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Synergy Between Emergency Obstetric and Neonatal Care and Maternal Death Surveillance and Response in Haiti

Pre- and Post-Crisis Analysis Report

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
In partial fulfillment of the requirements for the degree of
Master of Public Health
in Hubert Department of Global Health
2016

Abstract

Synergy Between Emergency Obstetric and Neonatal Care and Maternal Death Surveillance and Response in Haiti
Pre- and Post-Crisis Analysis Report

By *Gihad Mahgoub*

In a poor and disaster-prone country like Haiti, maternal and child health (MCH) indicators are far below other Caribbean and Latin countries. Maternal mortality ratio (MMR) in Haiti is the highest in the Western Hemisphere reaching 359 deaths per 100,000 live births in 2015 according to the Maternal Mortality Estimation Interagency Group. Studying MMR and understanding the root causes before and after the devastating 2010 earthquake, identifies gaps that can inform recommendations, strategies, and interventions to decrease mortality while improving maternal and child health in Haiti for future.

This special studies project aims to provide an overview of the provision of emergency obstetric and neonatal care (EmONC) and examine how it could be linked with strengthening the maternal death surveillance and response (MDSR). It is assumed that strong linkages between these services and systems, working effectively together, will contribute towards the reduction of MMR in Haiti. In order to understand this, data from 2013 (three years of post earthquake) in 2 facilities; Hôpital Albert Schweitzer (HAS) Sacré Coeur De Milot (SCM) was reviewed, discussed, and recommendations provided in this report.

Results/Finding
Reliable surveillance system informs the national strategy and interventions as it is proven to achieve better health outcomes. MDSR specifically involves community participation and surveillance, which ensures promotion of the underutilized services in EmONC facilities and provides the most accurate data that informs upgrading and enhancing the quality of services.

Main Recommendation and Conclusion
Developing a joint strategy applying both MDSR and EmONC would increase the efficiency of surveillance and reporting improving the cycle of service provision. This joint program should be piloted in EmONC facilities, the surrounding communities, and provide trainings to health care providers on verbal autopsy, as well as other key best practices. A community-based surveillance system that engages with service providers and the wider surveillance system will ensure quality data collection and analysis.

Synergy Between Emergency Obstetric and Neonatal Care and Maternal Death Surveillance and Response in Haiti
Post-Crisis Analysis Report

By *Gihad Mahgoub*
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Acknowledgements

I would like to extend thanks to those who helped me throughout this whole year and during this project in particular. Special mention goes to my supportive supervisors, *Dabney Evans* and *Endang Handzel*. My MPH has been a distinct experience and I thank both of my supervisors wholeheartedly, not only for their academic support, but also for their continuous efforts to enrich my learning experience. Gratitude is extending to all my colleagues in Hubert Department for Global Health, Rollins School of Public health and Emergency Response and Recovery Branch-CDC.
Special thanks to my colleagues *Eve Brecker* and *Allison Schachter* for their work in the area of Maternal Death Surveillance and Response which was inspiring and of great help throughout my project.

Finally, I express my profound gratitude to my husband for his constant encouragement and unfailing support all the way through my career and academic pursuits and to our baby for allowing this project to be completed.

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Acronyms[1]

ANC	Antenatal Care
AIDS	Acquired Immune Deficiency Syndrome
AMDD	Averting Maternal Death and Disability
BEmOC	Basic Emergency Maternal Obstetric Care
CEmOC	Comprehensive Emergency Maternal Obstetric Care
CDC	Center of Disease Control and Prevention
CFR	Case Fatality Rate
CHW	Community Health Worker
EmOC	Emergency Maternal Obstetric Care
EmONC	Emergency Maternal Obstetric and Neonatal Care
GDP	Gross Domestic Product
HAS	Hôpital Albert Schweitzer
HDI	Human Development Index
HIV	Human Immunodeficiency Virus
HSRO	Health Systems Reconstruction Office
MCH	Maternal and Child Health
MDGs	Millennium Development Goals
MDSR	Maternal Death Surveillance and Response
MMR	Maternal Mortality Ratio
MSPP	Le Ministère de la Santé Publique et de la Population/Ministry of Health and Population
PAC	Post-Abortion Care
PEPFAR	President's Emergency Plan for AIDS Relief
PNC	Postnatal Care
PLWAH	People Living with AIDS/HIV
SBA	Skilled Birth Attendant
SCM	Hôpital Sacré Coeur De Milot
SES	Socio-Economic Status
UN	The United Nations
UNFPA	The United Nations Population Fund
UNICEF	The United Nations Children's Emergency Fund
USAID	The United States Agency for International Development
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WRA	Women of Reproductive Age

[1] See Glossary in Appendix I for definitions of terms commonly used throughout the thesis.

List of Figures

1. Introduction

This special studies project will provide an analytical overview of data available from the assessment done in 2013 focusing on one facility in rural setting which is Hôpital Albert Schweitzer and another hospital in urban area, Sacré Coeur De Milot, as an example to evaluate the progress and try to understand the impact of EmONC intervention along with strengthening of the MDSR in different settings and how they both contribute towards the reduction of MMR.

1.1. Background and Rationale

The World Health Organization (WHO) recommends that every pregnant woman should receive at least four antenatal care visits to identify high-risk pregnancies, plan for better management and prevent delivery complications. In Haiti only two (67%) of every three pregnant women access antenatal care (ANC) services.(Provision of effective antenatal care, 2006) . Prolonged political unrest and economic instability negatively affected the health system along with the preexisting shortage in services providers before 2010 that became much worse afterwards. In Haiti there is also some cultural, social and legal constraints facing delivery of maternal and child health care services. For example, family planning is only covering 6% of the population who need it leading to unplanned and unwanted pregnancies. Moreover, abortion is illegal in Haiti and care is not provided at public health care facilities. This leads to more unsafe abortions and feeding both morbidity and mortality. The most recent factsheet of the US-based Guttmacher Institute estimates that at least 10% of all maternal deaths in Latin America and the Caribbean annually are due to unsafe abortion.

Maternal mortality is one of the most significant indicators of maternal and child health care and health status (Georgia Maternal Mortality, 2012). The Millennium Development Goal (MDG) 5 targeted reducing the maternal mortality ratio by 75%, between 1990 and 2015. By that deadline, only 43% was achieved (Seraphin et al., 2015). Maternal mortality has decreased in most of the western countries while Haiti is still moving ahead to control the high level of MMR (WHO, 2012)

Neonatal mortality in Haiti represents one third (34%) of all the deaths of children under 5, with the majority (approximately 90%) occurring in the first week of life. In 2013, there were an estimated 6,800 neonatal deaths in Haiti as per the steady neonatal mortality rate of 25 per 1,000 live births since 2010[1].

Many causes of death discussed in the details of the report below are medically controllable and preventable. We can see by comparing Haiti with the Dominican Republic that through properly equipped facilities better health outcomes are achieved. For example, the Dominican Republic shares the Hispaniola Island with Haiti and has nearly the same population size. However, there are huge differences in terms of both socioeconomic and health indicators. It is clear that in Haiti different interlinked factors contribute to adverse health outcomes such as the high MMR. Hence only through understanding of the untwined root causes can the most relevant strategies and interventions, contextually relevant for Haiti, be developed.

One of the most important recent events impacting the health systems and outcomes of Haiti is the 2010 earthquake. The earthquake hit the capital city Port au Prince on January 12th 2010; with the epicenter was just 10 miles southwest of the city. More than 300,000 people died and more than a million people were made homeless. In total, three million people were affected and 1.6 million were in relief camps made of tents and tarps. A million remained displaced more than a year after the

earthquake.

In 2013, the Haitian Ministry of Public Health (MSPP) cooperated with the US Center of Disease Control and Prevention (CDC) to conduct an assessment of 19 institutions providing maternal health services to assess the functionality of the sites offering the EmONC aiming at Identifying the gaps and needs in terms of human and other resources evaluating the quality of care, determining the level of knowledge and competence of staff involved.

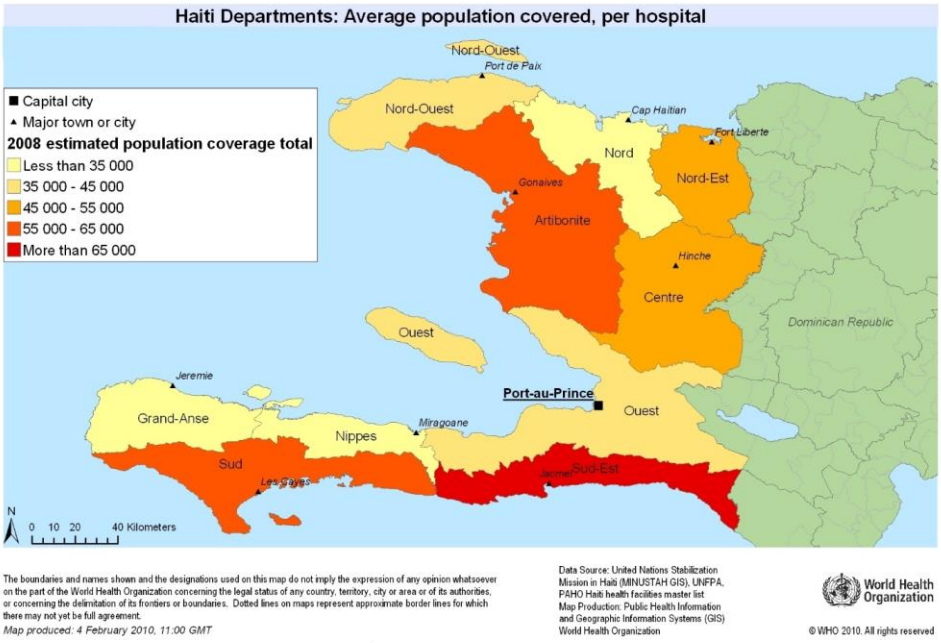


Fig.1 Haiti Departments Map Showing Average Population per Hospital – WHO 2010

1.2. Situation Analysis

Access to basic and comprehensive emergency care is key to reducing maternal mortality (WHO 2014; MSPP 2005; Wildman and Bouvier-Colle, 2004). One of the goals of the 2013-2016 Haiti Health Strategic Plan is to provide basic emergency obstetric care (BEmOC) in 108 facilities by 2015 (MSPP 2012). However, Wenjuan and her colleagues (2014) suggested little progress has been made in meeting this goal. When the 2013 assessment was implemented, only 70 facilities provided BEmOC and among hospitals where half of the births occur only 45 percent provide BEmOC. Availability of comprehensive emergency obstetric care (CEmOC) is even more limited offered at less than 10 percent of facilities nationwide. Given that BEmOC facilities (*i.e.*, hospitals and health centers) are located primarily in urban areas, most urban clusters are within almost three miles of a BEmOC facility. In rural areas, however, access to BEmOC facilities is more limited: only one in five rural areas are located within three miles of a BEmOC facility. It is clear that more effort is needed to expand BEmOC access in rural areas.

Haiti has a high infectious disease burden from human immunodeficiency virus (HIV) and malaria, affecting both maternal and child mortalities. Compared to the rest of the region, Haiti has much higher prevalence of HIV. According to UNICEF, 5.6% of population between the age of 15 and 49 live with HIV

or acquired immune deficiency syndrome (AIDS) including 19,000 children while the antiviral medications is short in supply. According to the CDC, 4,330 HIV-positive pregnant women were identified in Haiti in 2012, which put them at 10-fold higher risk of death (Moran and Moodley, 2012).

The United Nation Children's Emergency Fund (UNICEF) reports that almost half of births in developing countries take place without a skilled birth attendant. Research shows the single most important intervention for safe motherhood is to make sure that a trained provider with midwifery skills is present at every birth that transport is available to referral services, and that quality emergency obstetric care is available.

