth in unhygienic conditions, anemia, prolonged rupture of membranes, prolonged labor, multiple vaginal examinations in labor, Cesarean section, obstetrical maneuvers, retained placenta or tissue/membranes, and postpartum hemorrhage. Adherence to clinical protocols, aseptic precautions, and correct use of antibiotics could reduce the morbidity and mortality related to puerperal sepsis.

Uterine rupture plus obstructed labor was the third most common cause of maternal mortality in Kigoma Region in 2019. The majority of these deaths could be avoided by proper monitoring of labor progress using the partograph and appropriate management when prolonged labor is identified, including access to Cesarean delivery. Additional observation and supportive supervision to encourage real-time completion of the partograph for decision-making might contribute to improved labor management.

Facilities would benefit from assistance with developing concrete steps to utilize the results of maternal and perinatal death reviews to identify gaps, improve the quality of obstetric care, and mobilize political will and commitments at the district and regional levels. The review findings can be used to support facility-based interventions to reduce maternal mortality. Facilities could identify ways to strengthen their rapid response to avoidable factors of maternal deaths (e.g., root-cause analysis) and develop implementation plans.

Pre-discharge neonatal mortality remains high, indicating the need for better monitoring of intrapartum hypoxia (reduction of oxygen to the body's tissues), increased capacity to perform C-sections, improved use of protocols for neonatal resuscitation, and better monitoring of newborns within the first 24 hours of life. Addressing staff shortages, especially of cadres trained to monitor newborns, is also critical. Other cadres would benefit from training in monitoring newborns, identifying neonatal problems, and alerting nurses or doctors when problems arise. Additional findings from the recent follow-up evaluation of providers' knowledge and skills may help identify gaps and possible solutions.

The direct obstetric case fatality rate remains at higher-than-acceptable levels. Further investigation at the facility level into appropriate identification and timely treatment of complications is needed to ensure that complications are treated appropriately to save lives.

DATA QUALITY

Data quality changed over time, with a combination of a generally improved register content, the addition of key registers that capture maternal and perinatal deaths, and improvements in the completion of these registers. With the introduction of the national maternal and perinatal death surveillance and response (MPDSR) guidance in 2015, the proportion of maternal and perinatal deaths in facilities that were followed by facility-based reviews improved each year.

Annex A details the changes found in the labor and delivery (L&D) registers that occurred during the span of *The Project*. Standardized data capture is critical to be able to appropriately evaluate and monitor the EmONC status and determine outcomes. Facility-based training on accurate completion of the L&D registers is critical. Between 2013 and 2018, several trainings that highlighted the importance of data quality and complete record-keeping for accurate and comprehensive maternal and reproductive health data were conducted at the facility and regional levels. Specific training components encouraged staff to complete all columns of the L&D register, use defined and standardized terminology, and record particular variables accurately and consistently, including neonatal

Summary and Recommendations

resuscitation, pregnancy complications, neonatal deaths, and maternal deaths. Supportive supervision that includes increased time to address record-keeping issues possibly contributed to higher quality records.

The CDC-led evaluations employed an extensive register review using the RAPID approach to identify all deaths to women of reproductive age that occurred in health facilities. Women of reproductive age may die of indirect maternal causes in wards other than the labor and delivery ward, and their deaths may be recorded but not necessarily recognized as maternal deaths. Facilities more successfully identified indirect maternal deaths if data sources outside of the labor and delivery register recorded the pregnancy or postpartum status of the deceased at the time of death, in addition to the underlying cause that led to death. In the absence of patient records, however, the details about the relation between a death and the pregnancy status at the time of death is often difficult to document. Potentially more deaths to women of reproductive age in health facilities that occur outside the obstetric wards may be due to indirect maternal causes. Accurate documentation of the pregnancy or postpartum status is needed for all deaths to women of reproductive age, either in the registers that record these deaths or in the case notes. These additional efforts will strengthen the collection of data related to indirect maternal deaths, which require different preventive measures.

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Annex A Challenges Due to Changes in L&D Registers

Annex A Challenges Due to Changes in L&D Registers

OVERVIEW

New labor and delivery (L&D) registers in Tanzania require health facility personnel to record a broader range of information than in previous versions of the L&D register. The government of Tanzania rolled out three versions of the new register: one in 2013, one in 2014, and a third in 2016. The start dates for adopting each of the new registers varied in Kigoma health facilities, but many health centers and hospitals are currently using the 2014 and 2016 versions. The content of the three new registers is very similar, with wider columns and a different order of items collected in comparison to the old version. However, the differences between the new and old registers is significant, both in content and instructions for completion. This may have affected monitoring and evaluation (M&E) efforts for *The Project*.

CONTENT ISSUES

The new L&D registers collect more variables on women than the old registers. Some previous variables are no longer collected, and some variables are collected differently. Table A1 details differences in key variables between the old and new registers, how the CDC team adjusted its data collection approach, and how the changes may affect M&E results.

STRUCTURAL ISSUES

Also critical are the new registers' layouts. The page width has more than doubled (from two portrait-oriented A4 pages to two landscape-oriented A3 pages). The width makes it difficult for facility personnel to accurately follow a patient's entry line to the second page, where essential indicators are recorded, like mother and baby's status at discharge. This sometimes caused facility personnel to record information on the wrong woman's entry line. In at least one hospital, facility personnel accidentally reversed the information recorded in the columns for mother and baby's status at discharge. Triangulation of maternal and neonatal deaths from that hospital's morgue logbook addressed some of these errors.

The increase in the registers' number of variables seems to have created a burden for people responsible for completing the registers. Coupled with the size of the register, this may have contributed to the most common issues resulting from structural changes: 1) facility personnel seem to have completed whole columns at a time, rather than individual line entries, and 2) columns on the second page were often blank, incomplete, or filled in with dashes, whose meaning is unclear. These issues may have introduced recording errors or left out critical information.

