

# Health Facility Assessment of Emergency Obstetric & Neonatal Care Services (EmONC) in Kigoma Region, Tanzania: Selected Findings

## Background

Tanzania has the fourth highest number of maternal deaths in Sub-Saharan Africa and the sixth highest in the world (World Health Organization, 2014). The Millennium Development Goal 5 national target is to reduce maternal mortality to 193 maternal deaths per 100,000 live births by 2015 through high-skilled birth attendance (80% of all births), provision of comprehensive emergency obstetric care in 100% of hospitals, provision of basic emergency obstetric care in 70% of health centers and dispensaries, and a contraceptive prevalence rate of 60% (Ministry of Health and Social Welfare, *Sharpened One Plan*, 2014).

Since 2006, Bloomberg Philanthropies (BP) has supported the *Reducing Maternal Mortality in Tanzania Project*, aimed at decreasing maternal mortality through improved comprehensive obstetric care in Kigoma, Morogoro and Pwani regions. The World Lung Foundation implements the intervention, which has included upgrading the capacity of 15 facilities (10 health centers and 5 hospitals) to perform obstetric surgeries, in addition to training over 100 non-physician clinicians in anesthesia and emergency obstetric and neonatal care (EmONC).

In 2013, BP engaged epidemiologists from the U.S. Centers for Disease Control and Prevention (CDC) to independently evaluate the project's progress, as well as its impact on maternal health outcomes in Kigoma Region.

CDC employed a multi-method approach including: a standardized health facility assessment, extraction of pregnancy outcomes, obstetric complications, and abortion and surgery information from obstetric registers, and documentation of facility-based maternal deaths using multiple sources.

This evaluation aims to assess current practices and outcomes in project-supported facilities as well as other facilities that provide delivery care throughout Kigoma region. Kigoma is the first region to implement the project and the first to start decentralizing comprehensive emergency obstetric care to make it accessible in health centers. The evaluation provides information on the current level and trends in EmONC services and examines the contribution of project-supported facilities to the changes in the level of care in the region.

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## Methods

### Study Area

Kigoma Region is in the western part of Tanzania, with a population of approximately 2,127,930 people and a male-to-female ratio of 1:1.07. Most of the population lives in rural villages, whose economies center on agriculture, small business, and fishing, for those near Lake Tanganyika.

The region is bordered by Burundi and Kagera Region to the north, Shinyanga and Tabora Regions to the east, Democratic Republic of Congo (DRC) to the west, and Katavi Region to the south. Due to war and political instability in neighboring countries, Burundi and DRC, Kigoma Region experienced an influx of refugees. At the time of study implementation, most refugee camps in Kigoma Region had closed, with only two main camps continuing to operate.

At the time of study planning, the region was divided administratively in four districts, all of which were included in the evaluation: Kigoma Urban (Ujiji Municipality) (population: 215,458), Kigoma Rural (Kigoma DC) (population: 595,206), Kasulu District (population: 888,380), and Kibondo District (population: 428,886) (Tanzania Population and Housing Census, NBS, 2013).

The goal of the WLF-supported project is to expand access and utilization of comprehensive EmONC services and help the region achieve the MDG 5 goal. With the financial support of BP, the region upgraded nine health facilities (three hospitals and six health centers) with the technical and personnel capacity to provide and strengthen comprehensive EmONC services.

### Maternal and Child Health Indicators in Kigoma, 2010

Compared to other regions in Tanzania, Kigoma had some of the greatest need for family planning and maternal and child health, as reflected in the following indicators for year 2010 (Tanzania Demographic and Health Survey, NBS, 2013) (Table 1).

Indicator	Kigoma Region	Tanzania
Modern contraceptive prevalence rate	14%	27%
Unmet family planning need	41%*	18%
Institutional delivery rate	33% <sup>†</sup>	50%
Cesarean section rate	2% <sup>†</sup>	5%
15–19 year-olds who have begun childbearing	30%	23%
Neonatal mortality rate (per 1,000 live births)	25	26
Total fertility rate (births per woman)	7.1 <sup>‡</sup>	5.4
Total wanted fertility rate (births per woman)	6.3	4.7

\* Highest unmet family planning need in the country.

<sup>†</sup>Second lowest institutional delivery rate and C-section rate in the country.

<sup>‡</sup>Highest total fertility rate in the country.

## **Study Objectives**

This region-wide health facility assessment (HFA) was designed to describe and assess current practices in EmONC facilities in Kigoma Region. The information collected enables an understanding of the current level and trends in EmONC services. It also examines the contribution of BP's efforts to the level of care in the district as a whole.

The HFA had four objectives:

- To evaluate health facility infrastructure
- To evaluate the human resources available at the health facilities
- To assess health facilities' supplies of medications and essential equipment
- To document the EmONC functionality in all health facilities in the region

## **Data Sources**

The study assessed facilities with at least 90 deliveries per year (reference year 2012), totaling 127 health facilities (Kigoma Urban, 3; Kigoma Rural, 27, Kasulu District, 51; Kibondo District, 46).

CDC evaluated basic infrastructure and EmONC capacity/functionality in 125<sup>1</sup> health facilities currently providing obstetric services in Kigoma Region using a health facility assessment questionnaire. These facilities provided care to an estimated 97% of all institutional births in 2012, according to the data made available to CDC by each district in July 2013. CDC collected individual data from five hospitals (three project-supported; two non-project-supported), 23 health centers (six project-supported; 17 non-project-supported), and 97 health dispensaries<sup>2</sup> (all non-project-supported). Only an estimated 3% of institutional deliveries in 2012 were attended in the dispensaries not included in the study.

The evaluation also collected data related to pregnancy outcomes, abortions and obstetric surgeries, as well as documentation of facility-based maternal deaths. These findings are available in the "Reducing Maternal Mortality in Tanzania: Selected Pregnancy Outcomes Findings from Kigoma Region" (CDC, June 2014).

## **Selected Findings**

### **General Facility Infrastructure**

Any obstetric care requires standard infrastructural capabilities (e.g., water, electricity, latrines), 24-hour/7-day availability of skilled personnel, communication and transport for emergency

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<sup>1</sup>Due to 2 years of missing pregnancy outcomes data, Rusaba and Kitagata dispensaries were excluded from the analysis.

<sup>2</sup> Excluded from the study are dispensaries with less than 90 annual deliveries in 2012 (Kasulu District: Kigembe, Kilelema, Shunguliba; Kibondo District: Bitare, Kagezi, Kanyonza, Muhange, Nengo, Nyabibuye; Kigoma District: Kalya, Kamara, Kashaguru, Kiganza, Matendo, Mkigo, Nkonkwa).

referrals, delivery beds, equipment and supplies, and the presence of and adherence to routine practices and procedures.

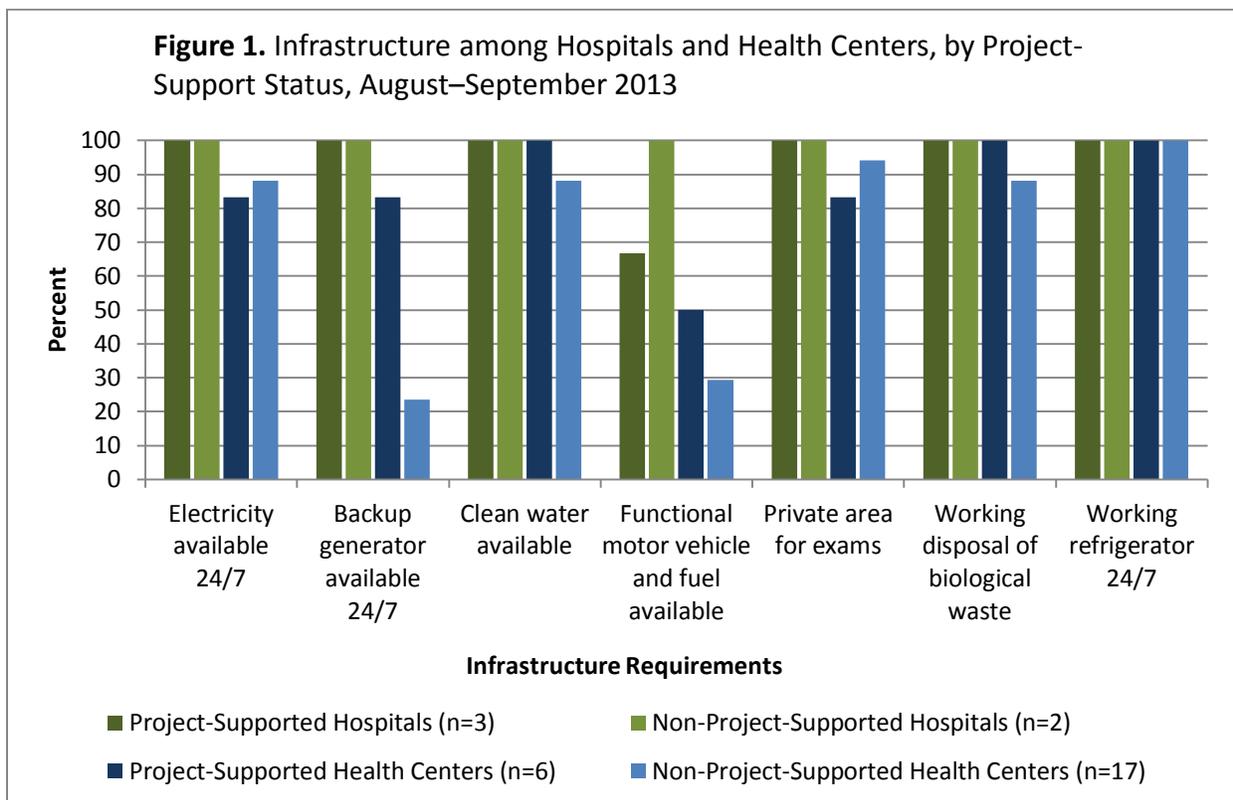
Additionally, the life-saving interventions comprised under basic and comprehensive EmONC, require more personnel available to perform specialized tasks, additional equipment and supplies, and, in the case of comprehensive care, availability of blood and surgical units.

To achieve a reduction in maternal mortality, the project invested in human resources, equipment, renovations for emergency obstetric care, improved surgical capacity and EmONC skills, and data systems. These improvements were implemented to ensure access to quality obstetric care, particularly for women with severe obstetric complications (e.g., obstetric hemorrhage, which, unattended may lead to death within two hours).

At the time of data collection during August–September 2013, CDC found the following:

**Electricity:** Without a reliable source of electricity, it is difficult for health staff to carry out obstetric procedures safely and well.

- All project-supported and non-project-supported hospitals reported availability of electricity at all times. Five of 6 (83%) project-supported health centers reported having reliable electricity, compared to 15 of 17 (88%) non-project-supported health centers (Figure 1).



**Back-up generators:** In the event that grid power fails, delivery facilities must have back-up generators to provide uninterrupted electricity.

- All hospitals reported that backup generators were available. Among health centers, more project-supported sites (5 of 6, 83%) had backup generators than non-project-supported sites (4 of 17, 24%) (Figure 1).