Delivery at a health facility reduces maternal mortality. In a health facility women are assisted by a skilled birth attendant (SBA) managing life-threatening obstetric complications and emergencies (Harvey et al. 2007). However, less than half of the facilities offering caesarean section services have staff trained in CEmOC in last two years. Guidelines for CEmOC were not commonly available in service areas. A study found that an increase in service provision measured by the availability of BEmOC and CEmOC functions was associated with 26 percent higher odds of facility delivery (Wenjuan et al, 2014)

1.3. CDC in Haiti 2013 to present

In a three components program <*See Fig. 2*>, CDC intended to assist the Ministry of Public Health and Population MSSP) in collaboration with other international actors and national stakeholders to improve the public health system capacities in achieving lower mortalities, better quality services and reliable reporting of pregnancy outcomes.

The program components are:

1). Improving access to institutional deliveries and quality emergency obstetric and neonatal care.
2). Increasing access to quality antenatal and postnatal care.
3). Establishing a scalable maternal death surveillance and response system.

The special studies project will focus on the CDC's efforts to reduce maternal mortality to 30 percent through improving emergency obstetrics care by achieving the following four objectives:

Objective 1: By 2015, 50% of pregnant women in catchment areas have institutional deliveries and access to quality emergency obstetric care.

Objective 2: By 2015, 75% of pregnant women in targeted areas receive the recommended frequency and quality of Antenatal (ANC)/ postnatal care (PNC).

Objective 3: By 2015, a scalable maternal death surveillance and response system is established in 100% of targeted facilities and selected communities.

Objective 4: By 2015, 100 % of EmOC facilities have improved their Data Management and Surveillance System for Maternal and Newborn Health.

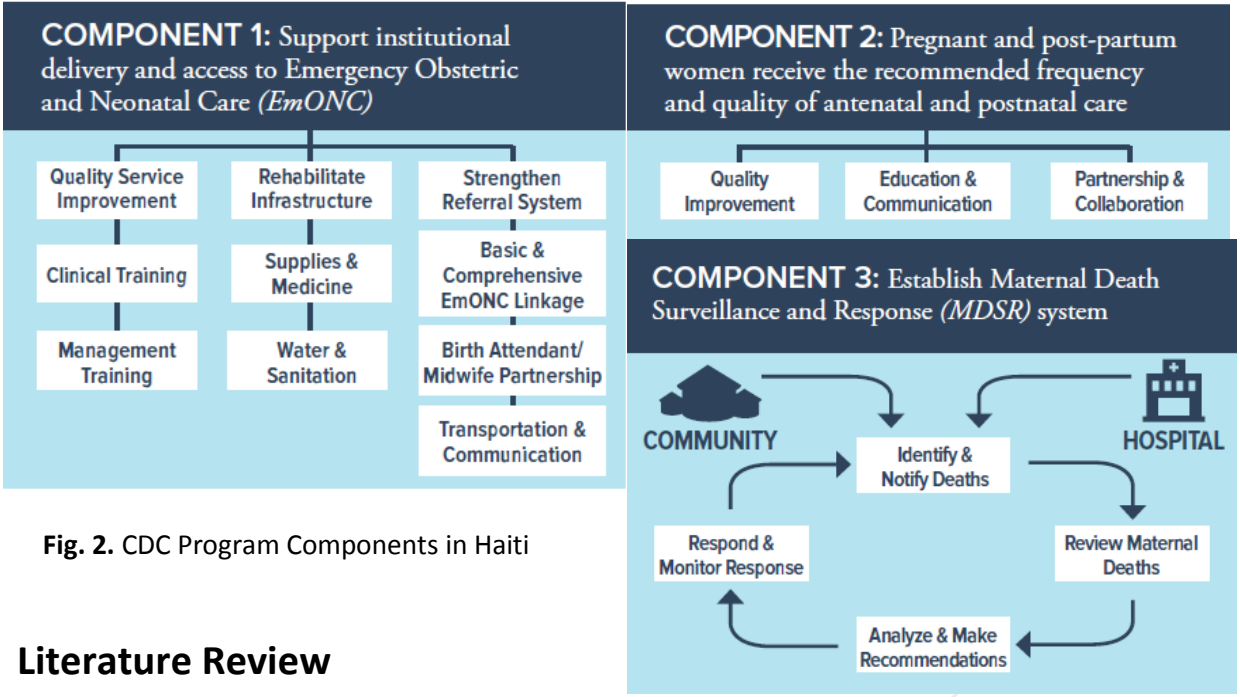


Fig. 2. CDC Program Components in Haiti

2. Literature Review

The Haitian government, in collaboration with the international community, prioritizes the reduction of maternal and neonatal mortality by adopting EmONC services provision in a number of facilities. However, when MDSR was piloted in 2013 in two facilities the results indicated there was a gap in the surveillance system. The verbal autopsies and applied community based surveillance, in addition to the facility based death reporting, showed discrepancy in mortality ratios between 2014 and 2015. In addition, a knowledge gap exists on the linkage between MDSR as a surveillance and response system that involves community participation and establishing, updating and promoting EmONC services. A literature review was conducted to identify what research was available in this area and the context of health outcomes in Haiti.

2.1. Neonatal and Maternal Deaths in Haiti

2.1.1. Major Causes of Neonatal and Maternal Death in Haiti

WHO reports that more than 80% of all global neonatal deaths are caused by preterm birth complications, newborn infections, and birth asphyxia. In Haiti, the average percentage of low-birth-weight infants in 2008 to 2012 was 23% putting those newborns and infant at 20-fold higher risk of death. While most of maternal deaths occur during labor and the first week post-partum, 80% of deaths could be related to unsafe abortions, eclampsia and pre-eclampsia, obstructed labor, post-partum hemorrhage and infections. In Haiti, eclampsia and pre-eclampsia account for almost 37% of total deaths while hemorrhage ranks the second causing 22%. Unsafe abortion is another crucial issue due to the unavailability of abortion care in health facility, which leads to serious complications increasing deaths (Causes of maternal and child deaths decade report, 2012)

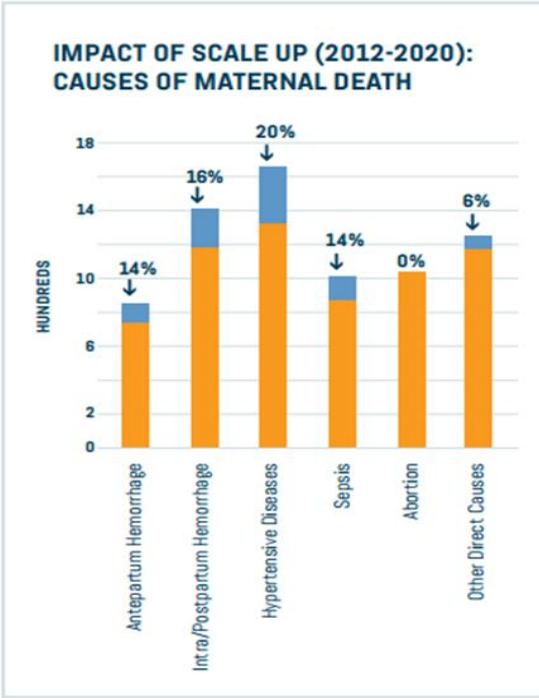


Fig.3. Major Causes of Maternal Death

2.1.2. Social Determinants of MMR in Haiti

Haiti is one of the poorest countries in the world, ranking 168 of 187 on the United Nations Human Development Index (HDI). GDP per capita 819.90 USD in 2013 (World Bank, 2013).

Key findings from the WHO's full health equity profile of Haiti based on data from the 2012 Demographic and Health Survey (DHS) demonstrate that:

- Coverage of maternal health services appears to be associated with wealth, education level of the mother, and rural versus urban place of residence. However, reproductive health and immunization coverage are less associated with those factors. (*See Fig. 4 a. and b.)*.
- Among women in urban areas, almost 62 percent of births are attended by skilled health personnel, compared with only 27 percent among women with rural areas.
- Contraceptive prevalence of modern and traditional method and satisfied family planning needs significantly vary across wealth quintiles.

Poverty is almost always entangled with challenged education, which is clearly affecting health care service provision in many ways such as the shortage in health care providers or the insufficient health awareness among the community (Poverty and Education by ETS, 2014). This knowledge gap led to patients not seeking necessary health care when like prenatal and postnatal visits for pregnant women. In Haiti, 40% do not have an antenatal care visit before their fourth month of pregnancy (Pan American Health Organization; 2011) and among all pregnant women only 67% receive at least four antenatal care visits. 61% of women didn't have postnatal assessment during the first forty days after delivery.

Total population estimate is 10,573,000 almost half of them (55%) are living in urban areas. Haiti's topography has a lot of mountains that served in many cases as a natural obstacle that make it very difficult for residents to access all services available to other population. More than half of the highways are unpaved.

2.1.3. Health Disparities in Coverage and Distribution of MCH and EmONC Services

Based on the socio-economic status (SES) and geographical distribution of services in Haiti, marked inequalities were reported for higher mortality ratios among the poorest 20% of the population in spite of the increased intervention coverage (Restrepo-Méndez MC). Along with this only 9.6% among the poorest 20% of pregnant women will have a skilled attendant at birth compared with 78% of the richest 20%[2]. One other side of disparity is clearly demonstrated in the geographical distribution of services where an obstetrics provider compared to 59.4% of urban deliveries attended by skilled providers does not attend 75% of deliveries in rural settings and 63% of deliveries in countryside.