CHANGES IN TERMINOLOGY IN THE LABOR AND DELIVERY REGISTER

Furthermore, there are differences in the registers' required terminology. The old register recommended the following terminology to indicate status at discharge for mothers and their babies:

- D = discharged (often 'hakuna' or 'nzuri' was written to indicate that the mother or baby was alive at discharge)
- DD = dead at discharge

The new registers include specific instructions with different terminology requirements for the status at discharge:

- H = hai (alive)
- A = amefariki (dead)

Annex A Challenges Due to Changes in L&D Registers

Health providers seem to have difficulty understanding this new terminology and often leave the answer blank. Additionally, due to the similarities between the handwritten capital letters 'H' and 'A', there is a bidirectional recording bias with 'A' (dead) outcomes recorded when 'H' (alive) was intended, and vice-versa.

Moreover, unlike the old register, the new registers contain variables requiring a 'yes' or 'no' answer (e.g., whether the baby was breastfed at 1 and 24 hours). The capital letters for the Swahili words are also difficult to distinguish:

- H = hapana (no)
- N = ndiyo (yes)

Annex A Challenges Due to Changes in L&D Registers

Table A Content Differences between Registers and Implications for Kigoma Monitoring and Evaluation Data

VARIABLE	OLD REGISTER	NEW REGISTERS	COMPROMISE	DATA IMPLICATION
Neonatal deaths (NNDs)	<ul style="list-style-type: none"> Column for NND <24 hours Column for NND 24+ hours 	<ul style="list-style-type: none"> No column for NNDs 	<ul style="list-style-type: none"> Recorded multiple other variables that may indicate whether baby was born alive and later died: breastfed within first hour, neonatal resuscitation performed, non-zero APGAR score, baby dead at discharge 	<p>Underreporting of NNDs</p> <ul style="list-style-type: none"> Baby's status as alive or dead at discharge in new register may not have been recorded clearly or accurately. Sometimes this column was blank, automatically completed as "alive," accidentally reversed with mother's status at discharge, or difficult to read (A = amefariki, "dead"; H = hai, "alive").
Stillbirths	<ul style="list-style-type: none"> Column for fresh stillbirths (FSB) Column for macerated stillbirths (MSB) 	<ul style="list-style-type: none"> One column for FSB/MSB 	<ul style="list-style-type: none"> Data collectors recorded FSB or MSB, if written in cell If cell had check mark, IUFD, or unspecified stillbirth, data collectors recorded as FSB (also the default for unspecified stillbirths in old register) 	<p>Underreporting or changing the MSB/FSB ratio in stillbirths</p> <ul style="list-style-type: none"> FSB/MSB column was often incomplete in new registers, so stillbirths may be underreported
Maternal deaths	<ul style="list-style-type: none"> Column for mother's status at discharge 	<ul style="list-style-type: none"> Column for mother's status at discharge with Swahili terminology for "alive" vs. "dead" 	<ul style="list-style-type: none"> Investigate all maternal deaths found only in L&D registers and not in other facility data sources 	<p>Over-reporting of maternal deaths and extensive investigations to verify actual maternal deaths</p> <ul style="list-style-type: none"> Mother's status as alive or dead at discharge in new register may not have been recorded clearly or accurately. Sometimes this column was blank, automatically completed as "alive," accidentally reversed with baby's status at discharge, or difficult to read (A = amefariki, "dead"; H = hai, "alive").
Helping Babies Breathe (neonatal resuscitation)	<ul style="list-style-type: none"> No column for Helping Babies Breathe (HBB) 	<ul style="list-style-type: none"> Column for type of HBB neonatal resuscitation performed (coding scheme differs between the two new register versions) 	<ul style="list-style-type: none"> Collected information on type of HBB neonatal resuscitation performed (if performed) 	<p>Information now available to track neonatal resuscitation efforts, but it cannot be compared with previous information</p> <ul style="list-style-type: none"> Given the new registers' inclusion of the HBB variable, we will now be able to track neonatal resuscitation efforts. Since HBB was not included in the old register, information on neonatal resuscitation has not been collected in previous rounds of data collection. Given the different code definitions for types of neonatal resuscitation between the two new registers, as well as the inconsistent use of proper codes, it is difficult to analyze HBB data by type of neonatal resuscitation (i.e., stimulation, suction, bag and mask).

Annex B Direct Obstetric Complications

Annex B Direct Obstetric Complications

Table B1 Distribution of Direct Obstetric Complications, Including First Trimester Complications by Type of Treating Facility, 2011–2018

Facility Type and Support Status	2011				2012			
	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b
Facility Type	N	(%)	(%)	(%)	N	(%)	(%)	(%)
Hospitals	3,621	67.6	34.9	28.9	3,445	62.7	31.3	26.9
Health centers	1,535	28.7	11.6	12.3	1,843	33.6	13.4	14.4
Dispensaries	199	3.7	1.7	1.6	203	3.7	1.3	1.6
Facility EmONC Status								
EmONC	4,413	82.4	30.0	35.3	4,444	80.9	27.7	34.7
Non-EmONC	942	17.6	4.7	7.5	1,047	19.1	4.3	8.2
Support Status								
Project-supported hospitals	2,905	54.2	33.5	23.2	2,878	52.4	29.5	22.5
Non-project-supported hospitals	716	13.4	42.3	5.7	567	10.3	44.7	4.4
Project-supported health centers	751	14.0	8.8	6.0	819	14.9	9.8	6.4
Non-project-supported health centers	785	14.7	13.9	6.3	1,026	18.7	16.9	8.0
Project-supported dispensaries	65	1.2	1.1	0.5	53	1.0	0.6	0.4
Non-project-supported dispensaries	134	2.5	2.4	1.1	150	2.7	2.4	1.2
Facility EmONC Status and Support								
Project-supported EmONC facilities	3,029	56.6	32.5	24.2	2,977	54.2	28.1	23.2
Project-supported non-EmONC facilities (includes dispensaries)	691	12.9	5.4	5.5	771	14.0	4.8	6.0
Non-project-supported EmONC facilities	1,384	25.8	25.6	11.1	1,467	26.7	27.0	11.5
Non-project-supported non-EmONC facilities	251	4.7	3.4	2.0	276	5.0	3.4	2.2
Total (All Facilities)	5,355	100%	15.3%	42.8%	5,491	100%	13.7%	42.9%
Met Need for EmONC	4,413			35.3%	4,444			34.7%
Proportion of Met Need for EmONC Occurring in Project-Supported EmONC Facilities				69%				67%

^a Includes antepartum and postpartum hemorrhage, uterine rupture, prolonged or obstructed labor, postpartum sepsis, eclampsia/preeclampsia, and first trimester complications (complicated abortions and ectopic pregnancies).