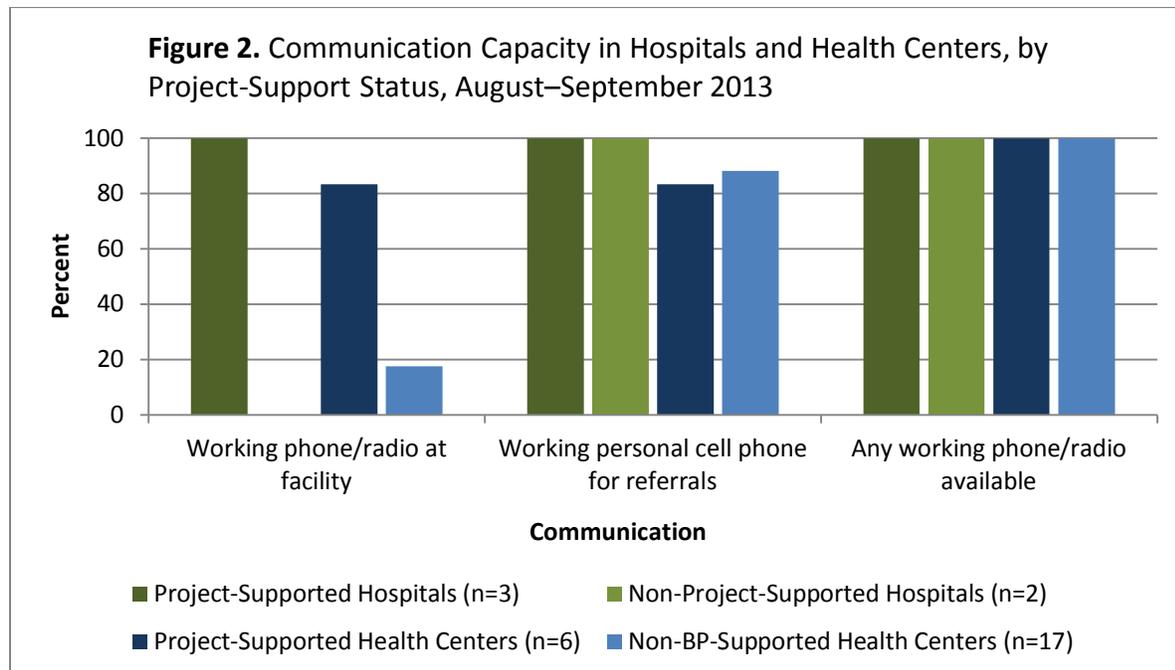
**Water and sanitation:** All health facilities must also have a reliable supply of safe water for sanitation and hydration. Health staff must be able to wash their hands to prevent the spread of infection, and patients need to have access to toilets in the maternity ward.

- Safe water was available in all hospitals, all project-supported health centers, and 88% of non-project-supported health centers (Figure 1).

**Transportation:** Adequate transportation takes into account vehicles, drivers, fuel, road conditions, and transportation charges. Availability of motorized transport is critical for referring women with obstetric emergencies requiring higher levels of service.

- Two of 3 (67%) project-supported hospitals had a functional motor vehicle and fuel at the time of evaluation, and both non-project-supported hospitals had a functional motor vehicle and fuel. Three of 6 (50%) project-supported health centers had a functional motor vehicle and fuel, compared to 5 of 17 (29%) non-project-supported health centers (Figure 2).

**Communication:** Lower-level facilities must have functional systems (i.e., two-way radio, landline telephone, or cell phones with service) to communicate with facilities for emergency referrals. All hospitals and health centers had either a personal cell phone or facility-based phone or radio for referrals (Figure 2). Facility-based communication is preferred, since cell phone signals are often poor. Additionally, staff members are not reimbursed for use of their personal cell phones and may not have regular funds to pay for service.



- All project-supported hospitals had a facility-based phone or radio, but neither of the two non-project-supported hospitals had facility-based phones or radios. Five of 6 (83%) project-supported health centers<sup>3</sup> had a facility-based phone or radio, compared to 3 of 17 (18%) non-project-supported health centers (Figure 2).
- All hospitals, 5 of 6 (83%) project-supported health centers<sup>4</sup> and 15 of 17 (88%) non-project-supported health centers had working personal cell phones available for referral phone calls (Figure 2).

**Twenty-four-hour services:** An obstetric emergency can happen at any time of the day or night. Thus, obstetric services must be available at all hours.

- All hospitals and health centers reported that services were available 24 hours per day, seven days per week.
- All hospitals reported having an operating theater open at all times. Five of 6 (83%) project-supported health centers reported having an open operating theater at all times, compared to 1 of 2 (50%) non-project-supported health centers with operating theaters.

### **Human Resources**

In countries with severe medical staff shortages, such as Tanzania, mid-level cadres (e.g., assistant medical officers, clinical officers, nurse-midwives, and advanced practice nurses) often provide critical EmONC services usually reserved for doctors. The Tanzania Ministry of Health and Social Welfare (MoHSW) has a policy specifying the number of doctors and other staff, by cadre, recommended for employment at each level of health facility (MoHSW, 1999). New guidelines were released in 2014, after data collection and analysis occurred for this report (MoHSW 2014). A comparison of the 1999 and 2014 guidelines is provided in Appendix A.

The evaluation team compared existing staffing resources at each facility providing delivery care with minimum expected staffing resources specified in the older guidelines (MoHSW, 1999).<sup>5,6</sup>

- With three designated positions at Maweni Regional Hospital unoccupied, Kigoma Region does not meet the minimum required number of obstetricians and surgeons (Table 2). The only obstetrician in the region provides care in Matyazo, a private, not-for-profit health center in Kigoma Rural District. Medical doctor positions were also severely understaffed throughout hospitals and health centers, regardless of project affiliation. For other cadre categories, project-supported facilities reported a much smaller staffing gap than non-project-supported facilities (Table 2).

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<sup>3</sup> Buhingu Health Center lacked a facility based phone or radio.

<sup>4</sup> Nyenge Health Center lacked reimbursements for personal cell phones and thus did not use them.

<sup>5</sup> Per the United Republic of Tanzania Ministry of Health Guidelines, regional hospitals should have a minimum of one surgeon, two obstetrician/gynecologists, 26 medical officers, 20 AMOs, 84 nurses, 30 nursing officers, 71 assistant nursing officers (ANOs), and one anesthesiologist. District hospitals should have a minimum of six medical officers, 11 AMOs, 10 nursing officers, 19 ANOs, 49 nurses, and two AMO-anesthesiologists. Health centers should have a minimum of one AMO, two clinical officers (COs), one ANO, and nine nurses. Dispensaries should have a minimum of one clinical officer or assistant and one nurse.

<sup>6</sup> Private hospitals (i.e., non-BP-supported hospitals), do not subscribe to the MoHSW's requirements and were thus not evaluated on minimum staffing requirements.

- Excluding requirements for surgeons and medical doctors, all project-supported hospitals met the minimum staffing requirements for the number of delivery attendants—assistant medical officers (AMOs)<sup>7</sup>, clinical officers<sup>8</sup>, midwives, and nurses<sup>9</sup>—as recommended by the Tanzania MoHSW. Of particular note, project-supported hospitals and health centers have twice as many nurse assistant/attendant positions occupied than positions designated.
- Furthermore, all six project-supported health centers met the minimum requirement of AMOs, compared to 6 of 17 (35%) non-project-supported health centers. Only 33% of project-supported health centers had the recommended number of nurses, compared to none of the non-project-supported health centers.
- All project-supported hospitals met the minimum staffing requirement for anesthesia. According to self-designated staffing requirements for anesthesia, 79% of anesthetist positions were unoccupied in non-project-supported hospitals. Not all health centers have operating theaters, so they have no minimum staffing requirements for anesthesia.
- Only 19% of dispensaries met minimum staffing requirements for the number of delivery attendants, comprised mainly of nurses and midwives.

**Table 2.** Current Gap in Human Resources by Cadre Type, Kigoma Region, Health Facility Assessment, September 2013

Cadre	Project-Supported Hospitals and Health Centers			Non-Project-Supported Hospitals and Health Centers		
	Designated <sup>1</sup>	Occupied	Staffing Gap	Designated <sup>1</sup>	Occupied	Staffing Gap
Obstetrician/gynecologist/surgeon	3	0	100%	7	1	86%
Medical doctor/officer	38	5	87%	7	1	86%
Assistant medical officer	48	41	15%	28	13	54%
Clinical officer/assistant	12	35	0%	46	30	35%
Midwife/nurse officer	286	237	17%	318	89	72%
Nurse assistant/attendant	115	239	0%	99	106	0%
Anesthetist/nurse anesthetist <sup>2</sup>	5	10	0%	24	5	79%

<sup>1</sup>Designation based on Ministry of Health and Social Welfare's minimum recommended number of staff, by cadre and facility. For private facilities (i.e., two nongovernmental and non-project-supported hospitals), the number of designated cadre were self-reported by the facility human resources office.

<sup>2</sup>Designated and occupied positions refer *only* to hospitals, as there is no minimum staffing requirement for anesthetists/nurse anesthetists in health centers.

<sup>7</sup> AMOs receive an Advanced Diploma in Clinical Medicine after completing a two-year course. This is in addition to their training and three years of experience practicing as clinical officers.

<sup>8</sup> Clinical officers receive a Diploma in Clinical Medicine after completing two to three years of training (the length of course depends on completion of either ordinary level or advanced level secondary education).

<sup>9</sup> Registered nurses, midwives, nursing officers, and assistant nursing officers are expected to perform all BEmONC signal functions, except for AVD. Associate nurses and midwives (3–4 years of training) are expected to perform all BEmONC signal functions, except for AVD and manual removal of the placenta. Nursing assistants are not expected to perform any signal functions. (AMDD 2011)

### Availability of Drugs and Equipment

Injection of **oxytocin** decreases postpartum hemorrhage, which is the leading cause of maternal mortality. Administering oxytocin is also the essential component of active management of the third stage of labor (AMTSL), the most effective preventive intervention for postpartum hemorrhage.

- All facilities had oxytocin in stock at the time of data collection (Figure 3).