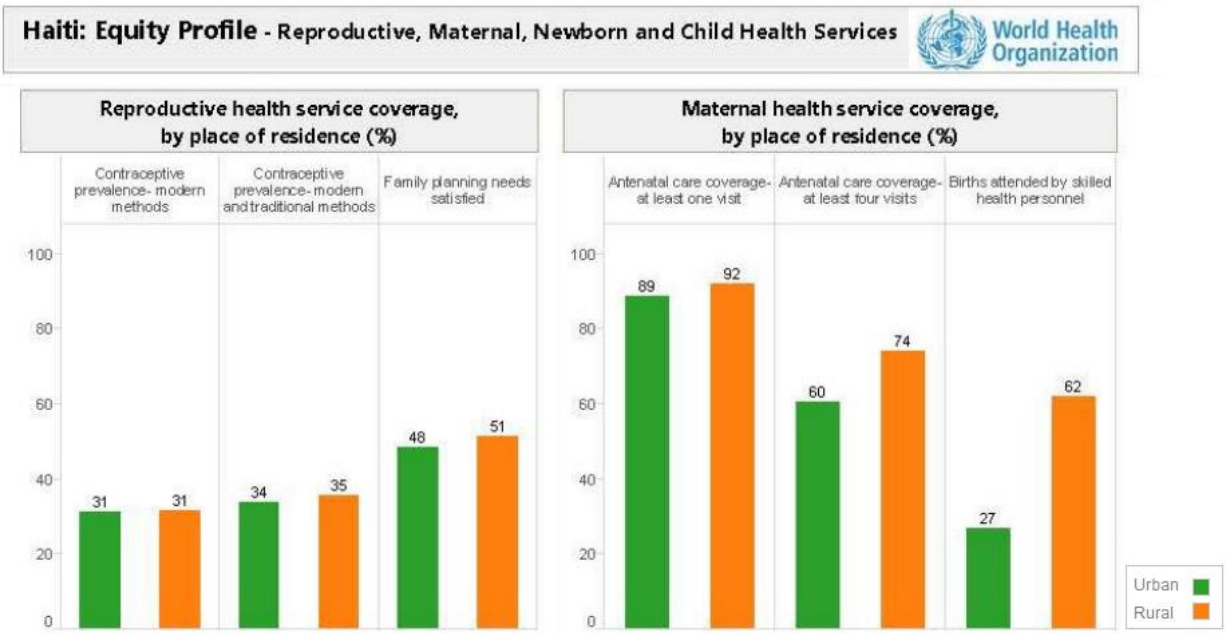


Fig. 4.a Haiti Equality Profile WHO

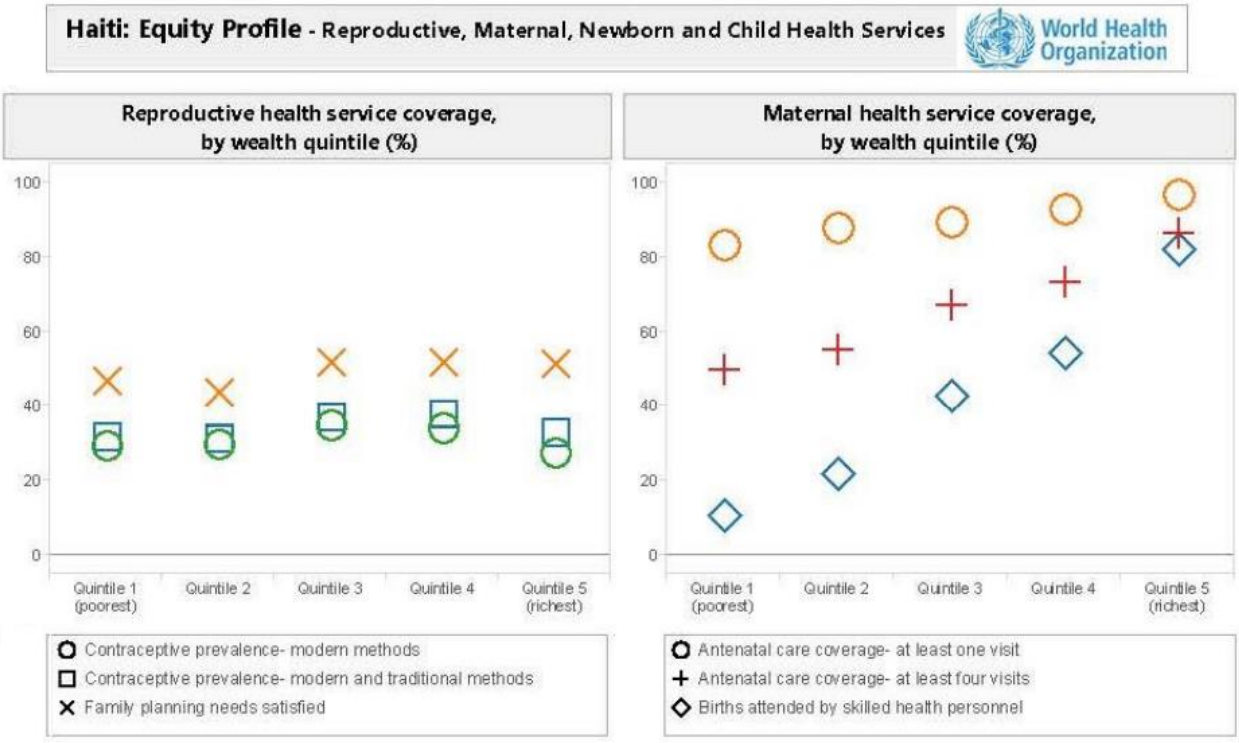


Fig. 4.b Haiti Equality Profile WHO

2.1.4. Health Care Service-related Factors Affecting MMR

Availability of quality services is the key element in service provision specially in obstetric care since women would only follow WHO's recommendation for at least four antenatal care only if a health facility, functional road and birth attendants are not hard to reach or afford.

2.1.4.1 Availability of Quality Services and the supporting infrastructure

This mainly includes the availability of conveniently located infrastructure that enables quality service provision in addition to skillful health care providers operating according to quality and patient safety measures. Almost one third (37%) of the health facilities in Haiti are public with the remaining either private (47%) or mixed (16%). Interestingly, less than 40% of total expenditure on health is either public expenditure or out-of-pocket with almost 60% left to "other" sources. This is typically bilateral donors and international aid organizations through direct provision or agreements with service providers for reimbursement after satisfactory delivery of service according to preset quality standards and inclusion criteria (WHO, Global Health Expenditure Database, 2014).

As a low income and disaster-prone country burdened by political instability, Haiti is short of an effectively operational infrastructure necessary to provide the health care services with shortage in facilities enabling community health education, technical capacity building for health care service providers among other services. The weak health system was further impacted when the earthquake destroyed 50 health centers in 2010. A few months later, the country's first cholera outbreak in a century further challenged the devastated system. Leaving only eight hospitals in Port Au Prince to serve millions of residents.

2.1.4.2. Access to services and health care human resources

WHO advised minimum threshold for providers are 23 doctors, nurses and midwives for every 10,000. Haiti's national and provincial average is far below that with only 4 doctors, nurses and midwives per 10,000 populations compared to 20.8/10,000 regionally. This undersupply of professional providers is aggravated by the migration of professionals to Canada and the USA, which augmented the burden on the already weakened health system. Before the earthquake, Haiti had a population of 2.7 million women at childbearing age served by 600 obstetricians and 350 midwives. The remaining MCH providers were left further burdened after the 200 healthcare professionals lost their lives with the midwifery and nursing schools destroyed by the 2010 earthquake.
In 2012 through 2016 only 37% of deliveries in Haiti had a skilled attendant present compared to 94% in other Caribbean countries (Jacobs, Judd and Bhutta, 2016).

The United States Agency for International Development (USAID) estimates around 40 % of the population lack access to essential health and nutrition services (USAID, 2016). In a country like Haiti, access to health facilities is jeopardized for many reasons; the geographical distribution of the population is more in the rural areas where the facilities are limited and not equipped to manage serious conditions.

2.1.5. Government Strategies and Interventions to Reduce MMR

The international community in different forms and capacities, as with many other developing countries affected by disasters and humanitarian emergencies, has heavily supported Haiti. The USAID, among other donors and international development agencies, have supported a range of different interventions in Haiti long time before the earthquake. It has been working to ensure that high impact interventions

are effectively implemented and that health systems are strengthened. USAID supports a continuum of care model to increase access to care by expanding the range of services, integrating community health workers with health facilities, and improving delivery of high quality primary care services.

As the country with the highest density of NGOs per capita even before the earthquake, Haiti has faced a chronic problem with appropriate aid distribution. Insufficient coordination and lack of communication and information sharing between different key actors on the ground. Due to these unclear directions, some organizations have been duplicating the same efforts being implemented or just done by other entities. Generally speaking, there has been difficult to know exactly how aid fund, that was estimated as more than a billion US dollar since the earthquake only, is distributed throughout the country. This results in surpluses of aid in certain geographic and thematic areas and wide gaps in other area

Fig. 5. Haiti Aid Map Showing Hundreds of NGOs

Haiti's MSPP, with support from different international partners and UN agencies, managed over the past decade to develop various important documents that should form together a clear and strong national framework for strengthening and rebuilding the health system in the country. Very-well written strategic documents like the Plan Directeur de Santé (Master Health Plan) 2012 – 2022. It is based on epidemiologic and demographic information and targeted to improve governance and the overall performance of the health system in terms of the care and services provided, mobilize financial resources for health, make available sufficient and quality human resources, restore a diverse network of community health workers. The Plan aims at gradually increasing the number and percentage of births attended by skilled personnel by 37 % (2012) 45% (2016) 60% (2019) 70% (in 2020).

Before the Master Plan, there was the National Strategic Plan for the Reform of the Health Sector in 2005 – 2010 with the purpose to sustainably improve the health status of the population through a comprehensive primary health care and quality. At that time, assisted delivery coverage was very low with over three quarters (76.3%) of births taking place at home (rural: 89%; urban: 56%). Accordingly, the MSPP recognized that quick referral of complicated cases to a structure delivering emergency obstetric care was a key to reducing maternal mortality.

In reality, addressing major challenges in service provision such as the shortage in health care facilities helped increase institutional deliveries by two folds between 2007 and 2010, when the government initiated *Soins Obstetricaux Gratuits* (Free Obstetric Care) - a maternal health program intended to increase free of charge obstetric care (WHO free obstetric care in Haiti, 2012) However, by 2010 only one in every four women gave birth at health facility(Seraphin et al, 2015. So the government started to adopt Emergency Obstetric and Neonatal Care (EmONC) to address this gap.

Maternal Death Surveillance and Response in Haiti

2.1.5. Evaluation of Surveillance Effectiveness

Inadequate surveillance and documentation:

With many inherited deep-rooted structural and operational challenges, accurate documentation and reliable reporting of deaths is very doubtful. This creates an urgent need for significant long-term investment in strengthening the existing surveillance system. This system must include continuous improvement and capacity building for all concerned parties and involved stakeholders. In order to support this effort, the CDC together with other international partners is investing in developing and establishing Maternal Deaths Surveillance and Response (MDSR) system along with Emergency Maternal Obstetric and Neonatal Care “EmONC”.

Without this financial and technical support, surveillance, reporting, and documentation could be negatively affected because of the shortage in trained personnel who have the skills to comprehensively report on pregnancy and delivery associated mortalities. Additionally, without a robust surveillance system the significant percentage of deliveries outside health facilities and lack of antenatal care could contribute to inaccurate estimates of mortalities especially, in the absence of nationally enforced program for data collection and reporting.

3. Methods

This section provides the framework designed to prepare this special studies project as a progress report of the status of EmONC and MDSR interventions in Haiti and how they can possibly add a synchronized action towards better monitoring and responding to the high level of MMR in the country. In this report, the researcher reviews available data about both programs from Sacré Coeur de Milot and Hôpital Albert Schweitzer hospitals before and after the earthquake in 2010. This includes reviewing the literature available on EmONC and MDSR mainly from the assessment conducted in collaboration with MSPP in 2013. Also most recent updates from the CDC's MDSR pilot project in 2015 in two hospitals and their communities. This have been reviewed in line with other available secondary data. Finally, the researcher analytically discusses the findings and recommendations in the next section.

3.1. Data Collection

The researcher obtained secondary data from different sources mainly assessments done to evaluate EmONC service availability and provision in 2009 by Haitian Ministry of Public Health and Population (MSPP) in collaboration with UNFPA in addition to assessment done in 2013 by MSPP in cooperation with CDC. Out of the 252 facilities assessed in 2009 and the 19 facilities assessed in 2013, the researcher decided to pick only two facilities selected in the CDC's pilot on MDSR in 2015. The facilities are Hôpital Sacré Coeur De Milot (SCM) and Hôpital Albert Schweitzer (HAS). However, as explained later in the limitations of this project, facilities rather administrative departments didn't segregate the accessible data for 2009 assessment.

Sources of Data

Published papers in beer-reviewed databases mainly PubMed between 2009 and 2016, EmONC and MDSR Guidelines by WHO 2010 and 2013 respectively, MSPP Assessment Report in 2013, operational reports and data shared by CDC Emergency Response and Recovery Branch (ERRB) - Public Health Systems Recovery Team.

3.2. Ethical Considerations

Ethical considerations were insured in all of the secondary data extracted from the assessments reviewed. No human subjects were included in this report. Therefore, it didn't require Emory Institutional Review Board approval. The primary objective of this project was to analyze the relation between MDSR and EmONC and how do both impacted MMR in Haiti.