^b Assuming that 15% of all women who give births would experience direct obstetric complications.

Annex B Direct Obstetric Complications

Table B1 Distribution of Direct Obstetric Complications, Including First Trimester Complications by Type of Treating Facility, 2011–2018 (Continued)

Facility Type and Support Status	2013				2014			
	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b
Facility Type	N	(%)	(%)	(%)	N	(%)	(%)	(%)
Hospitals	3,869	67.1	33.2	29.5	4,358	65.1	30.2	32.4
Health centers	1,793	31.1	14.3	13.7	2,254	33.7	15.4	16.8
Dispensaries	107	1.9	0.8	0.8	78	1.2	0.4	0.6
Facility EmONC Status								
EmONC	4,903	85.0	29.1	37.4	5,559	83.1	26.8	41.4
Non-EmONC	866	15.0	4.1	6.6	1,131	16.9	4.4	8.4
Support Status								
Project-supported hospitals	3,096	53.7	31.5	23.6	3,031	45.3	28.6	22.6
Non-project-supported hospitals	773	13.4	43.1	5.9	1,327	19.8	34.8	9.9
Project-supported health centers	824	14.3	10.0	6.3	1,205	18.0	13.3	9.0
Non-project-supported health centers	968	16.8	17.7	7.4	1,050	15.7	16.3	7.8
Project-supported dispensaries	35	0.6	0.4	0.3	54	0.8	0.5	0.4
Non-project-supported dispensaries	72	1.2	1.3	0.5	24	0.4	0.3	0.2
Facility EmONC Status and Support								
Project-supported EmONC facilities	3,247	56.3	29.8	24.8	3,311	49.5	27.4	24.6
Project-supported non-EmONC facilities (includes dispensaries)	709	12.3	4.9	5.4	1,003	15.0	5.9	7.5
Non-project-supported EmONC facilities	1,656	28.7	28.0	12.6	2,380	35.6	27.5	17.7
Non-project-supported non-EmONC facilities	157	2.7	2.3	1.2	125	1.9	1.4	0.9
Total (All Facilities)	5,769	100%	15.1%	44.0%	6,690	100%	14.4%	49.8%
Met Need for EmONC	4,903			37.4%	5,559			41.4%
Proportion of Met Need for EmONC Occurring in Project-Supported EmONC Facilities				66%				60%

^a Includes antepartum and postpartum hemorrhage, uterine rupture, prolonged or obstructed labor, postpartum sepsis, eclampsia/preeclampsia, and first trimester complications (complicated abortions and ectopic pregnancies).

^b Assuming that 15% of all women who give births would experience direct obstetric complications.

Annex B Direct Obstetric Complications

Table B1 Distribution of Direct Obstetric Complications, Including First Trimester Complications by Type of Treating Facility, 2011–2018 (Continued)

Facility Type and Support Status	2015				2016			
	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b
Facility Type	N	(%)	(%)	(%)	N	(%)	(%)	(%)
Hospitals	4,232	64.5	29.4	30.8	4,502	60.3	32.3	33.0
Health centers	2,260	34.4	15.1	16.4	2,873	38.5	16.6	21.0
Dispensaries	71	1.1	0.4	0.5	93	1.2	0.4	0.7
Facility EmONC Status								
EmONC	5,435	82.8	26.2	39.5	5,086	68.1	26.1	37.3
Non-EmONC	1,128	17.2	4.0	8.2	2,382	31.9	6.6	17.4
Support Status								
Project-supported hospitals	3,093	47.1	27.5	22.5	3,614	48.4	33.8	26.5
Non-project-supported hospitals	1,139	17.4	36.1	8.3	888	11.9	27.3	6.5
Project-supported health centers	1,116	17.0	14.2	8.1	1,748	23.4	15.5	12.8
Non-project-supported health centers	1,142	17.4	17.5	8.3	1,125	15.1	18.5	8.2
Project-supported dispensaries	33	0.5	0.3	0.2	42	0.6	0.3	0.3
Non-project-supported dispensaries	38	0.6	0.5	0.3	51	0.7	0.4	0.4
Facility EmONC Status and Support								
Project-supported EmONC facilities	3,301	50.3	25.4	24.0	4,563	61.1	25.2	33.4
Project-supported non-EmONC facilities (includes dispensaries)	943	14.4	5.2	6.9	841	11.3	5.1	6.2
Non-project-supported EmONC facilities	2,134	32.5	27.5	15.5	523	7.0	38.1	3.8
Non-project-supported non-EmONC facilities	185	2.8	1.8	1.3	1,541	20.6	7.9	11.3
Total (All Facilities)	6,563	100%	13.4%	47.7%	7,468	100%	13.5%	54.7%
Met Need for EmONC	5,435			39.5%	5,086			37.3%
Proportion of Met Need for EmONC Occurring in Project-Supported EmONC Facilities				61%				90%

^a Includes antepartum and postpartum hemorrhage, uterine rupture, prolonged or obstructed labor, postpartum sepsis, eclampsia/preeclampsia, and first trimester complications (complicated abortions and ectopic pregnancies).

^b Assuming that 15% of all women who give births would experience direct obstetric complications.