**Misoprostol** is used to induce or augment labor and stop postpartum hemorrhage.

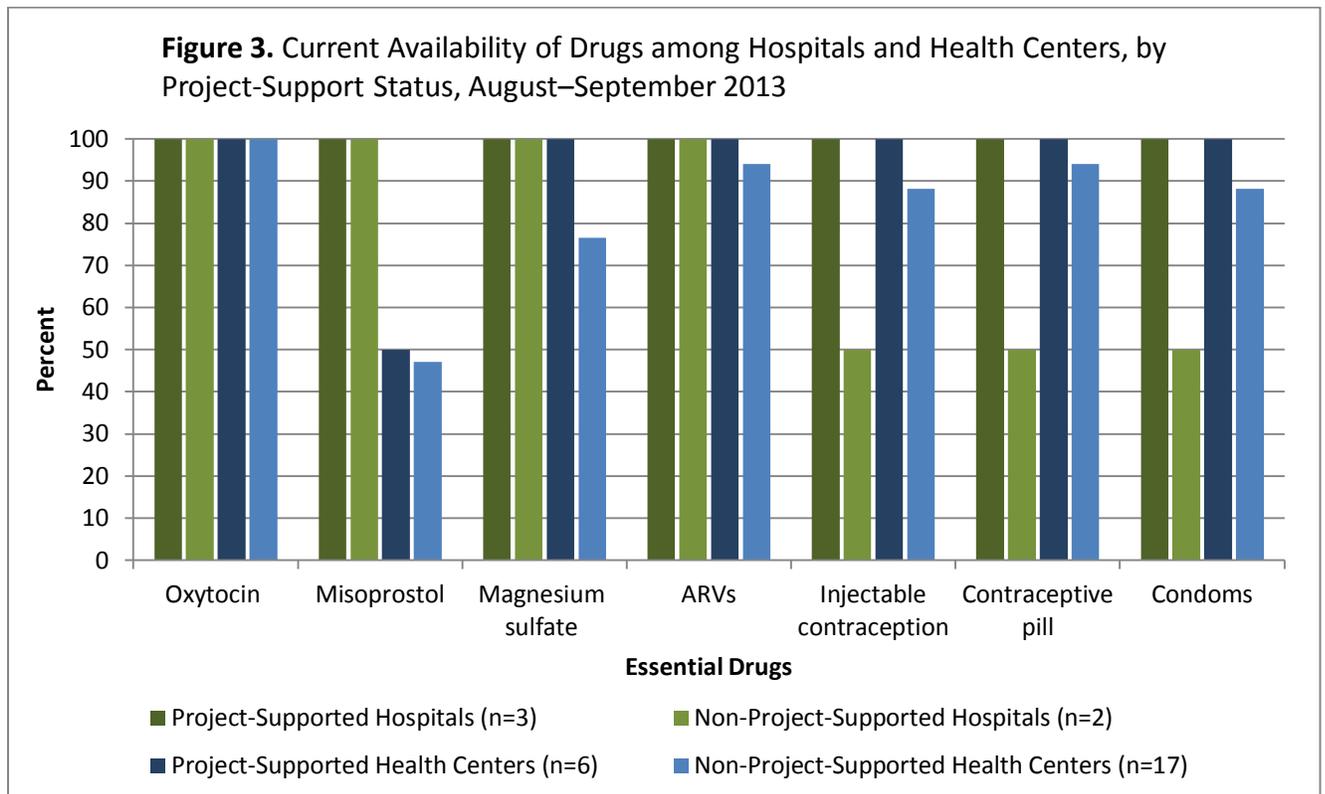
- All hospitals had current supplies of misoprostol. Three of 6 (50%) project-supported health centers and 8 of 17 (47%) non-project-supported health centers reported having misoprostol in stock (Figure 3).

**Anticonvulsants** are used to treat women who are suffering from eclampsia and preeclampsia during pregnancy.

- All hospitals and project-supported health centers (100%), compared to 13 of 17 (76%) non-project-supported health centers, were currently stocked with magnesium sulfate (Figure 3).

**Antiretroviral drugs** (ARVs) are used to treat HIV infection.

- All hospitals and project-supported health centers (100%) had current supplies of ARVs, compared to 16 of 17 (94%) non-project-supported health centers (Figure 3).



**Family planning methods** can reduce maternal deaths by preventing unwanted or high risk pregnancies.

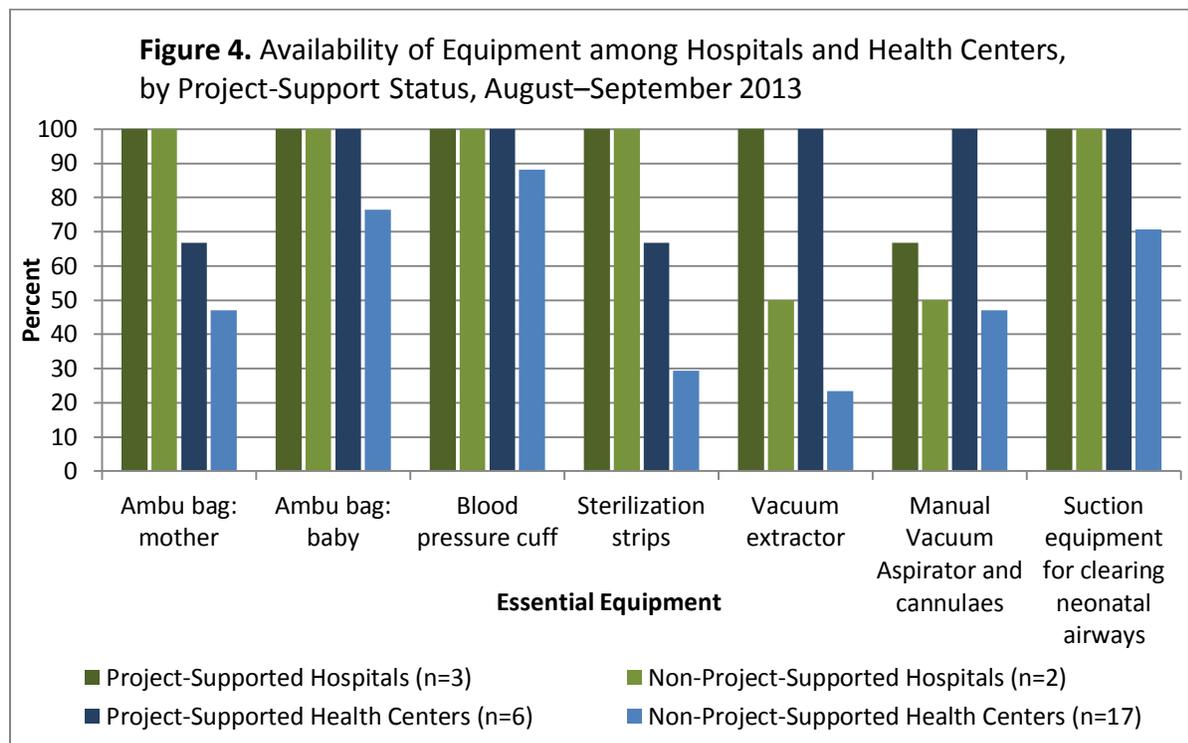
- All project-supported hospitals and health centers (100%) were stocked with injectable contraception, contraceptive pills, and condoms (Figure 3).
- One of 2 (50%) and 15 of 17 (88%) non-project-supported hospitals and health centers, respectively, had supplies of both injectable contraception and condoms. One of 2 (50%) non-project-supported hospitals and 16 of 17 (94%) non-project-supported health centers were currently stocked with contraceptive pills (Figure 3).

**Resuscitation:** As many as one of every 10 newborns do not breathe spontaneously immediately after birth. Such babies require simple assistance to initiate breathing, without which they would die. The mother may also require resuscitation.

- Newborns: All hospitals and project-supported health centers had ambu bags available for babies, compared to 13 of 17 (76%) non-project-supported health centers (Figure 4).
- Mothers: All hospitals had ambu bags available for use for mothers. Four of 6 (67%) project-supported health centers and 8 of 17 (47%) non-project-supported health centers had ambu bags available for mothers (Figure 4).

**Blood pressure cuffs** measure blood pressure and monitor mothers' risk for preeclampsia.

- All hospitals and project-supported health centers had functional blood pressure cuffs, compared to 15 of 17 (88%) non-project-supported health centers (Figure 4).



**Suction equipment** is used to clear neonatal airways, enabling the baby to breathe after birth.

- All hospitals and project-supported health centers reported availability of functional suction equipment for clearing neonatal airways, compared to 12 of 17 (71%) non-project-supported health centers (Figure 4).

**Assisted vaginal delivery:** When labor does not progress, clinicians may sometimes use forceps or vacuum extractors to assist with delivery.

- All project-supported hospitals and health centers had vacuum extractors available, compared to 1 of 2 (50%) non-project-supported hospitals and 4 of 17 (24%) non-project-supported health centers (Figure 4).

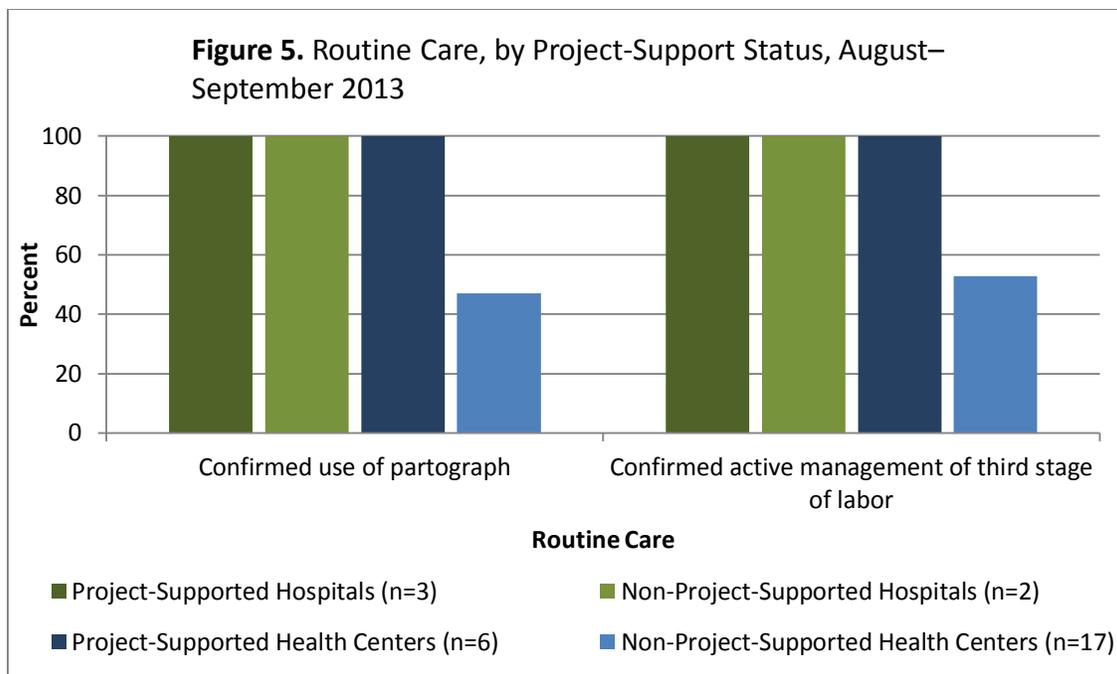
**Evacuation equipment:**

- Two of 3 (67%) project-supported hospitals and 1 of 2 (50%) non-project-supported hospitals had functional manual vacuum aspirators and cannulas available. All project-supported health centers had this equipment, compared to 8 of 17 (47%) non-project-supported health centers (Figure 4).