Research Procedures

Literature review provided an understanding about maternal mortality significance and analysis of the root causes. It also outlined the challenges confronting the Haitian health system from shortage in health care providers to jeopardized infrastructure and lack of reliable surveillance system. Studying the available assessments, reports, and studies about EmONC- differentiated between basic and comprehensive EmONC in terms of capacity needed and services provided. Literature suggested that adopting EmONC is effective in reducing MMR by improving access to emergency lifesaving care and managing complicated conditions, in addition to proactively promoting preventative measures. As part of the CDC's work in Haiti in the recovery phase post 2010 earthquake, a pilot MDSR project was implemented in two facilities and their communities highlighted that adding community surveillance along with the existing facility based death surveillance improves the quality of reporting on maternal

deaths hence inform policies at the national level to reduce MMR and sustain an effective comprehensive services with reliable surveillance system.

Quality of Data and Limitations

Resources and reports shared by ERRB team were of great assistance in outlining the project and developing this report. However, many of the available official data from reports, national plans, and strategy documents published by the Government of Haiti as well as many of the relevant UN country offices were in French. The researcher had to rely on machine translation provided free online from Google Translate to conclude the summary of vital information when necessary. This required extra effort during literature review and analysis, as well as could lead to some translation errors as a non-French speaker.

4. Synthesis

This section explains the EmONC and will also present the assessment done in Haiti in 2013 in addition to the MDSR project piloted in two EmONC facilities and their communities in 2015 to evaluate the processes and explore the impact of having reliable MDSR system on improving, expanding and promoting EmONC services and how this feeds into reducing MMR.

4.1. Overview of EmONC

EmONC is the provision of emergency obstetric and neonatal care while this cover both maternal and neonatal health, EmOC only specifies the obstetric care services provided and this is further classified into basic and comprehensive EmOC and referred to as BEmOC and CEmOC.

Cavallaro and Merchant performed a literature review of 69 studies for the evidence on the duration, causes and effects of delays in providing emergency obstetric care to women attending health facilities in low- and middle-income countries. Most studies reported long delays in providing care, and the mean waiting time for women admitted with complications was as much as 24 hours before treatment. The three most cited barriers to providing timely care were shortage of treatment materials, surgery facilities and qualified staff. Existing evidence is insufficient to estimate the effect of delays on birth outcomes. Delays in providing emergency obstetric care seem common in resource-constrained settings and further research was necessary to determine the effect of the third delay on birth outcomes (Cavallaro and Merchant, 2013).

Types and Distribution of EmOC among Different Health Facilities

EmOC could be further differentiated into two subcategories: basic and comprehensive emergency obstetric care (BEmOC and CEmOC). According to the latest definition (WHO. 2009)[3], a BEmOC facility should be able to implement the following six signal functions: administration of antibiotics, administration of uterotonic drugs/oxytoxics, administration of anticonvulsants, manual removal of placenta, assisted vaginal delivery, and removal of retained products. A full package of CEmOC includes all six BEmOC functions plus caesarean section and blood transfusion.

Availability of BEmOC and CEmOC was limited at health facilities in Haiti (18 percent and 9 percent, respectively). Higher-level facilities—hospitals and health centers with beds—were more likely to

provide BEmOC and CEmOC than lower-level health facilities including health centers without beds and dispensaries. Very few health centers without beds and dispensaries provided BEmOC and none provided CEmOC. By managing authority, the percentage providing BEmOC and CEmOC was the highest among NGO/private not-for-profit facilities. Despite government facilities being the major providers of delivery care, only 20 percent were BEmOC facilities and 10 percent were CEmOC facilities. Less than half had staff trained in CEmOC in the last two years and less than one-fourth had available guidelines for CEmOC adapted in Haiti.

The Haitian government considers hospitals and health centers to be the major providers of delivery services; dispensaries and health centers without beds are not mandated to provide delivery services (MSPP 2000). Nevertheless, our results show that half of the facilities offering delivery services are dispensaries and health centers without beds. These lower-level facilities are poorly prepared to provide delivery services. Not only is there almost no capacity to provide emergency obstetric care these lower-level facilities also lack essential equipment and supplies for normal delivery care. Only 9 percent of health centers without beds and none of the dispensaries have functional emergency transportation. As a result, there is high risk of death for mother and newborn when an obstetrical emergency occurs.[4]

Urban Vs. Rural

Urban areas are likely to be located near a BEmOC facility, with 86 percent linked to a BEmOC facility within 5 km. Rural areas, on the other hand, are much less likely to be located near a BEmOC facility, with only 55 percent within 10 km of a BEmOC facility. In other words, 45 percent of rural areas do not have access to a BEmOC facility within 10 km. Overall, the percentage of areas near a CEmOC facility is lower than the percentage near a BEmOC facility, with only 38 percent having access to a CEmOC facility within 5 km (71 percent urban and 14 percent rural). (Wang et al, 2014)

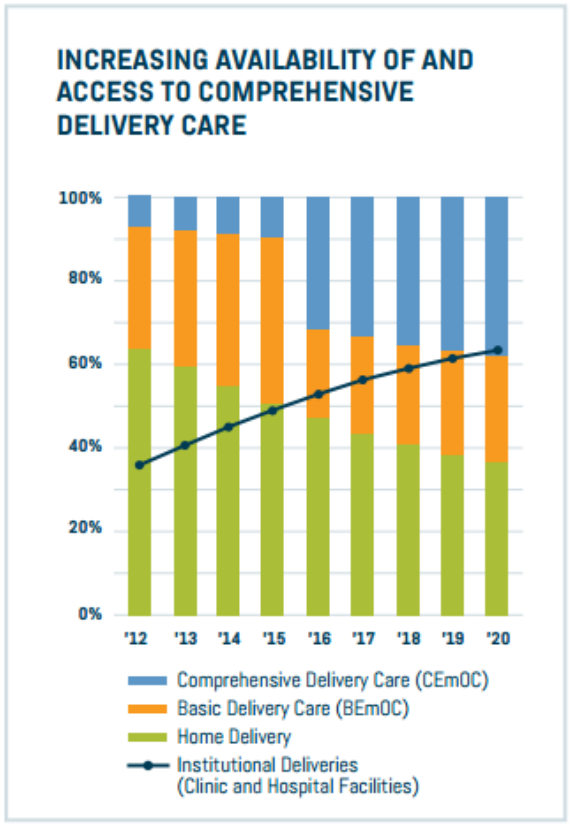


Fig. 6 Comprehensive Delivery Care Haiti 2012 - 2020

4.3. MSPP Assessment in 2013

MSPP in collaboration with Johns Hopkins conducted a situational analysis of the operation of EmONC services from a sample of sites (19 in total). The necessary data was collected during the month of December 2013.

The analysis of data on maternal health services showed that nineteen (19) institutions provide maternal health services but not all were able to provide the full package recommended by the MSPP. Sixteen (16) of them were involved in the services delivery at the time of the survey. The eight (8) UN indicators were used to assess the functioning of sites offering EmONC.

1. Nine (9) of the sixteen (16) sites met the criteria of operating a EmONC.
2. These sites were unevenly distributed. They served a population of 1,237,771 inhabitants contrary to international standards that recommend the allocation of four (4) BEmONC and a CEmONC for a population of 500 000 inhabitants. Nine (9) EmONC identified four (4) were BEmONC and five (5) CEmONC.
3. Seventy-five percent 75% of expected births occurred in a health facility which does not reach 100% of recommended institutional deliveries.
4. In the majority of cases, the sites were not able to meet their customer service needs of the fact that 57% of women with direct obstetric complications were treated in a health facility while the minimum is 100%.
5. The percentage of cesarean births was estimated at 9%, being found in the range of 5% to 15% required.
6. The case of direct obstetric case fatality rate (TCLOD) of 0.40% was below the 1% recommended.
7. The proportion of maternal deaths due to indirect obstetric complications (42%) seems high.
8. The rate of intrapartum and early neonatal death, analytical indicator of stillbirth was 3.96%.

The evaluation objectives were to:

- Have a clear idea of the situation of services
- Determine the level of knowledge and competence of staff affected
- Identify needs in terms of human and material resources
- Evaluate the quality of care

Methodology

A total of nineteen (19) site was selected for evaluation. selection was carried out according to their localization in priority corridors USAID (North/Northeast and Matheux axis with extension to the Lower Artibonite), supply services Maternal Health including PMTCT. The evaluation was conducted at the following sites:

Corridor Artibonite / West, eleven (11) Sites: CS Rousseau, CS Cabaret, CS Cazale, SADA Matheux, Pierre Payen, Clinique St Paul, St Nicolas Hospital in St. Marc, Hospital Albert Schweitzer (HAS), CAL Charles Colimon, Dumarsais Estime UNHCR and Nicolas Armand

Corridor North / Northeast, eight (8) locations: CS Dimple, Justinian University Hospital in Cap Haitien, Hospital Sacred Heart of Milot, CAL Fort St Michel, CAL Ouanaminthe, CAL Mont-organized, CDI Hole North and Fort-Liberté Hospital.

data collection method

Data collection was conducted from October 30 to December 13, 2013 at the nineteen (19) selected sites but analysis on maternal health services was limited to sixteen (16) of them saw that SADA/Matheux, the Cabaret and Dimple were not offering services in childbirth when passing investigators, one of the inclusion criteria of the survey.

The data collection tool consists of nine (9) modules and completed a tenth and methodology of the AMDD Program have been adapted for use the national context. These modules were:

Module 1: Identification of the institution and infrastructure
Module 2: The availability and distribution of human resources
Module 3: The availability of essential medicines, materials and equipment
Module 4: Service data on institutional deliveries and complications of childbirth
Module 5: EmONC functions and other essential services in SR
Module 6: Examination of partographs
Module 7: The level of theoretical and practical knowledge of health care providers
Module 8: The realization of caesarean sections and the management of cases of abortion
Module 9: Maternal deaths
Module 10: The psychological care of infected and affected by HIV.

Processing and Data Analysis
Data entry was carried out by a consultant in data processing. The processing and analysis of data was made from EPI INFO 6 and SPSS software. They took into account the expected results of the evaluation. Data were validated from the consistency of criteria previously defined. Technical Advisor Monitoring and Evaluation of Baltimore had provided technical support to the local team for quality control and data analysis.

Problems Encountered

The field team faced difficulties in collecting data, linked either to an impairment of the health information system or to administrative constraints:

Compared with the health information system:

- The use of data collection tools on non-standard maternal deaths did not collect uniform data
- The incomplete filling of data collection tools has resulted in a reporting data, particularly those concerning maternal deaths

Compared to the administration

- At some sites, the study staff spent long hours waiting for the key providers for interviews coincided with service delivery hours
- At CDI Trou du Nord located in the corridor North / Northeast, the Cuban staff was reluctant to consultation documents. It took the intervention of the maternal health program manager, team member, with the Departmental Director to facilitate access to data sources.

This evaluation report presents the findings on the supply of services and PMTCT EmONC.

The results are organized around three (3) main components of the survey:

- The first part analyzes the supply of obstetric and neonatal care basic and comprehensive. It takes into account health institutions offering maternity services in three (3) months preceding the survey. They number sixteen (16) in total. Health centers La Dimple, Cabaret and SADA are not considered in this analysis.
- The second part contains general information about the institutions in terms of physical infrastructure, amenities, competence of staff, medication management and supply of maternal health services package.
- The third part refers to services HIV/AIDS available. It is the availability of trained human resources, infrastructure, availability of inputs, the quality of service for adequate management of customers and appreciation of services by beneficiaries. The number of sites is fifteen (15). Note that POZ/Montrouis is not part of the first group of sites surveyed and the following institutions HAS, CS Dumarsais Estime, Good Samaritan (Cazale), Charles Colimon and Rousseau were not evaluated for this component.

This assessment followed the same eight indicators set by WHO and followed in 2009 assessment.