Annex B Direct Obstetric Complications

Table B1 Distribution of Direct Obstetric Complications, Including First Trimester Complications by Type of Treating Facility, 2011–2018 (Continued)

Facility Type and Support Status	2017				2018			
	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b
Facility Type	N	(%)	(%)	(%)	N	(%)	(%)	(%)
Hospitals	4,973	61.3	34.8	35.6	4,837	52.5	34.5	32.2
Health centers	2,997	36.9	14.9	21.4	3,482	37.8	13.6	23.1
Dispensaries	145	1.8	0.5	1.0	898	9.7	2.0	6.0
Facility EmONC Status								
EmONC	5,529	68.1	25.7	39.6	7,272	78.9	23.2	48.3
Non-EmONC	2,586	31.9	6.2	18.5	1,945	21.1	3.6	12.9
Support Status								
Project-supported hospitals	3,898	48.0	39.6	27.9	3,390	36.8	37.0	22.5
Non-project-supported hospitals	1,075	13.2	24.1	7.7	1,447	15.7	29.7	9.6
Project-supported health centers	1,863	23.0	13.9	13.3	2,176	23.6	14.3	14.5
Non-project-supported health centers	1,134	14.0	16.8	8.1	1,306	14.2	12.7	8.7
Project-supported dispensaries	75	0.9	0.5	0.5	634	6.9	2.6	4.2
Non-project-supported dispensaries	70	0.9	0.5	0.5	264	2.9	1.2	1.8
Facility EmONC Status and Support								
Project-supported EmONC facilities	4,896	60.3	25.4	35.0	4,676	50.7	24.2	31.1
Project-supported non-EmONC facilities (includes dispensaries)	940	11.6	4.8	6.7	1,524	16.5	5.2	10.1
Non-project-supported EmONC facilities	680	8.4	31.1	4.9	2,596	28.2	21.8	17.3
Non-project-supported non-EmONC facilities	1,599	19.7	7.2	11.4	421	4.6	1.7	2.8
Total (All Facilities)	8,115	100%	12.9%	58.0%	9,217	100%	10.8%	61.3%
Met Need for EmONC	5,529			39.6%	7,272			48.3%
Proportion of Met Need for EmONC Occurring in Project-Supported EmONC Facilities				89%				64%

^a Includes antepartum and postpartum hemorrhage, uterine rupture, prolonged or obstructed labor, postpartum sepsis, eclampsia/preeclampsia, and first trimester complications (complicated abortions and ectopic pregnancies).

^b Assuming that 15% of all women who give births would experience direct obstetric complications.

Annex B Direct Obstetric Complications

Table B2 Distribution of Direct Obstetric Complications, Excluding First Trimester Complications by Type of Treating Facility, 2011–2018

Facility Type and Support Status	2011				2012			
	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b
Facility Type	N	(%)	(%)	(%)	N	(%)	(%)	(%)
Hospitals	2,578	69.3	24.8	20.6	2,617	69.7	23.7	20.4
Health centers	983	26.4	7.5	7.9	990	26.4	7.2	7.7
Dispensaries	160	4.3	1.4	1.3	150	4.0	1.0	1.2
Facility EmONC Status								
EmONC	3,000	80.6	20.4	24.0	3,066	81.6	19.1	23.9
Non-EmONC	721	19.4	3.6	5.8	691	18.4	2.9	5.4
Support Status								
Project-supported hospitals	2,102	56.5	24.2	16.8	2,262	60.2	23.2	17.7
Non-project-supported hospitals	476	12.8	28.1	3.8	355	9.4	28.0	2.8
Project-supported health centers	597	16.0	6.5	4.8	591	15.7	6.5	4.6
Non-project-supported health centers	386	10.4	6.8	3.1	400	10.6	6.6	3.1
Project-supported dispensaries	60	1.6	1.0	0.5	51	1.4	0.6	0.4
Non-project-supported dispensaries	100	2.7	1.8	0.8	99	2.6	1.6	0.8
Facility EmONC Status and Support								
Project-supported EmONC facilities	2,191	58.9	23.5	17.5	2,347	62.5	22.2	18.3
Project-supported non-EmONC facilities (includes dispensaries)	568	15.3	4.4	4.5	556	14.8	3.5	4.3
Non-project-supported EmONC facilities	809	21.7	15.0	6.5	719	19.1	13.2	5.6
Non-project-supported non-EmONC facilities	153	4.1	2.1	1.2	135	3.6	1.6	1.1
Total (All Facilities)	3,721	100%	10.6%	29.8%	3,757	100%	9.4%	29.3%
Met Need for EmONC	3,000			24%	3,066			24%
Proportion of Met Need for EmONC Occurring in Project-Supported EmONC Facilities				73%				77%

^a Includes antepartum and postpartum hemorrhage, uterine rupture, prolonged or obstructed labor, postpartum sepsis, eclampsia/preeclampsia; does not include first trimester complications (complicated abortions and ectopic pregnancies).

^b Assuming that 15% of all women who give births would experience direct obstetric complications.

Annex B Direct Obstetric Complications

Table B2 Distribution of Direct Obstetric Complications, Excluding First Trimester Complications by Type of Treating Facility, 2011–2018 (Continued)