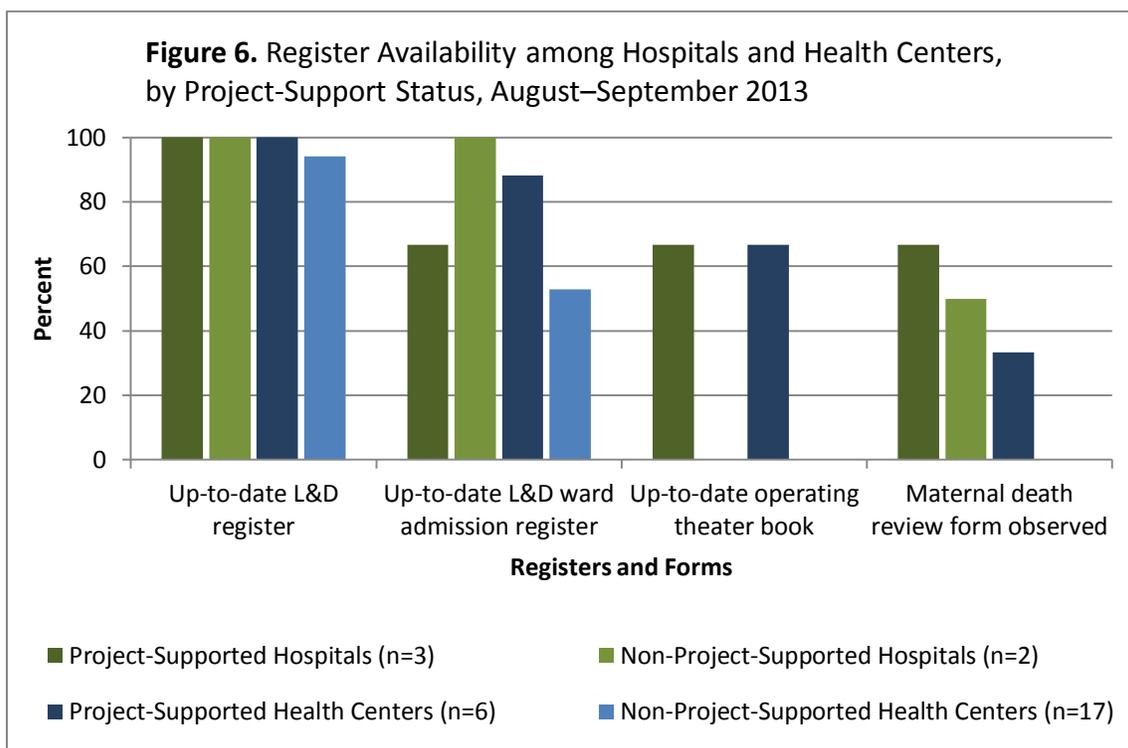
## ***Routine Care***

Using a partograph (a tool for monitoring the progress of labor) and providing active management of the third stage of labor (AMTSL) are elements of routine obstetric care that should be provided to all women to improve maternal and neonatal outcomes.

The World Health Organization recommends AMTSL as a critical intervention to prevent postpartum hemorrhage, establishing it as a routine standard in facilities providing delivery care. Unlike “expectant management” (i.e., waiting for the placenta to separate and deliver spontaneously), AMTSL involves giving the mother a prophylactic uterotonic drug after the baby is delivered. This can prevent placenta retention and postpartum hemorrhage by causing the uterus to contract after the placenta is delivered. Both conditions—retained placenta and postpartum hemorrhage—can lead to rapid maternal death.



- All hospitals and project-supported health centers demonstrated use of partographs during labor. Eight of 17 (47%) non-project-supported health centers had confirmed use of partographs (Figure 5).
- All hospitals and project-supported health centers reported practicing AMTSL, compared to 9 of 17 (53%) non-project-supported health centers (Figure 5).



Collecting routine data in obstetric wards and operating theaters enables facilities to monitor access to and quality, efficiency, and use of maternal and child health services.

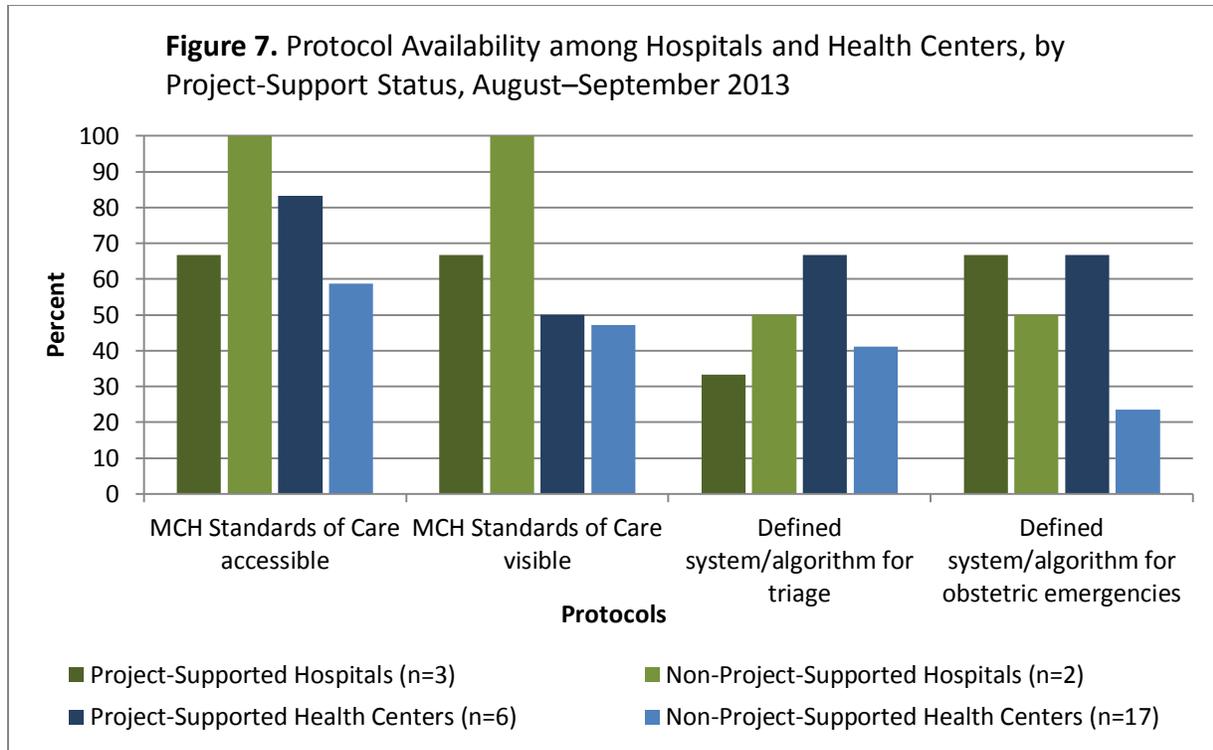
- All hospitals and project-supported health centers had an up-to-date labor and delivery (L&D) register, compared to 16 of 17 (94%) non-project-supported health centers (Figure 6).
- Both non-project-supported hospitals and 2 of 3 (67%) project-supported hospitals had an up-to-date obstetric ward admission and discharge register. A greater percentage of project-supported than non-project-supported health centers had an up-to-date admission and discharge register (5 of 6, 83%, and 9 of 17, 53%, respectively) (Figure 6).
- Although both non-project-supported hospitals and two non-project-supported health centers had operating theaters, only project-supported facilities had up-to-date operating theater logbooks (hospitals: 2 of 3, 67%; health centers: 4 of 6, 67%) (Figure 6).

A key part of monitoring clinical outcomes and services is conducting maternal death reviews, which can be used to help explain why women die. Maternal death review forms identify women's demographic details, perinatal health care history, location of death, cause of death, and other factors relevant to the maternal death. The findings are used to prevent future deaths by improving quality of care and other interventions.

- Two of 3 (67%) and 1 of 2 (50%) project- and non-project-supported hospitals, respectively, had maternal death review forms. Two of 6 (33%) project-supported health centers had this form, compared to none of the non-project-supported health centers (Figure 6).

In addition to the government maternal death review forms, the World Lung Foundation (WLF) requires that its sites complete monthly clinical audit forms for maternal deaths, fresh stillbirths, early neonatal deaths, C-sections, and vacuum extractions. The form also reviews serious complications (e.g., eclampsia, post-partum hemorrhage, uterine rupture) that do not end in maternal deaths (i.e., near-miss cases).

- Seven of the 9 (78%) project-supported facilities had complete or partially complete (e.g., partographs only) clinical audit forms (data not shown).



The initiative sought to ensure that health facilities had and displayed protocols and guidelines on various aspects of maternal and newborn care as references for staff.

- Two of 3 (67%) project-supported hospitals and both non-project-supported hospitals had written maternal and child health standards of care accessible and visible to staff. A greater percentage of project-supported than non-project-supported health centers had these standards accessible (5 of 6, 83%, and 10 of 17, 59%, respectively) and visible (3 of 6, 50%, and 8 of 17, 47%, respectively) (Figure 7).
- One of 3 (33%) project-supported hospitals and 1 of 2 (50%) non-project-supported hospitals had a defined algorithm for triage, compared to 4 of 6 (67%) project-supported health centers and 7 of 17 (41%) non-project-supported health centers (Figure 7).
- Two of 3 (67%) project-supported hospitals and 1 of 2 (50%) non-project-supported hospitals had a defined algorithm for obstetric emergencies. A greater percentage of project-supported health centers (4 of 6, 67%) than non-project-supported health centers (4 of 17, 24%) had such an algorithm (Figure 7).

## **EmONC Services**

EmONC comprises a set of life-saving clinical interventions (i.e., signal functions) that health professionals provide in health centers and hospitals, assuming they have the requisite training, equipment, supplies, and drugs. EmONC facilities include those with ‘basic’ and ‘comprehensive’ levels of care. Basic care interventions include administering parenteral antibiotics, anticonvulsants, and uterotonics; manual removal of placenta; removal of retained products of conception; assisted vaginal delivery (vacuum extractor or forceps); and neonatal resuscitation. Comprehensive care includes all the basic functions, plus obstetric surgery and blood transfusions.

In 2008, the Tanzania Maternal, Newborn, and Child Health Partnership launched a set of strategies for reducing mortality through the adoption of the “One Plan” and set key targets for improved maternal, newborn, and child health (Tanzania Ministry of Health and Social Welfare, 2008). Two operational targets stated in the plan and reinforced in the Sharpened Plan are to ensure that 100% of hospitals provide comprehensive EmONC and 70% of health centers and dispensaries provide basic EmONC by 2015 (Tanzania MoHSW, 2014). Currently, 73% of hospitals with delivery care provide CEmONC but only 39% of health centers and dispensaries provide BEmONC services.

### *EmONC Training of Health Personnel*

EmONC training is critical in reducing obstetric morbidity and mortality in facilities that provide emergency obstetric care. Since 2010, the project has trained non-physician clinicians, nurses, and anesthetists in emergency obstetric care in targeted facilities. EmONC training included the World Lung Foundation EmONC curriculum (including BEmONC and CEmONC training and supportive supervision) or the Life-Saving Skills curriculum for basic EmONC developed by the Tanzanian Ministry of Health and Social Welfare (Buffington et al., 2008).

- Overall, most facilities in Kigoma Region reported low levels of EmONC training within the last four years.
- All hospitals reported less than 10% of staff trained in EmONC (Kasulu Hospital: 8%; Kibondo Hospital: 2%; Maweni Hospital: 0%). Two of 3 project-supported hospitals had at least 3 staff members trained in EmONC. Only one nurse had reportedly received EmONC training in non-project-supported hospitals. As it is assumed that hospital staff are already trained in EmONC, most hospitals did not receive special or additional training.
- All (100%) project-supported health centers reportedly had EmONC-trained delivery staff (ranging from 2–6 trained delivery attendants per facility), compared to 71% of non-project-supported health centers (average of 1–2 trained delivery attendants per facility). The only exception was Gungu Health Center, with 8 delivery attendants trained in EmONC.
- Only 23% of dispensaries reported having a staff member trained in basic EmONC.

*Performance of EmONC Signal Functions*

The HFA questionnaire collected direct and indirect data about the EmONC signal functions currently performed (i.e., within three months) in all health facilities. CDC developed the following proxy indicators to assess BEmONC and CEmONC functionality (Table 3).