1) Indicator 1: Availability of EmOC services: To determine if the obstetric and neonatal care basic or comprehensive are actually available in health facilities considered
2) Indicator 2: Geographical distribution of health facilities EmONC: which highlights the degree of equity of access to the service in terms of geographical distribution of sites
3) Indicator 3: Births in health facilities EmONC: it shows the proportion of all births in the relevant corridors that take place in the survey of healthcare facilities.
4) Indicator 4: Requirements Satisfied by EmONC: This indicator is an estimate of the proportion of all women with major direct obstetric complications who are treated in health institutions involved in the investigation.
5) Indicator 5: Proportion of births by Caesarean section: The proportion of all births by caesarean measures access and use of caesarean interventions to prevent maternal and neonatal deaths and maternal morbidities such as obstetric fistula.
6) Indicator 6: Case fatality rate for direct obstetric (TCLOD): This is the proportion of women admitted to health institutions involved in the investigation with major direct obstetric complications, or develop the following complications after admission and die before leaving the hospital: the rupture of the uterus, prolonged / obstructed labor, postpartum sepsis, complications of abortion, eclampsia and severe pre-eclampsia, ectopic pregnancy, bleeding ante and postpartum.
7) Indicator 7: intra-partum death rate and early neonatal Proportion of intrapartum death (stillbirth, fetal deaths from 24 weeks of pregnancy) early neonatal occurring within the first 24 hours of birth in health facilities affected by investigation.
8) Indicator 8: Proportion of maternal deaths due to indirect causes in health facilities covered by the survey: This indicator numerator all maternal deaths due to indirect causes in health institutions involved in the investigation during a specific period, and the denominator, all maternal deaths occurring in health facilities involved in the investigation during the same period.

As per the below table both SCM and HAS fulfill the comprehensive EmONC services availability by providing; administration of antibiotics, administration of uterotonic drugs/oxytoxics, administration of anticonvulsants, manual removal of placenta, assisted vaginal delivery, and removal of retained products plus caesarean section and blood transfusion.

CORRIDOR/ INSTITUTION	antibiotique voie parentérale	anticonvulsivants par voie parentérale	Utérotonique voie parentérale	Délivrance manuelle du placenta	évacuation des produits résiduels ou débris ovulaires	Accouchement par vois basse assisté par ventouse ou forceps	réanimation du nouveau né avec ballon et masuqe	SONU B	Opération césarienne	Transfusion sanguine	SONU C
NORD / NORD-EST	7	7	7	7	7	7	5	3	4	3	2
CS La Fossette											
CS Fort St Michel	1	1	1	1	1	1	0		1	0	
Hôpital Justinien	1	1	1	1	1	1	1		1	1	X
CAL Sacré-Coeur	1	1	1	1	1	1	1		1	1	X
Hôpital Fort-Liberté	1	1	1	1	1	1	1	X	0	1	
CAL Ouanaminthe	1	1	1	1	1	1	0		0	0	
CAL Mont Organisé	1	1	1	1	1	1	1	X	0	0	
CDI Trou du Nord	1	1	1	1	1	1	1	X	1	0	
ARTIBONITE / OUEST	**8**	**8**	**8**	**5**	**5**	**9**	**5**	**1**	**6**	**4**	**3**
HAS	1	1	1	1	1	1	1		1	1	X
Hôpital St Nicolas	1	1	1	1	1	1	1		1	1	X
CAL Charles Colimon	1	1	1	1	1	1	1		1	1	X
CS Dumarsais Estimé	1	1	1	0	0	1	0		1	0	
CAL Pierre Payen	1	1	1	0	0	1	1		0	1	
CS Cabaret											
CAL Nicolas Armand	1	1	1	1	1	1	1	X	1	0	
CS St Paul	0	0	0	0	0	1	0		0	0	
SADA Matheux											
CS Bon Samaritain (Cazale)	1	1	1	0	0	1	0		0	0	
CS de Rousseau	1	1	1	1	1	1	0		1	0	
ENSEMBLE	**15**	**15**	**15**	**12**	**12**	**16**	**10**	**4**	**10**	**7**	**5**

Tools and Equipment:

HAS appeared to lack ventouse tools to assist delivery while SCM came short in having obstetrics forceps seat.
Availability of equipment for deliveries by vacuum or forceps taken by corridor and health institution offering delivery services

Institutions/Corridor	Types de matériel			
	Ventouse avec cupules de diverses tailles	Forceps obstétrical, partie basse	Forceps obstétrical, mi cavité	Forceps obstétrical, siège
NORD / NORD-EST	**2**	**2**	**1**	**1**
CS La Fossette				
CS Fort St Michel	0	0	0	0
Hôpital Justinien	1	1	1	1
CAL Sacré-Coeur	1	1	0	0
Hôpital Fort-Liberté	0	0	0	0
CAL Ouanaminthe	0	0	0	0
CAL Mont Organisé	0	0	0	0
CDI Trou du Nord	0	0	0	0
ARTIBONITE / OUEST	**3**	**3**	**2**	**2**
HAS	0	1	1	1
Hôpital St Nicolas	1	1	0	0
CAL Charles Colimon	1	1	1	1
CS Dumarsais Estimé	0	0	0	0
CAL Pierre Payen	0	0	0	0
CS Cabaret				
CAL Nicolas Armand	0	0	0	0
CS St Paul	0	0	0	0
SADA Matheux				
CS Bon Samaritain (Cazale)	0	0	0	0
CS de Rousseau	1	0	0	0
ENSEMBLE	**5**	**5**	**3**	**3**

Blood transfusion and Testing:

Both SCM and HAS are equipped with the necessary blood transfusion kits and blood testing for HIV and Syphilis. However, they both lack screening testing tools for Hepatitis C additionally SCM lacks Hepatitis B testing tools.

Institutions/Corridor	Types de matériel et de fournitures							
	Aiguille creuse pour la collecte de sang	Pince hémostatique	Flacons contenant une solution anticoagulante	Balance pour la collecte de sang	Test de dépistage de l'hépatite B	Test de dépistage de l'hépatite C	Test de dépistage du VIH	Test de dépistage de la syphilis
NORD / NORD-EST	**2**	**1**	**2**	**1**	**0**	**0**	**3**	**3**
CS La Fossette								
CS Fort St Michel	0	0	0	0	0	0	0	0
Hôpital Justinien	0	0	0	0	0	0	0	0
CAL Sacré-Coeur	1	1	1	1	0	0	1	1
Hôpital Fort-Liberté	0	0	1	0	0	0	1	1
CAL Ouanaminthe	0	0	0	0	0	0	0	0
CAL Mont Organisé	0	0	0	0	0	0	0	0
CDI Trou du Nord	1	0	0	0	0	0	1	1
ARTIBONITE / OUEST	**2**	**2**	**2**	**2**	**1**	**0**	**2**	**2**
HAS	1	1	1	1	1	0	1	1
Hôpital St Nicolas	0	0	0	0	0	0	0	0
CAL Charles Colimon	0	0	0	0	0	0	0	0
CS Dumarsais Estimé	1	1	1	1	0	0	1	1
CAL Pierre Payen	0	0	0	0	0	0	0	0
CS Cabaret								
CAL Nicolas Armand	0	0	0	0	0	0	0	0
CS St Paul	0	0	0	0	0	0	0	0
SADA Matheux								
CS Bon Samaritain (Cazale)	0	0	0	0	0	0	0	0
CS de Rousseau	0	0	0	0	0	0	0	0
ENSEMBLE	**4**	**3**	**4**	**3**	**1**	**0**	**5**	**5**

Indicator 3

Using the recommended EmONC standards, at least 15% of expected births in a geographic area should be at a health facility. Table # 20 shows that 73% of births registered within two (2) considered corridors had been conducted in a health facility. 94% of births recorded in the corridor sites North / Northeast and 59% of those occurred in the Artibonite/West Corridor sites took place in a health facility. With the exception of Nicolas Armand whose proportion is close to the minimum required (16%), the proportion for the majority of sites ranges from 27% (CS Rousseau) to 185% (CAL Sacred Heart). Strong pressure on the supply of services at the Sacred Heart site, Fort-Liberté and Dumarsais Estime, could explain the excess over 100% in the number of expected births. Note that these are reference structures that in most neighboring sites, there is no other delivery services.

CORRIDOR/ INSTITUTIONS	Pop. 2013	Expected births	Institutional deliveries	Percentage of institutional deliveries
NORD / NORD-EST	**502,206**	**14,062**	**13,231**	**94**
CS La Fossette				
CS Fort St Michel	42,622	1,193	1,197	100
Hôpital Justinien	223,270	6,252	6,078	97
CAL Sacré-Coeur	30,992	868	1,603	185
Hôpital Fort-Liberté	33,492	938	1,172	125
CAL Ouanaminthe	103,627	2,902	2,170	75
CAL Mont Organisé	20,791	582	224	38
CDI Trou du Nord	47,412	1,328	787	59
ARTIBONITE / OUEST	**1,985,387**	**55,590**	**37,629**	**68**
HAS	116,953	3,275	1,522	46
Hôpital St Nicolas	258,371	7,234	5,346	74
CAL Charles Colimon	165,444	4,632	3,293	71
CS Dumarsais Estimé	23,367	654	1,153	176
CAL Pierre Payen	36,427	1,020	408	40
CS Cabaret				
CAL Nicolas Armand	76,008	2,128	331	16
CS St Paul	38,205	1,070	11	1
SADA Matheux				
CS Bon Samaritain (Cazale)	8,739	245		0
CS de Rousseau	12,051	337	90	0
Total	**1,237,771**	**34,658**	**25,385**	**73**

Indicator 4

Satisfied needs in EmONC

The indicator on unmet needs in EmONC is "an estimate of the proportion of all women with major direct obstetric complications who are treated in a EmONC facility (Basic or Comprehensive)". The required minimum of 100 % was achieved by the Justinian Hospital and Fort -Liberté (99% and 109 % respectively). The Sacred Heart CS lags level of service use 162% of women treated for an obstetric

complication. As mentioned above, the strong pressure from other PPS on the Sacred Heart CS could explain this excess of the number of expected cases of complicated deliveries. As regards the other sites, the minimum ranges from 7% (HAS) to 66 % (Hôpital St Nicolas).

CORRIDOR/ INSTITUTIONS	Pop. 2013	Naissances attendues	Nombre de complications obstétricales majeures attendues	Complications obstétricales directes	Nombre de complications liées aux procédures	Nombre total de complications obstétricales directes majeures prises en charge	Proportion de complications obstétricales directes majeures prises en charge
NORD / NORD-EST	**502 206**	**14 062**	**2 109**	**1 772**	**57**	**1 829**	**87**
CS La Fossette							
CS Fort St Michel	42 622	1 193	179	18	0	18	10
Hôpital Justinien	223 270	6 252	938	882	44	926	99
CAL Sacré-Coeur	30 992	868	130	373	13	386	297
Hôpital Fort-Liberté	33 492	938	141	154	0	154	109
CAL Ouanaminthe	103 627	2 902	435	181	0	181	42
CAL Mont Organisé	20 791	582	87	53	0	53	61
CDI Trou du Nord	47 412	1 328	199	111	0	111	56
ARTIBONITE / OUEST	**735 565**	**20 596**	**3 089**	**1 139**	**5**	**1 144**	**37**
HAS	116 953	3 275	491	36	0	36	7
Hôpital St Nicolas	258 371	7 234	1 085	718	2	720	66
CAL Charles Colimon	165 444	4 632	695	190	3	193	28
CS Dumarsais Estimé	23 367	654	98	16	0	16	16
CAL Pierre Payen	36 427	1 020	153	72	0	72	47
CS Cabaret							
CAL Nicolas Armand	76 008	2 128	319	107	0	107	34
CS St Paul	38 205	1 070	160	0	0	0	0
SADA Matheux							
CS Bon Samaritain (Cazale)	8 739	245	37	0	0	0	0
CS de Rousseau	12 051	337	51	0	0	0	0
ENSEMBLE	**1 237 771**	**34 658**	**5 199**	**2 911**	**62**	**2 973**	**57**

Indicator 5

Proportion of births by Caesarean section

5 The indicator refers to births by caesarean section. It is expressed in percentage and "measure access to and use of a common obstetric intervention to prevent maternal and neonatal deaths and maternal morbidities such as obstetric fistula." The standard recommended cesarean births varies between 5 % and 15 %. At the site level, this proportion is estimated at 9 %, being found in the expected range. It is relatively higher in the Northern Corridor / Northeast (12%) than in the Artibonite / West (7%). CS Sacred Heart has the highest proportion (50%) (Table # 34). This would be due to the fact that this site is a reference structure and as such, would receive a lot of complicated cases.