Facility Type and Support Status	2013				2014			
	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b
Facility Type	N	(%)	(%)	(%)	N	(%)	(%)	(%)
Hospitals	2,679	69.7	23.0	20.4	2,999	67.7	20.8	22.3
Health centers	1,063	27.7	8.5	8.1	1,359	30.7	9.3	10.1
Dispensaries	101	2.6	0.7	0.8	73	1.6	0.4	0.5
Facility EmONC Status								
EmONC	3,208	83.5	19.1	24.5	3,699	83.5	17.8	27.5
Non-EmONC	635	16.5	3.0	4.8	732	16.5	2.8	5.4
Support Status								
Project-supported hospitals	2,178	56.7	22.1	16.6	2,143	48.4	20.2	16.0
Non-project-supported hospitals	501	13.0	27.9	3.8	856	19.3	22.4	6.4
Project-supported health centers	591	15.4	6.8	4.5	770	17.4	7.0	5.7
Non-project-supported health centers	472	12.3	8.6	3.6	589	13.3	9.2	4.4
Project-supported dispensaries	29	0.8	0.3	0.2	52	1.2	0.5	0.4
Non-project-supported dispensaries	72	1.9	1.3	0.5	21	0.5	0.3	0.2
Facility EmONC Status and Support								
Project-supported EmONC facilities	2,267	59.0	20.8	17.3	2,285	51.6	18.9	17.0
Project-supported non-EmONC facilities (includes dispensaries)	531	13.8	3.7	4.0	680	15.3	4.0	5.1
Non-project-supported EmONC facilities	941	24.5	15.9	7.2	1,414	31.9	16.4	10.5
Non-project-supported non-EmONC facilities	104	2.7	1.5	0.8	52	1.2	0.6	0.4
Total (All Facilities)	3,843	100%	10.1%	29.3%	4,431	100%	9.5%	32.9%
Met Need for EmONC	3,208			25%	3,699			28%
Proportion of Met Need for EmONC Occurring in Project-Supported EmONC Facilities				71%				62%

^a Includes antepartum and postpartum hemorrhage, uterine rupture, prolonged or obstructed labor, postpartum sepsis, eclampsia/preeclampsia; does not include first trimester complications (complicated abortions and ectopic pregnancies).

^b Assuming that 15% of all women who give births would experience direct obstetric complications.

Annex B Direct Obstetric Complications

Table B2 Distribution of Direct Obstetric Complications, Excluding First Trimester Complications by Type of Treating Facility, 2011–2018 (Continued)

Facility Type and Support Status	2015				2016			
	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b
Facility Type	N	(%)	(%)	(%)	N	(%)	(%)	(%)
Hospitals	2,634	68.1	18.3	19.1	2,917	62.0	20.9	21.4
Health centers	1,168	30.2	7.8	8.5	1,698	36.1	9.8	12.4
Dispensaries	66	1.7	0.3	0.5	93	2.0	0.4	0.7
Facility EmONC Status								
EmONC	3,310	85.6	15.9	24.1	3,187	67.7	16.4	23.3
Non-EmONC	558	14.4	2.0	4.1	1,521	32.3	4.2	11.1
Support Status								
Project-supported hospitals	1,942	50.2	17.2	14.1	2,338	49.7	21.8	17.1
Non-project-supported hospitals	692	17.9	21.9	5.0	579	12.3	17.8	4.2
Project-supported health centers	582	15.0	5.4	4.2	1,068	22.7	9.5	7.8
Non-project-supported health centers	586	15.1	9.0	4.3	630	13.4	10.3	4.6
Project-supported dispensaries	32	0.8	0.3	0.2	42	0.9	0.3	0.3
Non-project-supported dispensaries	34	0.9	0.4	0.2	51	1.1	0.4	0.4
Facility EmONC Status and Support								
Project-supported EmONC facilities	2,072	53.6	15.9	15.1	2,928	62.2	16.2	21.4
Project-supported non-EmONC facilities (includes dispensaries)	484	12.5	2.7	3.5	520	11.0	3.2	3.8
Non-project-supported EmONC facilities	1,238	32.0	15.9	9.0	259	5.5	18.9	1.9
Non-project-supported non-EmONC facilities	74	1.9	0.7	0.5	1,001	21.3	5.1	7.3
Total (All Facilities)	3,868	100%	7.9%	28.1%	4,708	100%	8.5%	34.5%
Met Need for EmONC	3,310			24%	3,187			23.3%
Proportion of Met Need for EmONC Occurring in Project-Supported EmONC Facilities				63%				92%

^a Includes antepartum and postpartum hemorrhage, uterine rupture, prolonged or obstructed labor, postpartum sepsis, eclampsia/preeclampsia; does not include first trimester complications (complicated abortions and ectopic pregnancies).

^b Assuming that 15% of all women who give births would experience direct obstetric complications.

Annex B Direct Obstetric Complications

Table B2 Distribution of Direct Obstetric Complications, Excluding First Trimester Complications by Type of Treating Facility, 2011–2018 (Continued)

Facility Type and Support Status	2017				2018			
	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b	Direct obstetric complications ^a		Complications as proportion of total deliveries	Proportion of expected complications treated ^b
Facility Type	N	(%)	(%)	(%)	N	(%)	(%)	(%)
Hospitals	3,155	61.1	22.1	22.6	3,426	57.9	24.4	22.8
Health centers	1,866	36.1	9.3	13.3	2,265	38.3	8.9	15.1
Dispensaries	145	2.8	0.5	1.0	225	3.8	0.5	1.5
Facility EmONC Status								
EmONC	3,590	69.5	16.7	25.7	4,948	83.6	15.8	32.9
Non-EmONC	1,576	30.5	3.8	11.3	968	16.4	1.8	6.4
Support Status								
Project-supported hospitals	2,425	46.9	24.7	17.3	2,512	42.5	27.5	16.7
Non-project-supported hospitals	730	14.1	16.4	5.2	914	15.4	18.8	6.1
Project-supported health centers	1,280	24.8	9.6	9.2	1,546	26.1	10.1	10.3
Non-project-supported health centers	586	11.3	8.7	4.2	719	12.2	7.0	4.8
Project-supported dispensaries	75	1.5	0.5	0.5	128	2.2	0.5	0.9
Non-project-supported dispensaries	70	1.4	0.5	0.5	97	1.6	0.5	0.6
Facility EmONC Status and Support								
Project-supported EmONC facilities	3,171	61.4	16.4	22.7	3,388	57.3	17.5	22.5
Project-supported non-EmONC facilities (includes dispensaries)	609	11.8	3.1	4.4	798	13.5	2.7	5.3
Non-project-supported EmONC facilities	419	8.1	19.1	3.0	1,560	26.4	13.1	10.4
Non-project-supported non-EmONC facilities	967	18.7	4.4	6.9	170	2.9	0.7	1.1
Total (All Facilities)	5,166	100%	8.2%	36.9%	5,916	100%	6.9%	39.4%
Met Need for EmONC	3,590			26%	4,948			33%
Proportion of Met Need for EmONC Occurring in Project-Supported EmONC Facilities				88%				68%

^a Includes antepartum and postpartum hemorrhage, uterine rupture, prolonged or obstructed labor, postpartum sepsis, eclampsia/preeclampsia; does not include first trimester complications (complicated abortions and ectopic pregnancies).