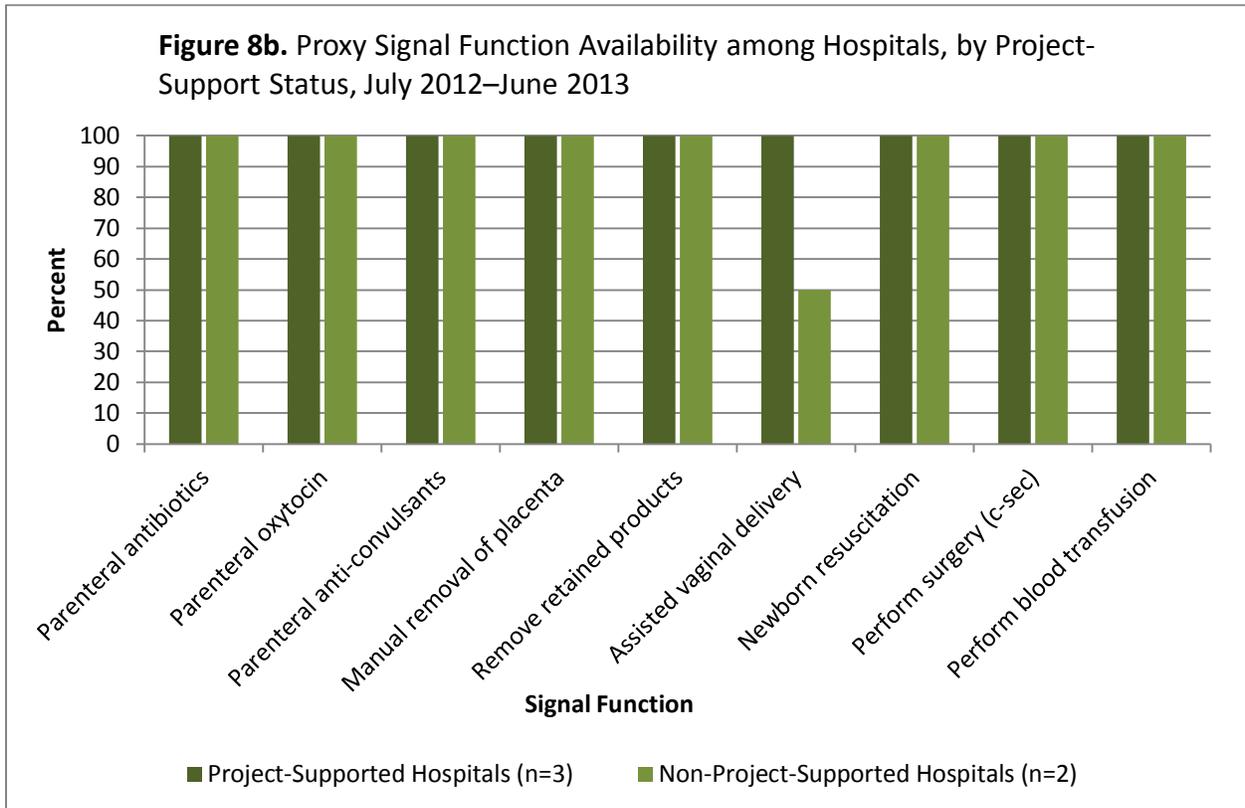
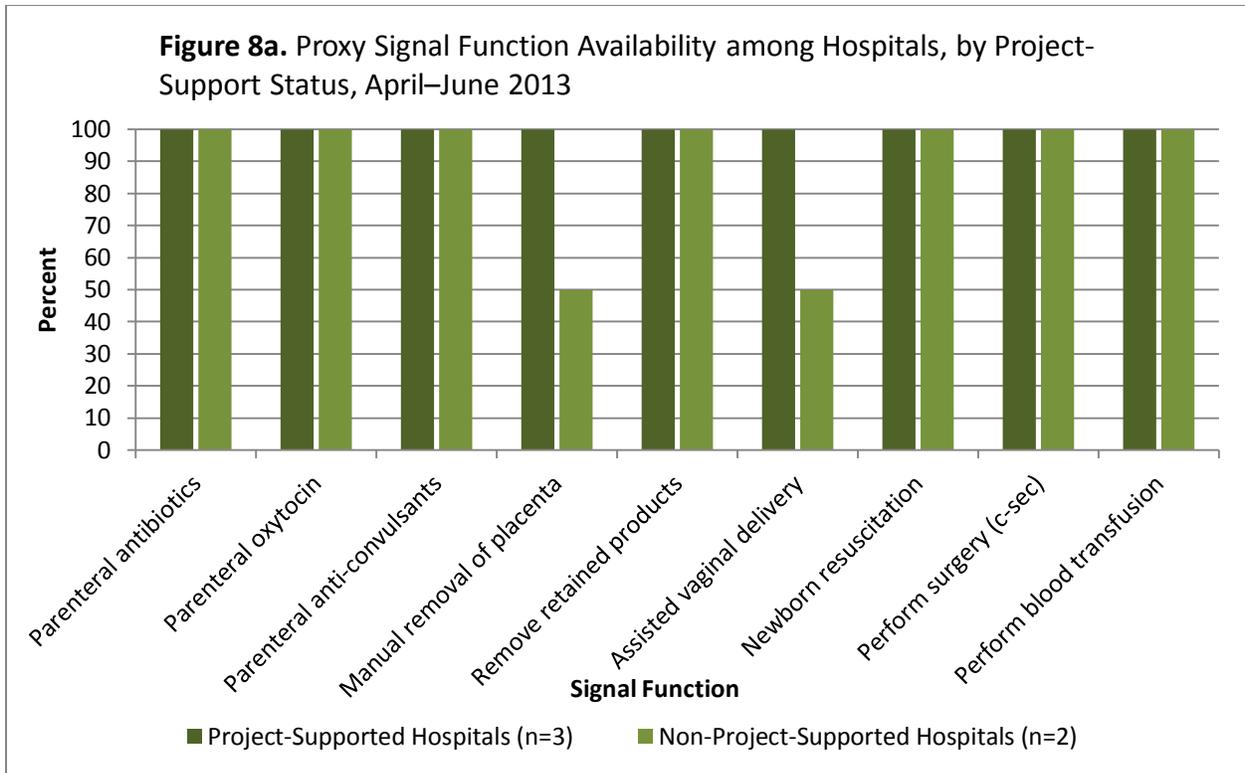
<b>WHO-Recommended Signal Function</b>	<b>Proxy Indicator</b>
1. Administer parenteral (via injection) antibiotics	Facility has ampicillin, gentamicin, or equivalent drugs in stock at time of data collection
2. Administer uterotonic drugs	Facility has syntocinon (oxytocin) or ergometrin in stock at time of data collection
3. Administer anticonvulsants	Facility has magnesium sulfate in stock at time of data collection
4. Manually remove the placenta	Facility performed manual removal of placenta at least once in past three months, as indicated in labor & delivery (L&D) and/or operating theater (OT) logs
5. Remove the retained products of conception	Facility performed removal of retained products at least once in past three months, as indicated in L&D, OT, and/or abortion logs
6. Perform assisted vaginal delivery (AVD) <sup>3</sup>	Facility has performed assisted vaginal delivery at least once in the past three months (April–June 2013), as indicated in L&D, OT and/or abortion logs
7. Perform newborn resuscitation	Facility has functional ambu bag for newborn
8. Perform C-section (i.e., cesarean section)	Facility performed C-section at least once in past three months, as indicated in L&D and/or OT logs
9. Perform blood transfusion	Facility reported ability to perform blood transfusion
<sup>1</sup> BEmONC services include signal functions 1-7. <sup>2</sup> CEmONC services include all signal functions, 1-9. <sup>3</sup> AVD is an uncommon intervention in Tanzania. We classify facilities performing all BEmONC or CEmONC signal functions except AVD as BEmONC-1 or CEmONC-1, respectively.	

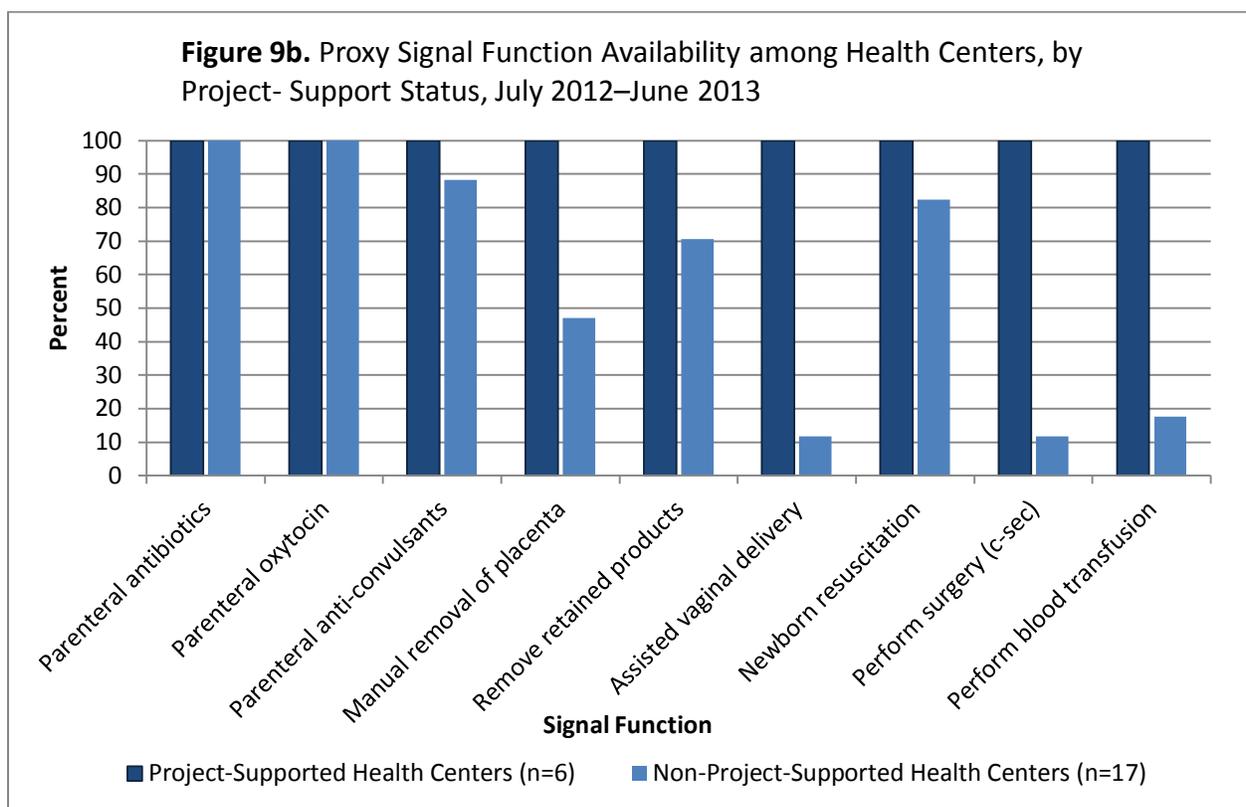
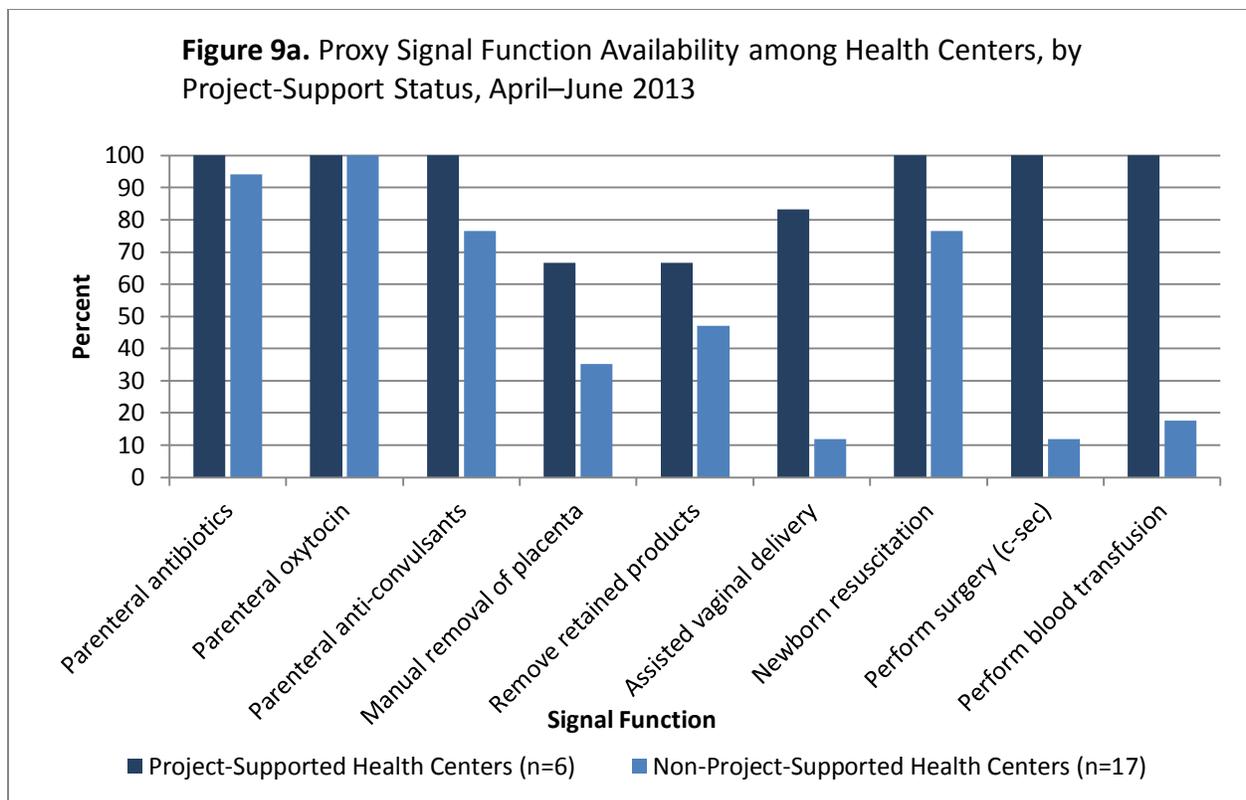
Using proxy indicators for EmONC signal functions, the evaluation team assessed health facilities' EmONC functionality in the three months prior to data collection (April–June 2013), per WHO's recommended guidelines (Figures 8a & 9a; Tables 5-7).