CORRIDOR/ INSTITUTIONS	Pop. 2013	Expected births	Expected number of major obstetric	Direct Obstetric Complications	Number of procedural	Total number of major direct	Percentage of major direct obstetric

			complications		complications	obstetric complications supported	complications supported
NORD / NORD-EST	**502,206**	**14,062**	**2,109**	**1,772**	**57**	**1,829**	
CS La Fossette							
CS Fort St Michel	42,622	1,193	179	18	0	18	10%
Hôpital Justinien	223,270	6,252	938	882	44	926	99%
CAL Sacré-Coeur	30,992	868	130	373	13	386	297%
Hôpital Fort-Liberté	33,492	938	141	154	0	154	109%
CAL Ouanaminthe	103,627	2,902	435	181	0	181	42%
CAL Mont Organisé	20,791	582	87	53	0	53	61%
CDI Trou du Nord	47,412	1,328	199	111	0	111	56%
ARTIBONITE / OUEST	**735,565**	**20,596**	**3,089**	**1,139**	**5**	**1,144**	**37%**
HAS	116,953	3,275	491	36	0	36	7%
Hôpital St Nicolas	258,371	7,234	1,085	718	2	720	66%
CAL Charles Colimon	165,444	4,632	695	190	3	193	28%
CS Dumarsais Estimé	23,367	654	98	16	0	16	16%
CAL Pierre Payen	36,427	1,020	153	72	0	72	47%
CS Cabaret							
CAL Nicolas Armand	76,008	2,128	319	107	0	107	34%
CS St Paul	38,205	1,070	160	0	0	0	0%
SADA Matheux							
CS Bon Samaritain (Cazale)	8,739	245	37	0	0	0	0%
CS de Rousseau	12,051	337	51	0	0	0	0%
Total	**1,237,771**	**34,658**	**5,199**	**2,911**	**62**	**2,973**	**57%**

Proportion of caesarean births per corridor and health institution offering

Indicator 6
Case of direct obstetric fatality rate (TCLOD)

The case fatality rate for direct obstetric is an evaluation indicator of the quality of services provided. The maximum acceptable level is 1%. Overall, less than 1% of women treated for obstetric complications were dead, or 0.40 %. Deaths from direct obstetric complications are more likely in the corridor Artibonite / West (0.79 %). The two (2) health facilities that reported a high direct obstetric case fatality rates are: Hôpital St Nicolas (1.11 %) and CS Pierre Payen (1.39 %). (Table # 35).

CORRIDOR/ INSTITUTIONS	Pop. 2013	Expected births	Number of caesarean sections	Percentage of caesarean deliveries
NORD / NORD-EST	**502,206**	**14,062**	**1,693**	**12%**
CS La Fossette				
CS Fort St Michel	42,622	1,193	40	3%
Hôpital Justinien	223,270	6,252	1,068	17%
CAL Sacré-Coeur	30,992	868	431	50%
Hôpital Fort-Liberté	33,492	938	95	10%
CAL Ouanaminthe	103,627	2,902		0%
CAL Mont Organisé	20,791	582		0%
CDI Trou du Nord	47,412	1,328	59	4%
ARTIBONITE / OUEST	**735,565**	**20,596**	**1,366**	**7%**
HAS	116,953	3,275	375	11%
Hôpital St Nicolas	258,371	7,234	688	10%
CAL Charles Colimon	165,444	4,632	295	6%
CS Dumarsais Estimé	23,367	654		0%
CAL Pierre Payen	36,427	1,020	4	0%
CS Cabaret				
CAL Nicolas Armand	76,008	2,128	4	0%
CS St Paul	38,205	1,070		0%
SADA Matheux				
CS Bon Samaritain (Cazale)	8,739	245		0%
CS de Rousseau	12,051	337		0%
Total	**1,237,771**	**34,658**	**3,059**	**9%**

Indicator 7

Proportion of maternal deaths due to indirect obstetric complications

This indicator shows the weight of indirect obstetric complications in the global maternal mortality. The proportion of maternal deaths by indirect obstetric complications was estimated at 42%. This result may not reflect the real situation of all sites surveyed since the five (5) deaths considered in this calculation has been made in two (2) sites, Justinian Hospital and St Nicolas.

Corridor/ Institutions	Total No. of Major Direct Complications	No. of Deaths Due to Direct Complications	Percentage of Deaths Due to Direct Complications
NORD / NORD-EST	**1,829**	**3**	**0.16%**
CS La Fossette			
CS Fort St Michel	18	0	0.00%
Hôpital Justinien	926	2	0.22%
CAL Sacré-Coeur	386	0	0.00%
Hôpital Fort-Liberté	154	1	0.65%
CAL Ouanaminthe	181	0	0.00%
CAL Mont Organisé	53	0	0.00%
CDI Trou du Nord	111	0	0.00%
ARTIBONITE / OUEST	**1,144**	**9**	**0.79%**
HAS	36	0	0.00%
Hôpital St Nicolas	720	8	1.11%
CAL Charles Colimon	193	0	0.00%
CS Dumarsais Estimé	16	0	0.00%
CAL Pierre Payen	72	1	1.39%
CS Cabaret			
CAL Nicolas Armand	107	0	0.00%
CS St Paul	0	0	
SADA Matheux			
CS Bon Samaritain (Cazale)	0	0	
CS de Rousseau	0	0	
Total	**2,973**	**12**	**0.40%**

Indicator 8
intrapartum death rate and early neonatal

In regard to stillbirths, the rate of intrapartum and early neonatal death was 3.96 % in all sites located in the corridors North / Northeast and Artibonite / West (Table # 37). Note that the instrumented deliveries result in a higher percentage of stillborn (8.93 %) than the physiological delivery (3.76 %) and cesarean section (5.30 %). The highest rate of mortality from an instrumented delivery (9.80%) was observed at Justinien Hospital. By cons, Hospitals Fort Liberte and St Nicolas accuse the highest rates of intrapartum and early neonatal death associated with cesarean section (7.37% and 8.58% respectively).

CORRIDOR/ INSTITUTIONS	Mode d'accouchements et Nombre de mort-nés								
	Accouchement physiologique institutionnel			Accouchement instrumenté			Section césarienne		
	Total accouchement	Total mort-né	%	Total accouchement	Total mort-né	%	Total accouchement	Total mort-né	%
NORD / NORD-EST	**11 400**	**425**	**3,73**	**51**	**5**	**9,80**	**1 693**	**80**	**4,73**
CS La Fossette									
CS Fort St Michel	1 157	31	2,68	0	0		40	0	0,00
Hôpital Justinien	4 905	218	4,44	51	5	9,80	1 068	56	5,24
CAL Sacré-Coeur	1 158	67	5,79	0	0		431	16	3,71
Hôpital Fort-Liberté	1 073	57	5,31	0	0		95	7	7,37
CAL Ouanaminthe	2 170	24	1,11	0	0				
CAL Mont Organisé	213	7	3,29	0	0				
CDI Trou du Nord	724	21	2,90	0	0		59	1	1,69
ARTIBONITE / OUEST	**10 674**	**406**	**3,80**	**5**	**0**	**0,00**	**1 366**	**82**	**6,00**
HAS	1 141	69	6,05	3	0	0,00	375	16	4,27
Hôpital St Nicolas	4 585	213	4,65	0	0		688	59	8,58
CAL Charles Colimon	2 990	88	2,94	2	0	0,00	295	6	2,03
CS Dumarsais Estimé	1 153	16	1,39	0	0				
CAL Pierre Payen	387	8	2,07	0	0		4	1	25,00
CS Cabaret									
CAL Nicolas Armand	324	10	3,09	0	0		4	0	0,00
CS St Paul	11	1	9,09	0	0				
SADA Matheux									
CS Bon Samaritain (Cazale)									
CS de Rousseau	83	1	1,20	0	0				
ENSEMBLE	**22 074**	**831**	**3,76**	**56**	**5**	**8,93**	**3 059**	**162**	**5,30**

The survey results revealed that nineteen (19) visited sites were offering maternal health services and two (2) of the fourteen (14) HIV websites providing the complete package of care and support to people infected and affected by HIV. A total of sixteen (16) health facilities involved in the delivery of emergency obstetric and neonatal care. However, only nine (9) of them met the criteria of operation of EmONC even if they are not all able to perform the instrumented vaginal deliveries.
Staff training deficiencies in such areas the use of forceps and vacuum extraction, manual removal of placenta, repair of obstetric fistula, use of partograph of cervical cancer screening, resuscitation of adult and newborn, respect for clients' rights, psychosocial support, was noted. Providers had limited knowledge of the package elements to provide victims of violence based on gender and blood exposure accidents.

Moreover, these results have shown, unequal access to existing services EmONC since the BEmONC / CEmONC recommended ratio was not respected in the two (2) corridors. This has created strong pressure on the better-endowed sites that were also facing equipment shortages, equipment and basic medicines. In this context, the coverage of some services remains low. This is the case of the major direct obstetric complications for which the level of unmet need is far below the expected benchmark. By cons, if rate of direct obstetric case fatality, a service quality assessment indicator is higher than the expected level in many health facilities in the Artibonite / west corridor. This suggests that the problems of management and service organization such personnel deficiency formed in some areas under use and improper use of scans, lack of standards and stock outs of some essential drugs have probably

negatively affected supply services in the visited sites. Based on the identified problems, the following recommendations are made to improve access and quality of maternal health services and care and support provided to PLWHA:

• **Assessment Recommendations**
improving access to essential services:

1. Most of the sites concerned by the investigation offer a package of maternal health services and care and support for PLWHA incomplete. Gradually add the missing elements of the package considering sites operating capacity and providing technical guidance and recurrent resources.
2. Nine (9) of the sixteen (16) sites are assessed health facilities EmONC. Meeting the technical platform of the remaining sites to become at least EmONC B. structures
3. The complete kit for instrumented deliveries was available in two (2) sites. Within three (3) months preceding the survey, this mode of delivery was performed in a single site. In addition, most service delivery points did not have either trained staff able to perform properly instrumented deliveries. Equipping all sites EmONC C a complete kit of births assisted by forceps and suction cup and undertake the training of personnel for the proper handling of these instruments.
4. Institutions of references are mostly at a distance away from some peripheral sites and means of transport for the rapid evacuation of obstetric emergencies are not always available. Develop a functional ambulance system in each corridor to facilitate the rapid evacuation of emergencies.
5. Revitalize maternal mortality surveillance committees to reduce delays in care

• **Improving the quality of services:**

1. Trained personnel deficiency was identified for several maternal health aspects, respect for clients' rights, psychosocial support, elements of the package to provide victims of violence based on gender and exposure to accidents blood. Establish a training plan based on identified needs and undertake the training of relevant personnel.
2. Provide technical close supervision to monitor the training in terms of skills and abilities acquired.
3. The use of the partograph is not yet widespread and the tool has not been properly used in all sites. Support the MSPP for the widespread application of the partograph and provide the necessary framework to monitor its use.
4. Of the nine (9) Standards Documents recommended maternal, four (4) of them were available in a range from 50% to 63%; the others were virtually nonexistent. Planning staff orientation sessions for the dissemination of standards manuals.