^b Assuming that 15% of all women who give births would experience direct obstetric complications.

Annex B Direct Obstetric Complications

Table B3 Number of Obstetric Procedures Performed in All Facilities with Operating Theatres, 2011–2018

Kasulu District																
Type of Procedure	Heri Hospital								Kabanga Hospital							
	2011	2012	2013	2014	2015	2016	2017	2018	2011	2012	2013	2014	2015	2016	2017	2018
Cesarean sections	143	121	119	128	156	91	164	78	271	160	230	351	246	212	342	329
Operation on ruptured uterus (repair or hysterectomy)	4	1	0	1	0	0	0	0	8	0	1	5	0	5	5	0
Surgery for ruptured ectopic pregnancy	0	1	2	0	1	0	0	0	4	3	5	1	5	8	10	0
Laparotomy and drainage for post-abortion complications	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Hysterectomy for post-abortion complication	2	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0
Hysterectomy for postpartum hemorrhage	1	0	0	0	1	0	0	0	0	0	1	2	0	0	0	0
Manual removal of placenta performed in OT	0	0	0	1	0	0	0	0	11	1	3	0	0	4	5	0
Kasulu District Hospital																
Type of Procedure	Kasulu District Hospital								Biharu Health Center							
	2011	2012	2013	2014	2015	2016	2017	2018	2011	2012	2013	2014	2015	2016	2017	2018
Cesarean sections	462	679	501	597	654	604	585	521	NA	NA	NA	NA	NA	NA	NA	27
Operation on ruptured uterus (repair or hysterectomy)	45	25	26	19	21	20	17	12	NA	NA	NA	NA	NA	NA	NA	0
Surgery for ruptured ectopic pregnancy	4	2	4	10	9	1	5	0	NA	NA	NA	NA	NA	NA	NA	0
Laparotomy and drainage for post-abortion complications	0	6	0	0	0	0	1	0	NA	NA	NA	NA	NA	NA	NA	0
Hysterectomy for post-abortion complication	0	0	0	0	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	0
Hysterectomy for postpartum hemorrhage	3	5	0	2	1	1	4	0	NA	NA	NA	NA	NA	NA	NA	0
Manual removal of placenta performed in OT	2	1	0	0	0	4	3	0	NA	NA	NA	NA	NA	NA	NA	0
Kiganamo Health Center ^a																
Type of Procedure	Kiganamo Health Center ^a								Muyama Health Center							
	2011	2012	2013	2014	2015	2016	2017	2018	2011	2012	2013	2014	2015	2016	2017	2018
Cesarean sections	NA	NA	0	0	6	90	88	172	NA	NA	NA	NA	NA	18	23	45
Operation on ruptured uterus (repair or hysterectomy)	NA	NA	0	0	0	3	2	0	NA	NA	NA	NA	NA	1	1	1
Surgery for ruptured ectopic pregnancy	NA	NA	0	0	0	0	0	0	NA	NA	NA	NA	NA	0	0	1
Laparotomy and drainage for post-abortion complications	NA	NA	0	0	0	0	0	0	NA	NA	NA	NA	NA	0	0	0
Hysterectomy for post-abortion complication	NA	NA	0	0	0	0	0	0	NA	NA	NA	NA	NA	0	0	0
Hysterectomy for postpartum hemorrhage	NA	NA	0	0	0	0	0	0	NA	NA	NA	NA	NA	0	0	0
Manual removal of placenta performed in OT	NA	NA	0	0	0	0	1	0	NA	NA	NA	NA	NA	0	0	0
Nyenge Health Center																
Type of Procedure	Nyenge Health Center								Shunga Health Center							
	2011	2012	2013	2014	2015	2016	2017	2018	2011	2012	2013	2014	2015	2016	2017	2018
Cesarean sections	7	7	8	11	7	28	14	9	61	91	101	123	171	173	132	174
Operation on ruptured uterus (repair or hysterectomy)	0	0	0	0	0	1	0	1	1	0	1	2	0	2	0	0
Surgery for ruptured ectopic pregnancy	0	0	0	0	0	0	0	0	4	4	1	6	3	0	0	4
Laparotomy and drainage for post-abortion complications	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Hysterectomy for post-abortion complication	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
Hysterectomy for postpartum hemorrhage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manual removal of placenta performed in OT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NA = Not applicable because the facility did not have an OT.
^aKiganamo OT opened August 2013.

Annex B Direct Obstetric Complications

Table B3 Number of Obstetric Procedures Performed in All Facilities with Operating Theatres, 2011–2018 (Continued)