EmONC signal function performance relies on the case load and number of complicated deliveries that are attended. Low-level facilities (i.e., dispensaries and some health centers) are less likely to attend complicated pregnancies than hospitals and upgraded health centers due to infrastructure capacity, staffing, and/or referral systems. Thus, the EmONC classification system may not adequately and accurately capture all facilities' capacity to handle emergency obstetric cases.

Given this, as well as facilities' inconsistent documentation of signal function performance, the evaluation also assessed EmONC functionality based on signal function performance in the 12 months prior to the evaluation (July 2012–June 2013) (Figures 8b & 9b; Tables 8-10). The following results pertain to EmONC functionality based on proxy signal functions for the 12 months prior to the evaluation:

- All hospitals and health centers reported availability of ampicillin, gentamicin, or equivalent drugs at the time of evaluation (Figures 8b & 9b).
- All hospitals and health centers had oxytocin in stock (Figures 8b & 9b).
- All hospitals and project-supported health centers had magnesium sulfate in stock (Figures 8b & 9b), compared to 15 of 17 (88%) of non-project-supported health centers (Figure 9b).
- All hospitals and project-supported health centers performed manual removal of the placenta (Figures 8b & 9b), compared to 8 of 17 (47%) non-project-supported health centers (Figure 9b).
- All hospitals and project-supported health centers performed removal of retained products (Figures 8b & 9b), compared to 12 of 17 (71%) non-project-supported health centers (Figure 9b).
- All project-supported hospitals performed assisted vaginal deliveries (AVDs) or had a functional vacuum extractor, compared to 1 of 2 (50%) non-project-supported hospitals (Figure 8b). All project-supported health centers met this signal function, compared to 2 of 17 (12%) non-project-supported health centers (Figure 9b).
- All hospitals and project-supported health centers had functional ambu bags for babies, whereas 14 of 17 (82%) non-project-supported health centers had functional ambu bags (Figures 8b & 9b).
- All hospitals and project-supported health centers performed cesarean sections, compared to 2 of 17 (12%) non-project-supported health centers (Figures 8b & 9b).
- All hospitals and project-supported health centers had blood transfusion capability, whereas 3 of 17 (18%) non-project-supported health centers reported this capability (Figures 8b & 9b).





**Table 4.** Signal Functions in Health Centers, by Project-Support Status, April–June 2013

EmONC Function	Project-Supported N=6 (%)	Non-Project-Supported N=17 (%)
Parenteral antibiotic administration	6 (100)	16 (94.1)
Oxytocin administration	6 (100)	17 (100)
Anticonvulsant administration	6 (100)	13 (76.5)
Manual removal of placenta	4 (66.7)	6 (35.2)
Removal of retained products	4 (66.7)	8 (47.1)
Assisted vaginal delivery	5 (83.3)	2 (11.8)
Newborn resuscitation	6 (100)	13 (76.5)
Cesarean section	6 (100)	2 (11.8)
Blood transfusion	6 (100)	3 (17.6)

The evaluation team also assessed proxy indicators for EmONC signal functions performed at each facility. Tables 5–7 reflect EmONC functionality in the three months prior to data collection (April–June 2013).

**Table 5.** Signal Functions Performed in Project-Supported Hospitals and Health Centers, Three Months Prior to Assessment, April–June 2013

Facility	Average facility deliveries *	Anti-biotics	Oxy-tocin	Mag-nesium Sulfate	Manual removal of placenta	Removal of retained products	AVD	Newborn resusci-tation	C-section	Blood trans-fusion
<b>Hospitals</b>										
Kasulu	403	X	X	X	X	X	X	X	X	X
Kibondo	288	X	X	X	X	X	X	X	X	X
Maweni	236	X	X	X	X	X	X	X	X	X
<b>Health Centers</b>										
Buhingu	26	X	X	X	X	X	X	X	X	X
Kakonko	128	X	X	X	X		X	X	X	X
Mabamba	83	X	X	X		X	X	X	X	X
Nguruka	79	X	X	X	X	X	X	X	X	X
Nyenge	36	X	X	X	X	X		X	X	X
Ujiji	177	X	X	X			X	X	X	X

\* Average monthly facility-based deliveries reported during April–June 2013.

**Table 6.** Signal Functions Performed in Health Centers Planned<sup>1</sup> for Scale-Up of CEmONC Capacity, Three Months Prior to Assessment, April–June 2013

Facility	Average facility deliveries <sup>2</sup>	Anti-biotics	Oxy-tocin	Mag-nesium Sulfate	Manual removal of placenta	Removal of retained products	AVD	Newborn resusci-tation	C-section	Blood trans-fusion
Gungu	167	X	X	X				X		
Gwanumpu	9	X	X					X		
Ilagala	17	X	X	X						
Janda	13		X	X	X	X		X		
Kifura	14	X	X	X				X		
Kiganamo	11	X	X					X		
Muyama	12	X	X	X				X		
Mwamgongo	7	X	X	X		X				
Nyakitonto	21	X	X	X	X			X		
Nyanzige	25	X	X					X		

<sup>1</sup>Regionally chosen as priority for CEmONC scale-up as part of government's "One Plan"

<sup>2</sup>Average monthly facility-based deliveries reported during April–June 2013

**Table 7.** Signal Functions Performed in Other Hospitals and Health Centers, Three Months Prior to Assessment, April–June 2013

Facility	Average facility deliveries*	Anti-biotics	Oxy-tocin	Mag-nesium Sulfate	Manual removal of placenta	Removal of retained products	AVD	Newborn resusci-tation	C-section	Blood trans-fusion
<b>Hospitals</b>										
Heri	38	X	X	X		X		X	X	X
Kabanga	68	X	X	X	X	X	X	X	X	X
<b>Health Centers</b>										
Biharu	58	X	X	X	X	X		X		
Bitale	22	X	X	X	X	X		X		
Matyazo	81	X	X	X	X	X	X	X	X	X
Mulera	6	X	X			X		X		X
Rusesa	34	X	X	X		X		X		
Shunga	54	X	X	X	X	X	X	X	X	X
Uvinza	15	X	X	X						

\*Average monthly facility-based deliveries reported during April–June 2013.

As previously mentioned, facilities' EmONC classification based on signal function performance in the past three months may not adequately capture facilities' capacity to provide EmONC services to women. This is due to the fact that EmONC signal function performance relies on the case load and number of complicated deliveries that are attended. Thus, high-level facilities (i.e., hospitals and upgraded health centers) are more likely to attend complicated pregnancies than low-level facilities (i.e., dispensaries and some health centers). Therefore, the evaluation also assessed EmONC functionality based on signal function performance in the 12 months prior to the evaluation (July 2012–June 2013) (Tables 8-10).

Facilities were classified as CEmONC or BEmONC. They were also classified as CEmONC-1 or BEmONC-1, based on their signal functions in the past 12 months, excluding AVD as a required signal function. AVD is a low-cost life-saving intervention for delivery of the fetus during prolonged second stage labor. It is also a safe alternative to some caesarean sections in settings with limited access to surgical care and human resource constraints. Although all project-supported facilities performed AVDs in the past 12 months, this procedure is relatively uncommon in other delivering facilities. Despite provision of other signal functions, these facilities may not qualify as providing EmONC given that AVD is rarely performed. For the current analysis, EmONC facilities are classified as those routinely performing all other life-saving interventions, regardless of AVD performance.

- Overall, Kigoma Region has 12 EmONC and 6 EmONC-1 facilities, based on signal performance in the past 12 months.
- In the past 12 months, 5 of 17 (29%) non-project-supported health centers performed all BEmONC-1 signal functions only.
- In the past 12 months, all project-supported hospitals and 1 non-project-supported hospital performed all CEmONC signal functions; 1 non-project-supported hospital (Heri Hospital) performed all CEmONC-1 signal functions. All project-supported health centers and 2 of 17 (12%) non-project-supported health centers performed all CEmONC signal functions.

**Table 8.** Signal Functions Performed in Project-Supported Hospitals and Health Centers, 12 Months Prior to Assessment, July 2012–June 2013

Facility	Average facility deliveries <sup>*</sup>	Anti-biotics	Oxy-tocin	Mag-nesium Sulfate	Manual removal of placenta	Removal of retained products	AVD	Newborn resusci-tation	C-section	Blood trans-fusion
<b>Hospitals</b>										
Kasulu	387	X	X	X	X	X	X	X	X	X
Kibondo	261	X	X	X	X	X	X	X	X	X
Maweni	203	X	X	X	X	X	X	X	X	X
<b>Health Centers</b>										
Buhingu	24	X	X	X	X	X	X	X	X	X
Kakonko	132	X	X	X	X	X	X	X	X	X
Mabamba	81	X	X	X	X	X	X	X	X	X
Nguruka	78	X	X	X	X	X	X	X	X	X
Nyenge	34	X	X	X	X	X	X	X	X	X
Ujiji	197	X	X	X	X	X	X	X	X	X

<sup>\*</sup> Average monthly facility-based deliveries reported July 2012–June 2013.