Overview of Maternal Deaths Surveillance and Response (MDSR)

MDSR defined by WHO as a form of continuous surveillance that links the health information system and quality improvement processes from local to national levels, which includes the routine identification, notification, quantification and determination of causes and avoidability of all maternal deaths, as well as the use of this information to respond with actions that will prevent future deaths.
The primary goal of MDSR is to eliminate preventable maternal mortality by obtaining and strategically using information to guide public health actions and monitoring their impact.
The overall objectives of MDSR are to provide information that effectively guides immediate as well as longer term actions to reduce maternal mortality; and to count every maternal death, permitting an assessment of the true magnitude of maternal mortality and the impact of actions to reduce it
(WHO MDSR Guidelines, 2013)

MDSR provides more precise estimate of MMR as it standardizes and expands the reporting practices to improve the quality of care and better inform interventions to reduce mortality and provide guidance on specific causes of deaths. To achieve this, MDSR is depending upon collecting data at facility and community level through networks of community health workers (CHW) (Hounton, 2013).

How Does MDSR Work?

As part of a continuous surveillance approach, MDSR requires ongoing identification of maternal deaths at both facilities and communities, hence the need for ongoing notification of deaths to the nearest civil registry office and investigation for causes of death. Analysis of these data will provide district then national overview of mortality and causes of death, which will effectively inform developing strategies and planning interventions to prevent deaths from similar causes in the future (WHO, 2013)

MDSR in Haiti

One of the main challenges for the health system in Haiti is surveillance and reporting this is demonstrated in failure of eight hospitals out of the ten in Port-au-Prince's 10 hospitals to follow the country's policy in deaths reporting and to keep a proper death list. One other thing about the reporting registry books and death certificates is that they lack information about the causes of death and they also don't segregate data by health facilities (Diagnostic and Development group, 2015)

In 2015, CDC collaborated with MSPP in Haiti and other partners to pilot MDSR at two facilities and their surrounding communes; 1) Hospital Sacré Coeur Milot (SCM) serving commune Milot commune and Hospital Albert Schweitzer (HAS) serving Verretes and Petite Riviere commune which are also providing EmONC services. To report women of reproductive age (WRA) deaths at both hospital and the community levels. Results from this pilot indicated 44% increase in reported WRA deaths from 2014 to 2015 due to the successful community surveillance. As per the below figures

Hôpital Sacré Coeur De Milot (SCM)

SCM is a 125 bed tertiary care medical center and private institution and official referral center operated by the Crudem Foundation, a private for profit institution. The center boasts a maternity ward and neo-natal unit. Services include: a child vaccination program, family planning, child growth monitoring, ante natal care services, Prevention of Maternal to Child Transmission of HIV program, normal delivery services, sick child services and Comprehensive EmOC amongst other services.

Notre Dame Clinic outpatient clinic: facility with the capacity to provide quality healthcare for an additional 50,000 or more Haitians. With 18 examination rooms, a modern radiology suite, new dental clinic, pharmacy, medical records department, pediatrics and HIV clinics and an impressive and modern emergency department, the Notre Dame Clinic is a flagship healthcare facility.

In November 2012, CRUDEM and Hôpital Sacré Coeur staff engaged in a detailed strategic planning session and produced a five-year strategic action plan with specific goals for hospital excellence. For maternal and newborn care, they determined to: 1). Look at the quality of services available to women and infants; and 2). Reduce intra-hospital maternal mortality by 75% and neonatal mortality rate by 25% in 2014.

In an assessment done in 2013

In order to best identify information that is being collected both consistently and more informally as well as to understand the data flow-process, I used a mixed-methods approach. Quantitative data

includes a line listing of information being collected in the pediatric ward. Three qualitative data includes interviews with chief nurses in the pediatric wards.

Hôpital Albert Schweitzer (HAS)

HAS is a 131 bed hospital located in Dechappelles in the Artibonite valley. It is as a non-profit private institution. Facility services include a neonatal care intensive unit, child vaccination, growth monitoring, sick child services, family planning and antenatal care. HAS is the only 24/7 full-service hospital serving more than 350,000 people. It is the only facility within a 610-square-mile area that provides care for women with high-risk pregnancies, for children with serious illness and malnutrition, for people who need trauma care and surgery, and for those with infectious and non-communicable diseases. The most complicated cases seen in regional clinics and other medical facilities are referred to us routinely.

HAS also operates four community health centers providing primary care in valley and mountainous areas aiming at improving public health by brining healthcare closer to population and minimizing unnecessary expenses on hospital care as referrals to the hospital are coordinated by medical staff who are able to filter the cases and decide about the need for further care. Community centers provide malnutrition screening and care, pre and postnatal care, reproductive health services, minor surgical procedures and dispensing medications.

Mobile Clinics 70 HAS Mobile Clinics staffed with HAS licensed practical nurses rotate through 30 different locations every month to provide primary care, including minor wound repairs and reproductive health services.