Kibondo District																
Type of Procedure	Kakonko Health Center								Kibondo District Hospital							
	2011	2012	2013	2014	2015	2016	2017	2018	2011	2012	2013	2014	2015	2016	2017	2018
Cesarean sections	27	68	46	129	172	168	193	213	460	335	385	469	373	677	829	992
Operation on ruptured uterus (repair or hysterectomy)	0	0	1	4	8	0	1	1	13	17	16	14	12	16	27	28
Surgery for ruptured ectopic pregnancy	0	0	0	0	0	0	0	0	1	7	6	0	3	6	8	18
Laparotomy and drainage for post-abortion complications	0	0	0	0	0	0	0	0	2	4	1	1	0	0	0	0
Hysterectomy for post-abortion complication	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Hysterectomy for postpartum hemorrhage	0	0	0	1	0	0	0	1	2	2	2	0	1	15	4	2
Manual removal of placenta performed in OT	0	0	0	0	0	0	0	0	4	6	5	0	0	4	0	0
Kifura Health Center ^b																
Type of Procedure	Kifura Health Center ^b								Mabamba Health Center							
	2011	2012	2013	2014	2015	2016	2017	2018	2011	2012	2013	2014	2015	2016	2017	2018
Cesarean sections	NA	NA	0	0	5	53	39	33	19	31	16	25	18	51	23	42
Operation on ruptured uterus (repair or hysterectomy)	NA	NA	0	0	0	0	0	NA	1	1	1	1	0	1	0	2
Surgery for ruptured ectopic pregnancy	NA	NA	0	0	0	0	0	NA	0	0	0	0	0	0	0	0
Laparotomy and drainage for post-abortion complications	NA	NA	0	0	0	0	0	NA	0	0	0	0	0	0	0	0
Hysterectomy for post-abortion complication	NA	NA	0	0	0	0	0	NA	0	0	0	0	0	0	0	0
Hysterectomy for postpartum hemorrhage	NA	NA	0	0	0	0	0	NA	0	0	0	0	0	0	0	0
Manual removal of placenta performed in OT	NA	NA	0	0	0	0	0	NA	3	2	0	0	0	0	0	0
Nyanzige Health Center ^c																
Type of Procedure	Nyanzige Health Center ^c															
	2011	2012	2013	2014	2015	2016	2017	2018								
Cesarean sections	NA	NA	NA	NA	1	58	79	93								
Operation on ruptured uterus (repair or hysterectomy)	NA	NA	NA	NA	0	2	1	3								
Surgery for ruptured ectopic pregnancy	NA	NA	NA	NA	0	0	0	0								
Laparotomy and drainage for post-abortion complications	NA	NA	NA	NA	0	0	0	0								
Hysterectomy for post-abortion complication	NA	NA	NA	NA	0	0	0	0								
Hysterectomy for postpartum hemorrhage	NA	NA	NA	NA	0	0	0	0								
Manual removal of placenta performed in OT	NA	NA	NA	NA	0	0	0	0								

NA = Not applicable because the facility did not have an OT.

^bKifura OT was collected starting August 2013.

^cNyanzige OT was collected starting August 2015.

Annex B Direct Obstetric Complications

Table B3 Number of Obstetric Procedures Performed in All Facilities with Operating Theatres, 2011–2018 (Continued)

Kigoma District (Rural)																
Type of Procedure	Bitale Health Center ^d								Buhingu Health Center ^e							
	2011	2012	2013	2014	2015	2016	2017	2018	2011	2012	2013	2014	2015	2016	2017	2018
Cesarean sections	NA	NA	0	0	2	40	60	99	6	25	38	28	41	13	21	19
Operation on ruptured uterus (repair or hysterectomy)	NA	NA	0	0	0	0	1	1	0	4	3	2	5	0	0	0
Surgery for ruptured ectopic pregnancy	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Laparotomy and drainage for post-abortion complications	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hysterectomy for post-abortion complication	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hysterectomy for postpartum hemorrhage	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manual removal of placenta performed in OT	NA	NA	0	0	0	0	0	10	0	1	0	1	0	0	0	0
Type of Procedure	Ilagala Health Center								Kayla Health Center							
	2011	2012	2013	2014	2015	2016	2017	2018	2011	2012	2013	2014	2015	2016	2017	2018
Cesarean sections	NA	NA	NA	NA	NA	7	48	75	NA	NA	NA	NA	NA	NA	NA	10
Operation on ruptured uterus (repair or hysterectomy)	NA	NA	NA	NA	NA	1	1	0	NA	NA	NA	NA	NA	NA	NA	2
Surgery for ruptured ectopic pregnancy	NA	NA	NA	NA	NA	0	0	0	NA	NA	NA	NA	NA	NA	NA	6
Laparotomy and drainage for post-abortion complications	NA	NA	NA	NA	NA	0	0	0	NA	NA	NA	NA	NA	NA	NA	0
Hysterectomy for post-abortion complication	NA	NA	NA	NA	NA	0	0	0	NA	NA	NA	NA	NA	NA	NA	0
Hysterectomy for postpartum hemorrhage	NA	NA	NA	NA	NA	0	0	0	NA	NA	NA	NA	NA	NA	NA	1
Manual removal of placenta performed in OT	NA	NA	NA	NA	NA	0	0	0	NA	NA	NA	NA	NA	NA	NA	3
Type of Procedure	Matyazo Health Center								Nguruka Health Center							
	2011	2012	2013	2014	2015	2016	2017	2018	2011	2012	2013	2014	2015	2016	2017	2018
Cesarean sections	106	156	141	210	213	243	165	345	58	38	50	55	54	71	60	105
Operation on ruptured uterus (repair or hysterectomy)	2	2	6	0	7	1	0	3	2	3	2	5	7	5	2	2
Surgery for ruptured ectopic pregnancy	2	3	8	4	1	1	2	2	1	1	1	2	1	0	0	0
Laparotomy and drainage for post-abortion complications	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Hysterectomy for post-abortion complication	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hysterectomy for postpartum hemorrhage	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0
Manual removal of placenta performed in OT	0	3	2	0	5	1	1	2	7	8	2	0	0	0	0	0

NA = Not applicable because the facility did not have an OT.

^dBitale OT was collected starting August 2013.

^eBuhingu OT opened August 2011.