**Table 9.** Signal Functions Performed in Health Centers Planned<sup>1</sup> for Scale-Up of CEmONC Capacity, 12 Months Prior to Assessment, July 2012–June 2013

Facility	Average facility deliveries <sup>2</sup>	Anti-biotics	Oxy-tocin	Mag-nesium Sulfate	Manual removal of placenta	Removal of retained products	AVD	Newborn resusci-tation	C-section	Blood trans-fusion
Gungu	172	X	X	X		X		X		
Gwanumpu	6	X	X					X		
Ilagala	16	X	X	X						
Janda	17	X	X	X	X	X		X		
Kifura	17	X	X	X	X			X		
Kiganamo	10	X	X					X		
Muyama	12	X	X	X	X	X		X		
Mwamgongo	8	X	X	X		X				
Nyakitonto	21	X	X	X	X	X		X		
Nyanzige	23	X	X	X		X		X		

<sup>1</sup> Regionally chosen as priority for CEmONC scale-up as part of government’s “One Plan”

<sup>2</sup> Average monthly facility-based deliveries reported July 2012–June 2013.

**Table 10.** Signal Functions Performed in Other Hospitals and Health Centers, 12 Months Prior to Assessment, July 2012–June 2013

Facility	Average facility deliveries*	Anti-biotics	Oxy-tocin	Mag-nesium Sulfate	Manual removal of placenta	Removal of retained products	AVD	Newborn resusci-tation	C-section	Blood trans-fusion
<b>Hospitals</b>										
Heri	37	X	X	X	X	X		X	X	X
Kabanga	67	X	X	X	X	X	X	X	X	X
<b>Health Centers</b>										
Biharu	63	X	X	X	X	X		X		
Bitale	23	X	X	X	X	X		X		
Matyazo	83	X	X	X	X	X	X	X	X	X
Mulera	7	X	X	X		X		X		X
Rusesa	29	X	X	X		X		X		
Shunga	54	X	X	X	X	X	X	X	X	X
Uvinza	11	X	X	X						
* Average monthly facility-based deliveries reported July 2012–June 2013.										

### **Availability of BEmONC and CEmONC per 500,000 Population**

About 15% of women develop complications in childbirth that are potentially life-threatening and require immediate access to emergency obstetric care. A central pillar of the safe motherhood strategy is to ensure adequate coverage of EmONC. The World Health Organization (WHO) recommends that, at a minimum, 5 EmONC facilities—including at least one CEmONC—are available per 500,000 population. The Tanzania “Sharpened One Plan” policy document aims to increase provision of CEmONC in all hospitals. The same document recommends that basic EmONC life-saving interventions are available in 70% of health centers and dispensaries (MoHSW, 2014).

Table 7 shows the WHO’s minimum recommended number of EmONC facilities in each district in Kigoma, according to population size. It also shows the actual availability of EmONC facilities (including both EmONC and EmONC-1), based on signal functions performed during the past 12 months.

Although the availability of basic and comprehensive EmONC facilities improved substantially because of the project’s efforts, Kigoma is still lacking adequate EmONC coverage.

- According to WHO, a minimum of 21 EmONC facilities, including 5 CEmONC facilities, need to be fully functioning in Kigoma to meet the emergency obstetric needs of the region’s population. The actual number of 18 EmONC facilities (or 4.2 per 500,000 population) in Kigoma Region falls slightly short of WHO-recommended minimum, and it is substantially lower than the MoHSW’s recommended number.
- With 13 existing CEmONC facilities (3.1 per 500,000 population), Kigoma Region meets the WHO-recommended minimum of 1 CEmONC facility per 500,000 population.
- There is some variability in EmONC coverage among the districts. Only one district (Kasulu) in the region meets the minimum recommended number of EmONC facilities per 500,000 population. All districts meet the minimum recommendation of CEmONC facilities, having 2 or more CEmONC functioning facilities. The largest gap is in Kibondo, where only 3 facilities provide EmONC care (all facilities being CEmONC). It is worth noting, however, that the established refugee camp population (approx. 69,000 population) benefits from an additional CEmONC facility within the camp, which is under UNHCR management and not included in our evaluation or the region’s health planning.
- Many BEmONC facilities are located within the geographic catchment areas of CEmONC facilities (see next section). To meet the WHO-recommended minimum number EmONC facilities, Kigoma Region requires additional BEmONC facilities.

**Table 11.** Availability of EmONC<sup>1</sup> Facilities per 500,000 Population in 12 Months Prior to Assessment, by District, July 2012–June 2013

District	Population, 2012 Census	Recommended minimum number of EmONC <sup>2</sup> facilities		Number of Existing EmONC facilities <sup>3</sup>		
		All EmONC	CEmONC	BEmONC only	CEmONC	EmONC
Kigoma Urban	215,458	2	1	0	2	2
Kigoma Rural	595,206	6	1	1	3	4
Kasulu	888,380	9	2	4	5	9
Kibondo	428,886	4	1	0	3	3
<b>TOTAL</b>	<b>2,127,930</b>	<b>21</b>	<b>5</b>	<b>5</b>	<b>13</b>	<b>18</b>

<sup>1</sup> Includes BEmONC and CEmONC facilities that may not have performed AVD in past 12 months (i.e., BEmONC-1 and CEmONC-1).

<sup>2</sup> WHO recommends minimum level of five EmONC facilities per 500,000 population, including at least one CEmONC facility.

<sup>3</sup> EmONC functionality is classified using signal functions over the past 12 months. Includes CEmONC and BEmONC facilities that may have not provided assisted vaginal delivery within the past 12 months.

The same analysis was performed for provision of EmONC signal functions over a 3-month period (Table 12). Predictably, fewer facilities qualified as full basic or comprehensive EmONC facilities, when performance of EmONC interventions was narrowed to a 3 month period.

- Based on a 3-month EmONC performance, only 11 facilities provided full EmONC care, lowering the number of EmONC facilities to 2.6 per 500,000 population.
- Most of these facilities (9 out of 11) provided CEmONC care, which proves to be well within the minimum recommended number of CEmONC facilities (2 per 500,000 population).
- All districts have a minimum number of CEmONC facilities, but only Kasulu district meets the minimum required number of basic and comprehensive EmONC facilities. Particularly notable is the Kibondo district, where there is only one EmONC facility currently providing care (apart from the refugee clinic), instead of a minimum of 4 recommended.

**Table 12.** Availability of EmONC<sup>1</sup> Facilities per 500,000 Population in Three Months Prior to Assessment, by District, April–June 2013

District	Population, 2012 Census	Recommended minimum number of EmONC <sup>2</sup> facilities		Number of Existing EmONC facilities <sup>3</sup>		
		All EmONC	CEmONC	BEmONC only	CEmONC	Total EmONC
Kigoma Urban	215,458	2	1	0	1	1
Kigoma Rural	595,206	6	1	1	3	4
Kasulu	888,380	9	2	1	4	5
Kibondo	428,886	4	1	0	1	1
<b>TOTAL</b>	<b>2,127,930</b>	<b>21</b>	<b>5</b>	<b>2</b>	<b>9</b>	<b>11</b>

<sup>1</sup> Includes BEmONC and CEmONC facilities that may not have performed AVD in past three months (i.e., BEmONC-1 and CEmONC-1).

<sup>2</sup> WHO recommends minimum level of five EmONC facilities per 500,000 population, including at least one CEmONC facility.

<sup>3</sup> EmONC functionality is classified using signal functions over the past three months. Includes CEmONC and BEmONC facilities that may have not provided assisted vaginal delivery within the past three months.

## Geographic Distribution of Facilities

The EmONC facility density per 500,000 population indicator does not yield complete information on the proportion of the population with good geographical accessibility to emergency services. In resource-poor settings, geographic issues may contribute to factors that prevent women from seeking care at all or in a timely manner. Such factors could lead to obstetric complications and even death.

Kigoma Region is predominantly rural, so geographic distance and terrain play a major role in determining the accessibility of EmONC services and the subsequent impact on health outcomes. In deciding future EmONC upgrades, geographic distribution analysis helps demonstrate how BEmONC and CEmONC coverage can optimally expand.

The evaluation team analyzed the population coverage of health facilities, going beyond a simple “Euclidean” approach that uses a straight-line distance (typically 10 or 15 km radius around each facility). Actual landscape was considered, as well as the availability of different means of transport for detailed measurement of geographical access to maternity care at birth. Time-cost surface modeling was employed using Geographic Information Systems (GIS) based on terrain (slope and land cover), physical barriers (e.g., lakes, rivers), and transportation networks. Modeling of travel time involved a two-fold calculation: 1) walking time to the nearest road across different terrain, and 2) traveling by motorized vehicle along the nearest roads to a health facility.

This allowed for more realistic estimates of travel time to health facilities, as well as population coverage and accessibility. Travel time was overlaid as contour-like boundaries on population density maps, derived from population estimates and satellite imagery (AfriPop Project). This enabled an assessment of women’s travel-time accessibility to health services.<sup>10</sup>

Figure 10 demonstrates improvements in geographic accessibility to CEmONC services as a result of project-supported conversion of six health centers. Before the project-supported upgrades and interventions, 39% of the population lived within one hour (dark green) and 68% within two-hour travel time of existing CEmONC facilities (light green). This proportion increased to 44% and 72%, respectively, after six health centers were upgraded to provide CEmONC services.

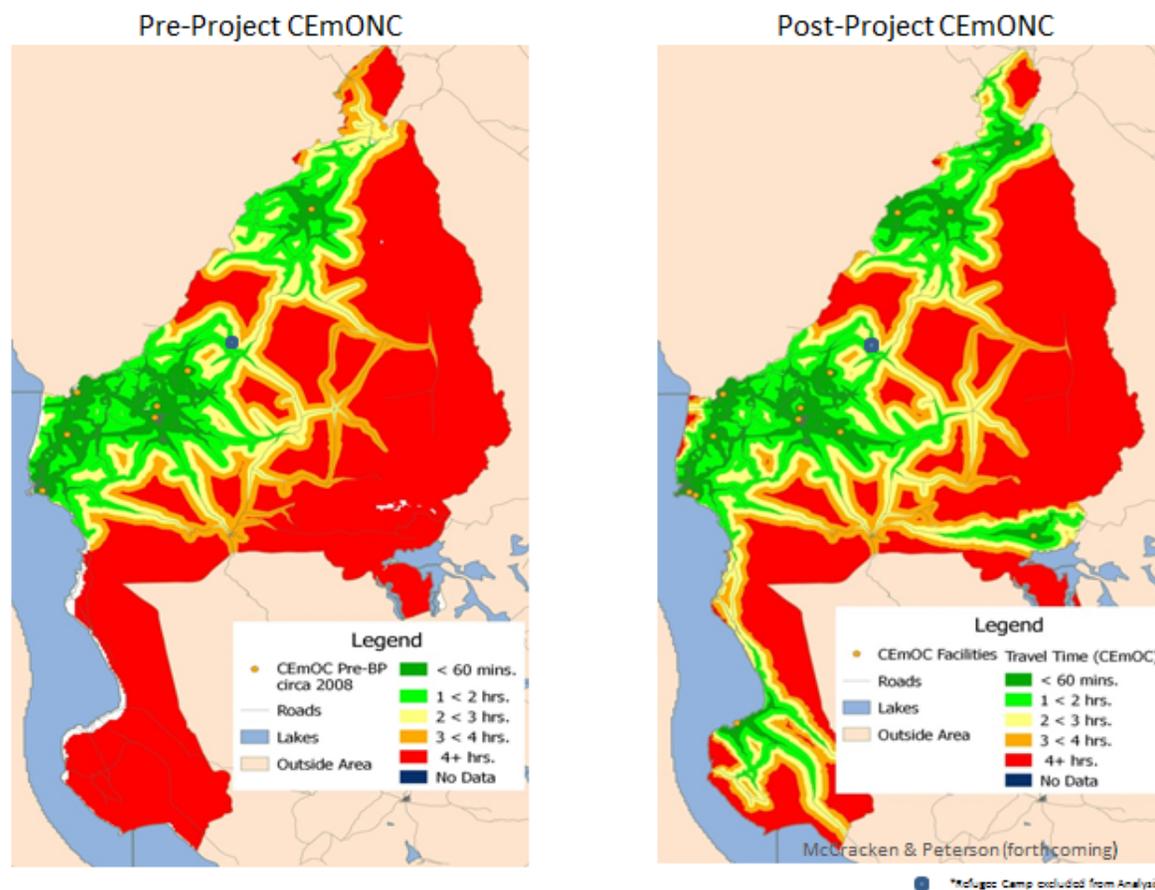
Figure 11 shows the current geographical distances to CEmONC only (panel 1), all CEmONC and BEmOC facilities (panel 2), and all facilities that provide EmONC and routine delivery care (panel 3). Overall, 52% of the population lived within one hour of basic and comprehensive EmONC, only eight percentage points higher than within one hour of travel time to CEmONC alone. This is partly due to the insufficient number of basic EmONC facilities per 500,000 population (as shown in Tables 11 & 12) and partly to the geographical position of the BEmONC facilities, which often are located in the catchment areas of larger CEmONC facilities.