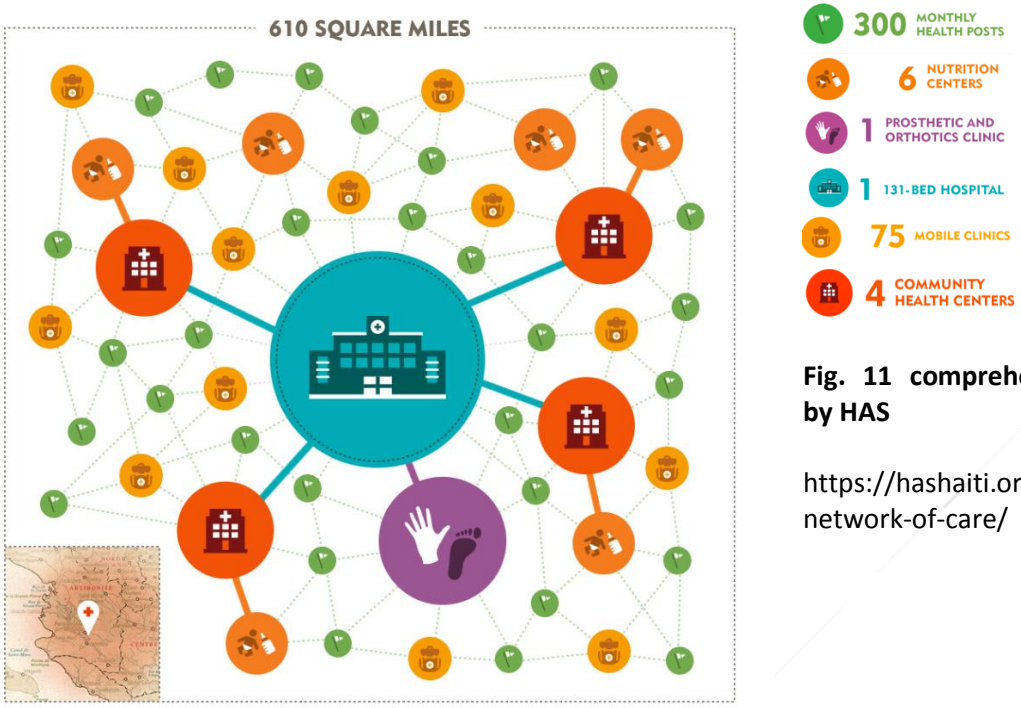


Fig. 11 comprehensive services by HAS

https://hashaiti.org/vision/our-network-of-care/

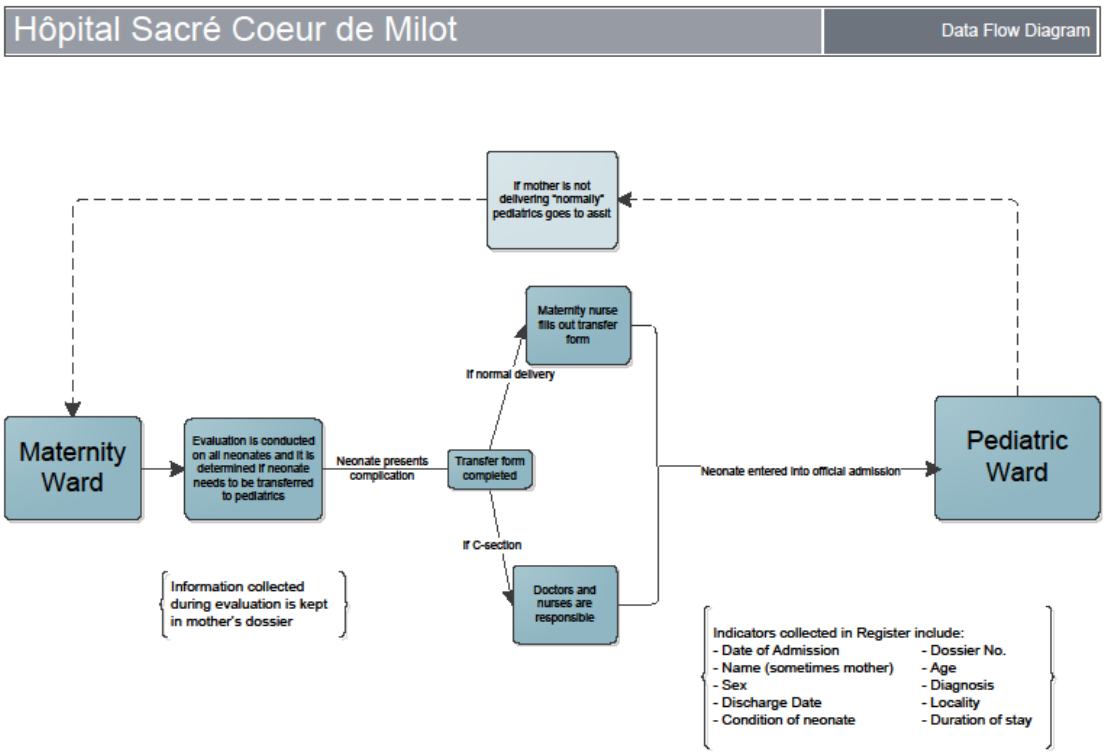


Fig. 10 Data Flow Diagram At SCM source at http://crudem.org/

Fig. 12 A

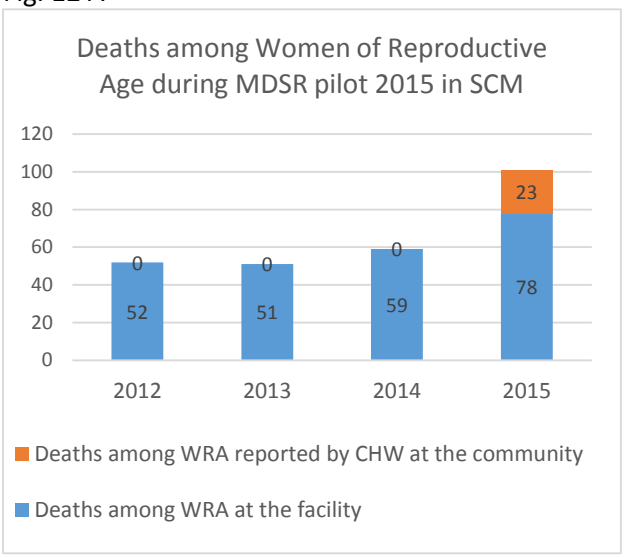


Fig. 12 B

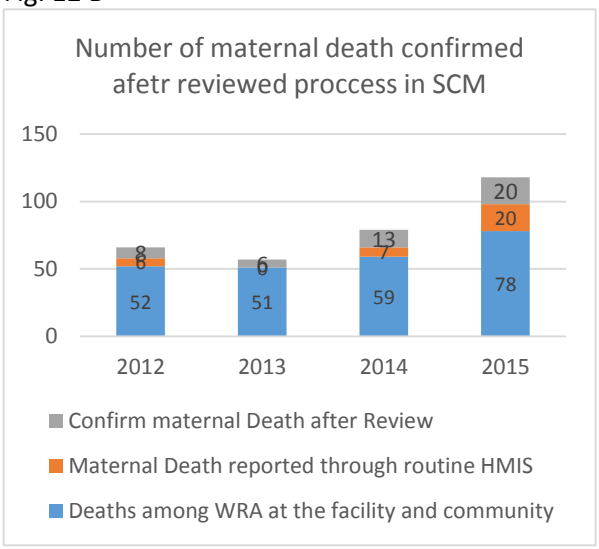


Fig 12 C

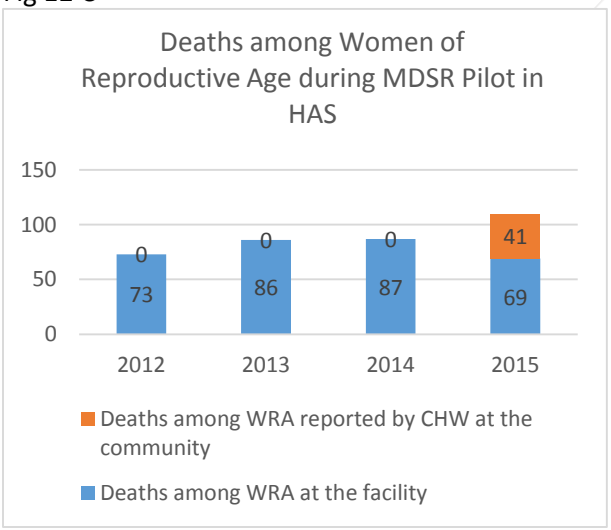
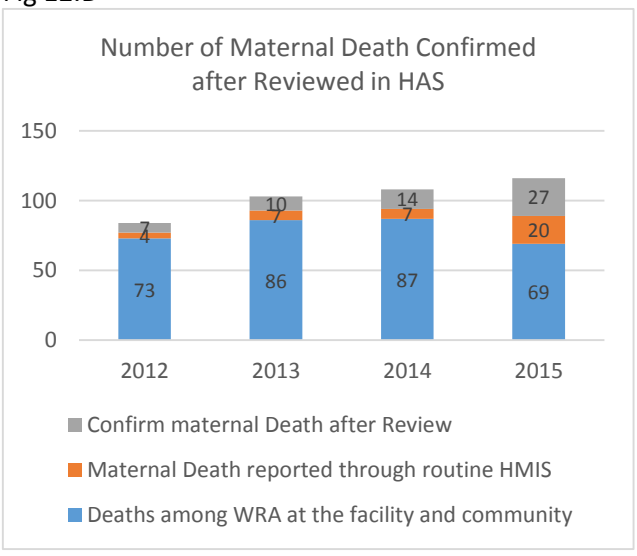


Fig 12.D



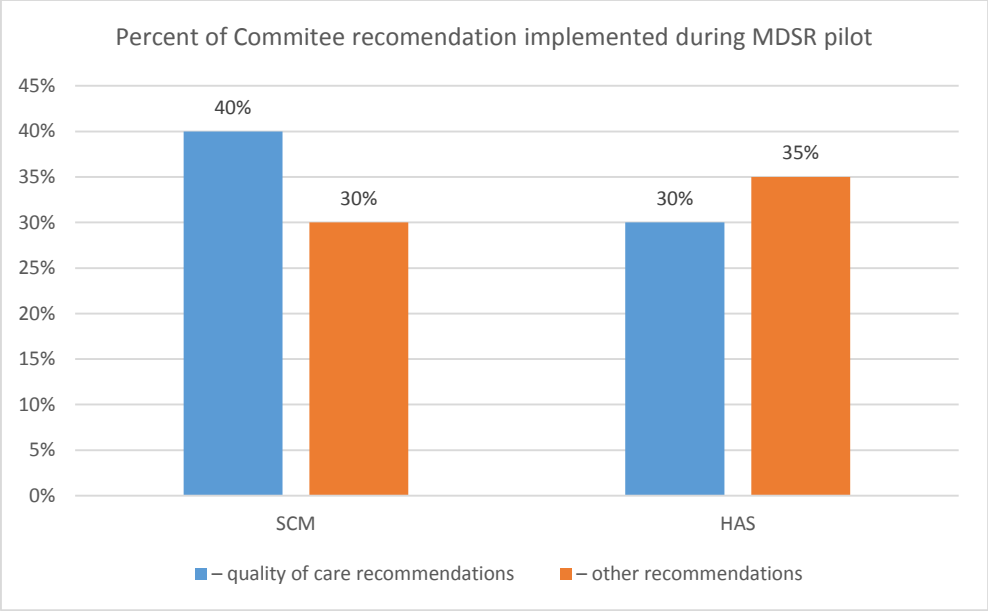
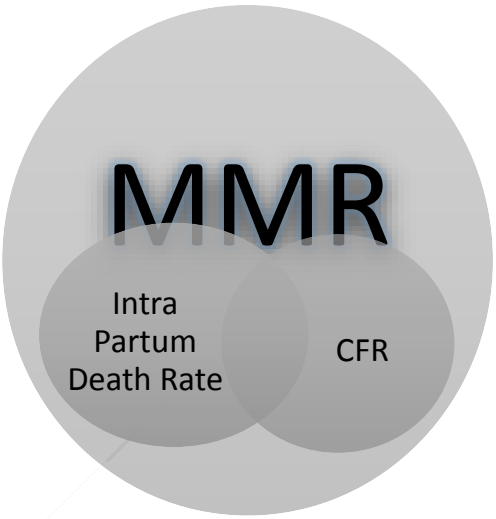


Fig. 14 Percent of committee recommendation implemented during MDSR Pilot

Discussion

The government in Haiti is striving to develop strategies and interventions to reduce maternal mortality over the past decade. However, the 2010 devastating earthquake is aggravating the status in many ways. With support from international community MSPP in 2008 adopted the standardized EmONC approach in unifying the services provision and improving the quality as a step in improving maternal health and reducing MMR and planned for a national assessment in 2009 (Survey of obstetric and neonatal emergencies) conducted in collaboration with UNFPA mainly to evaluate the availability, utilization, quality of service in addition to availability of materials for EmONC services in 252 facilities from all sectors. Later in 2013 MSPP coordinated with CDC to conducted another assessment in 19 facilities evaluating EmONC services provision according to the recently updated indicators for evaluation developed by WHO in 2010.



Linkage between EmONC and MDSR

Initially to improve the health outcomes related to significant health issue such as maternal morbidity and mortality, reliable surveillance system is a necessity as results capturing the real magnitude of the problem inform more convenient and relevant strategy and interventions. This is crucial in a low-resource setting like Haiti to optimize and prioritize resource allocation. According to the eight indicators to evaluate EmONC, capturing case fatality rate and proportion of maternal deaths due to indirect causes feeds into the significance of having reliable surveillance system in place

MDSR Pilot in Haiti

The maternal fatality rate of women with direct obstetric complications was **2.63%,** while the maximum acceptable level must be lower than **1%.** Preeclampsia / eclampsia and hemorrhage (ante and postpartum) are the specific causes of the most common maternal mortality. Note that caesarean section rate and needs covered are so low, we can objectively question the completeness of data on maternal deaths. (Survey of Emergency Obstetric and Neonatal Care in Haiti, 2009)

In the two selected facilities, marked increase in the reported deaths occurred when community surveillance was included considering that significant proportion of Haitian women doesn't access healthcare facilities. It is also notable that the reported deaths in the facility were also increased between 2014 and 2015. This could be related to the improved reporting mechanisms, strict application of case definition, and increased capacity of health care worker to collect and report data, verbal autopsy and community surveillance.

Limitation of MDSR in Haiti

1. The procedures in place for death notification are not 100% followed and there is no mandatory system for maternal cause specific deaths
2. Documentation is not standardized between health facilities and not nationally synthesized
3. MDSR requires comprehensive community engagement, which happened to a very far extent in this pilot, though the coverage can't be guaranteed to be 100%.
4. Introduction of verbal autopsy might be challenging as it depends upon recall so may be subjected to information bias.

Recommendations

As the Haitian government aims to reduce MMR by 75% before 2020, more efforts are needed in identifying and addressing the requirements for establishing, upgrading, expanding and promoting more equitable EmONC services provision in both rural and urban areas. Ensuring that population based distribution of facilities covers the minimum of 100 fully functioning facilities.

One of the main challenges in surveillance, technical service provision, and in provision of quality care is the technical and professional capacity of health care professionals and paramedics working in Haiti. This places increased emphasis on the need for continuous professional development programs designed to build and maintain the capacity of the providers leading to improved service provision and reduction of mortality. Additionally, this could also include nurse practitioners, physician assistants and other models covering for the shortage in physicians.

Effective family planning programs indirectly feeds into reducing mortality by lowering the percentages of unwanted pregnancies subsequently they lower the unsafe abortion and its fatal complication especially in covering 96% of unmet family planning needs.

1. Developing joint MDSR and EmONC programs to effectively reduce MMR
2. Introducing Health Information System (HIS) would improve the quality of data surveillance and reporting.

Conclusion

Maternal mortality ratio (MMR) in Haiti is the highest in the Western Hemisphere with a shortage of at least 88 facilities below the recommended national target and underutilization of the existing 12 facilities. Studying MMR and understanding the challenges after the devastating 2010 earthquake could help identify gaps that can inform recommendations, strategies, and interventions to decrease mortality while improving maternal and child health in Haiti for future.

This special studies project aims to provide an overview of the provision of emergency obstetric and neonatal care (EmONC) and examine how it could be linked with strengthening the maternal death surveillance and response (MDSR). Available dataset from 2 facilities, supported by CDC to implement relevant interventions, were reviewed and analyzed. The Researcher presents an innovative applicable solution by synchronizing both EmONC and MDSR to jointly contribute towards the reduction of MMR in the country.

Reliable surveillance system ultimately informs the national strategy and policy making as it is proven to achieve better health outcomes. MDSR specifically involves community participation in surveillance, which if used farther could easily expand further promotion of the underutilized services in EmONC facilities and provision of the most accurate data to inform upgrading and enhancing the quality of services.

Adopting a joint MDSR and EmONC program can ensure high community engagement to promote EmONC services, help improve the quality, advise of managing access limitations and inform plans and interventions to reduce mortalities. Also joint programming to implement both MDSR and EmONC by

the same team in the same facilities should offer a unique modality to better allocate and utilize the already scarce resources. It would increase the efficiency of surveillance and reporting while ensuring quality and accountability in service provision. A community-based surveillance system that engages service providers and the community health volunteers/workers will ensure prompt and high quality data collection and analysis informing preparedness and response.

Appendices

Appendix I

Glossary of Most Important Terms and Definitions

CFR	The percentage due to the indirect causes of all the maternal deaths in of EmONC facilities.
EmOC	The percent of all women with major direct obstetric complications who are treated in a health facility providing emergency obstetric care in a given reference period.
EmONC	Emergency obstetric and newborn care (**EmONC**) is a package of medical interventions to treat life-threatening complications during pregnancy and childbirth.
MDSR	Maternal Death Surveillance and Response (MDSR) is a form of continuous surveillance linking the health information system and quality improvement processes from local to national levels. It includes the routine identification, notification, quantification, and determination of causes and avoidability of all maternal deaths, as well as the use of this information to respond with actions that will prevent future deaths.
MMR	Maternal death is defined by the WHO as "The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes."

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