Annex B Direct Obstetric Complications

Table B3 Number of Obstetric Procedures Performed in All Facilities with Operating Theatres, 2011–2018 (Continued)

Kigoma District (Urban)																
Type of Procedure	Baptist Hospital ^f								Maweni Regional Hospital							
	2011	2012	2013	2014	2015	2016	2017	2018	2011	2012	2013	2014	2015	2016	2017	2018
Cesarean sections	NA	NA	62	249	158	258	223	456	591	565	497	518	541	570	584	513
Operation on ruptured uterus (repair or hysterectomy)	NA	NA	2	13	10	7	6	2	12	18	17	24	15	0	6	8
Surgery for ruptured ectopic pregnancy	NA	NA	0	1	1	1	2	6	15	28	14	10	28	6	24	0
Laparotomy and drainage for post-abortion complications	NA	NA	1	1	0	0	0	0	9	5	3	1	5	0	0	0
Hysterectomy for post-abortion complication	NA	NA	0	0	0	0	0	0	2	4	0	0	1	0	0	0
Hysterectomy for postpartum hemorrhage	NA	NA	0	0	0	2	1	1	6	2	3	8	0	0	1	4
Manual removal of placenta performed in OT	NA	NA	0	0	0	0	0	3	14	9	5	4	2	0	1	3
Ujiji Health Center ^g																
Type of Procedure	2011	2012	2013	2014	2015	2016	2017	2018								
Cesarean sections	1	26	97	85	54	80	141	120								
Operation on ruptured uterus (repair or hysterectomy)	0	2	1	1	0	0	1	1								
Surgery for ruptured ectopic pregnancy	0	0	0	0	0	0	0	1								
Laparotomy and drainage for post-abortion complications	0	0	0	0	0	0	0	0								
Hysterectomy for post-abortion complication	0	0	0	0	0	0	0	0								
Hysterectomy for postpartum hemorrhage	0	0	0	0	0	0	0	1								
Manual removal of placenta performed in OT	0	0	1	0	0	0	0	0								

NA = Not applicable because the facility did not have an OT.

^f Baptist OT was collected starting August 2013.

^g Ujiji OT opened November 2011.

Annex B Direct Obstetric Complications

Table B4 Number of Abortion Complications Surgically Treated by Project Support Status, 2011–2018

All Hospitals and Health Centers

Facility Type	2011	2012	2013	2014	2015	2016	2017	2018
Project-Supported Hospitals								
Kasulu	227	238	366	358	516	640	590	267
Kibondo	130	160	223	183	302	407	454	137
Maweni	400	144	287	316	273	208	388	474
Non-Project-Supported Hospitals								
Baptist	—	—	26	124	145	89	107	258
Heri	62	50	56	42	62	20	30	27
Kabanga	171	157	180	275	232	187	191	248
Project-Supported Health Centers								
Bitale	16	19	34	66	91	90	34	43
Buhingu	1	33	10	39	26	6	8	29
Ilagala	0	0	0	0	17	22	18	18
Kakonko	2	8	12	37	110	77	63	87
Kalya	—	—	—	—	—	—	—	23
Kifura	0	0	1	33	81	97	109	87
Kiganamo	5	0	0	11	1	43	47	88
Mabamba	77	91	82	69	72	61	75	40
Nguruka	34	13	61	108	77	106	45	53
Nyanzige	8	22	1	10	14	54	56	48
Nyenge	4	26	25	46	28	72	84	53
Ujiji	5	3	5	10	18	37	32	41
Non-Project-Supported Health Centers								
Biharu	29	26	16	10	46	31	0	29
Gwanumpo	3	5	3	10	11	1	8	28
Gungu	0	1	1	0	1	27	23	5
Janda	9	23	17	17	18	52	57	19
Kagezi	—	—	—	—	—	—	—	1
Kimwanya	—	—	—	—	6	0	0	1
Matyazo	167	217	200	164	149	205	262	243
Mulera	9	10	1	6	7	34	20	6
Muyama	6	9	4	9	7	15	11	20
Muyovozi	—	—	0	0	0	6	3	0
Mwamgongo	0	0	0	0	0	2	0	0
Nyakitonto	5	1	3	10	9	6	11	25
Rusesa	17	36	15	28	44	56	71	62
Shunga	68	151	149	173	103	8	35	112
Uvinza	—	—	5	13	13	21	50	56
Total	1,455	1,443	1,783	2,167	2,479	2,680	2,882	2,628

Notes: Abortions are taken from abortion tally, not major OT registers; Cells containing "—" indicates years in which data was not collected.

Annex C Maternal and Perinatal Outcomes by Council

Annex C Maternal and Perinatal Outcomes by Council

Table C Maternal and Perinatal Outcomes by Council, Kigoma Region, 2018

	Council								
	Kigoma Town/Ujiji Municipal	Kigoma District	Kasulu Town	Kasulu District	Kibondo District	Buhigwe District	Kakonko District	Uvinza District	All Facilities
Events									
Number of total facility deliveries	9,472	8,575	9,489	17,283	12,158	10,093	5,959	12,158	85,187
Number of births in facilities with operating theatres	7,208	3,120	7,139	1,631	6,764	1,150	1,958	3,914	32,884
Number of births in EmONC facilities	6,636	1,544	6,865	4,794	6,578	292	653	3,919	30,609
Number of direct obstetric complications (excluding abortions)	1,387	523	1,364	287	1,297	206	438	414	5,916
Number of C-sections	1,089	445	1,022	183	1,067	150	306	209	4,471
Number of births with uterotonic drugs administered (AMTSL)	9,528	7,651	9,408	16,420	11,483	8,702	5,421	10,743	79,356
Number of all births delivered in facilities	9,637	8,660	9,642	17,440	12,283	10,200	6,029	12,271	86,162
Number of live births delivered in facilities	9,415	8,583	9,408	17,355	12,067	10,135	5,943	12,148	85,054
Indicators									
Population C-section rate (%)	10.7	4.5	10.4	0.9	8.7	1.3	3.9	1.2	4.5
Met need for EmONC (excluding abortions)(%)	78.2	25.1	92.2	8.2	68.1	3.0	12.1	11.8	32.9
Health Facilities									
Number of Hospitals	2	0	2	0	1	1	0	0	6
Number of Health Centers	2	3	1	6	3	4	3	5	27
Number of Dispensaries	2	27	10	30	24	25	21	25	164
Total Number of Facilities	6	30	13	36	28	30	24	30	197
Estimated number of population deliveries 2018 (estimated from Census and RHS 2014)	10,154	9,971	9,814	20,067	12,316	11,987	7,897	18,081	100,287