Almost three in four people live within one hour distance to any delivery care facilities, suggesting that if women decide to seek care at nearby lower-level facilities (i.e., dispensaries), their access to EmONC could also be improved through referral agreements and protocols between facilities. The most notable absence of basic and comprehensive EmONC services is along the shore of Lake Tanganyika, in Kibondo District and the eastern part of Kasulu District.

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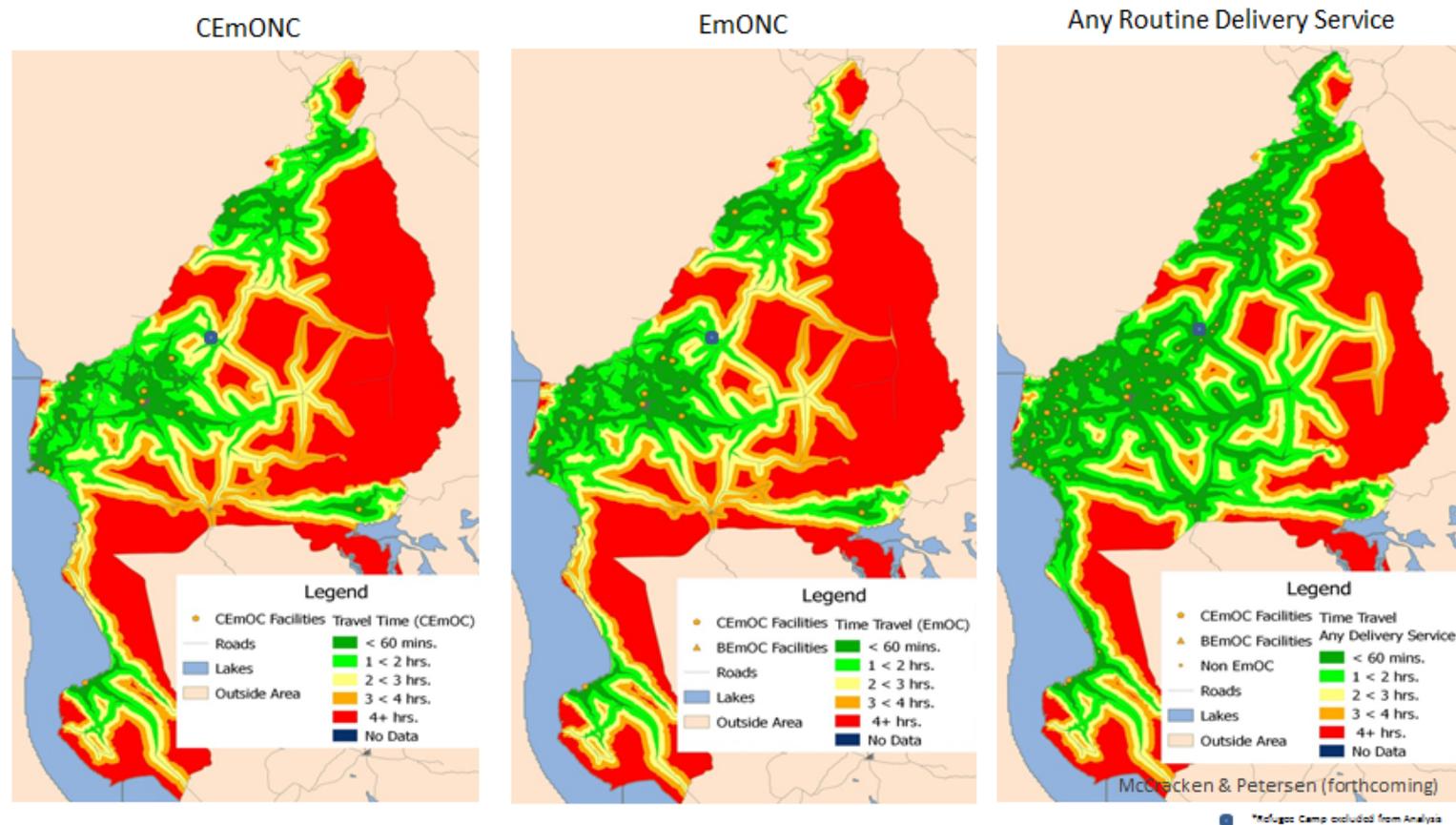
<sup>10</sup> The population of the refugee camp in northwestern Kigoma Region were subset and estimated to determine how many people fall into each travel-time group. They were then subtracted from the overall estimate in the region.

**Figure 10.** Travel Time to CEmONC Facilities Before and After Project Assistance, Six Health Centers Upgraded to CEmONC Status



Percent Population Coverage to CEmONC Facilities Before and After Project Assistance		
	Pre-Project CEmONC	Post-Project CEmONC
< 60 min.	38.8	44.1
< 2 hrs.	67.5	72.4
< 3 hrs.	76.4	82.6
< 4 hrs.	84.2	90.2
4+ hrs.	15.8	9.4

**Figure 11.** Current Modeled Travel Time to Maternal Health Services



	<u>CEmONC</u>	<u>EmONC (BEmONC or Higher)</u>	<u>Facilities with Any Routine Delivery Service</u>
< 60 min.	44.1	51.9	71.7
< 2 hrs.	72.4	72.7	84.9
< 3 hrs.	82.6	83.0	90.5
< 4 hrs.	90.2	90.6	95.1
4+ hrs.	9.8	9.4	4.9

## Implications and Recommendations

- Most project-supported facilities have adequate infrastructure (e.g., electricity, water), allowing staff to provide safe obstetric procedures. In collaboration with the regional administration, partners should help address remaining infrastructural deficiencies in health centers by ensuring the 24/7 availability of electricity and backup generators.
- There is a shortage of functional motor vehicles and fuel in project-supported hospitals and all health centers. As availability of motorized transportation is critical in referring and transporting women with emergency obstetric needs to higher levels of care, future project components should center on ensuring that facilities are equipped with vehicles, fuel, and vehicle-maintenance capacity.
- All health centers and hospitals reported having a working phone or radio, although such facility-based communication was only available in project-supported facilities; non-project-supported facilities primarily used personal mobile phones. Qualitative assessments should explore the reliability of personal phones for emergency referrals, particularly regarding availability of phone credit and reimbursements.
- In order to ensure the availability and accessibility of obstetric and neonatal care, facilities should improve efforts to meet minimum staffing requirements for deliveries and anesthesia. Staffing investments in all facilities should center on the adequate training and availability of obstetricians/gynecologists and surgeons, as well as medical doctors and officers. Non-project-supported facilities would require additional support to improve human resources, as they also lack trained midwives and anesthetists.
- EmONC training of staff in all facilities remains low. All providers should maintain their basic EmONC certification. Routine refresher trainings should integrate physician and midwives so as to reinforce team care management approaches and maintain skill levels. Upon basic EmONC certification, all providers should be universally approved to perform functions independently, as described by MoHSW policy.
- To sustain the longevity of skills after training completion, supervisory and mentoring visits should integrate EmONC-supportive supervision. Such measures to preserve the quality of providers' skills include hands-on practice, team approaches, supported-supervision and follow-up on-the-job training, all of which WLF routinely provides in project-supported facilities.
- Supervisory and mentoring visits can also help sustain the skill levels of providers who work in remote places. Developing a rotation that allows remote healthcare providers hands-on practice of obstetric skills in facilities with a higher number of severe obstetric cases can also sustain providers' training. Alternatively, a trial of low technology simulation-based EmONC practice may be performed.
- All hospitals and project-supported facilities demonstrated widespread use of routine delivery care, such as partographs and active management of the third stage of labor. Project-supported facilities demonstrated ability to perform assisted vaginal deliveries (AVD), unlike many non-project-supported facilities, which could have otherwise achieved BEmONC or CEmONC status. Interventions in future project-supported facilities should encourage continued education and supervision of routine delivery care and scale up AVD

capacity. Increasing providers' training in AVDs would increase health facilities' EmONC capacity, according to WHO guidelines.

- Project-supported facilities showed moderate availability of some medication and equipment. Operations research should be conducted to determine where bottlenecks occur in the supply chain (i.e., facility vs. district vs. regional vs. medical supplies distributors levels). Future interventions should implement efficient equipment and supply-request processes to decrease waiting periods and avoid stock-outs.
- Project-supported interventions improved the availability of facilities providing BEmONC and CEmONC services. Continuing to increase existing health facilities' capacity should allow Kigoma Region to meet the WHO minimum criteria for EmONC per population size. Improvements should center on strengthening signal functions, especially AVD and immediate access to safe blood transfusions at all times.
- The selection of new health centers to scale up the project-supported interventions should take into account existing EmONC capabilities and needs, including travel time to BEmONC and CEmONC facilities to ensure equitable access and maximize impact on maternal mortality reduction.

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## Appendix A

### Government Guidelines for Facility Human Resources

**Table A1.** Ministry of Health and Social Welfare Staffing Guidelines for Health Facilities, 1999 and 2014

Cadre	Regional Hospital		District Hospital		Health Center		Dispensary	
	1999	2014	1999	2014	1999	2014	1999	2014
Surgeon	1	--	--	--	--	--	--	--
Obstetrician/ Gynecologist	2	3	--	--	--	--	--	--
Medical Officer	26	29	6	8	--	1	--	--
Assistant Medical Officer	20	22	11	16	1	1	--	--
Clinical Officer	--	--	--	--	2	2	1	1
Nurse	84	91	49	33	9	9	1	2
Nursing Officer	30	30	10	12	--	--	--	--
Assistant Nursing Officer	71	77	19	33	1	1	--	--
Anesthesiologist	1	1	--	--	--	--	--	--
AMO-Anesthesiologist	--	--	2	--	--	--	--	--