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Maternal Mortality in Haiti

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Abstract

The rates of maternal mortality in the country of Haiti are astoundingly higher than any other nation in the western hemisphere. In a country that faces socioeconomic and government instability, there is little protection for those who cannot support themselves financially and with regards to health. A mother plays a key role in the safety and well being of a child and her lack of presence in the first months of an infant's life can be detrimental and even fatal to the child. In 2015, maternal mortality rates in Haiti reached 359 deaths per 100,000 live births, a significantly higher rate than the global statistic among developing nations. This number notably exceeded that of Haiti's neighboring country the Dominican Republic, which in the same year rates were recorded at 92 deaths per 100,000 live births (World Bank Group, 2016). The question is, what is causing such high rates of maternal mortality throughout the country? Contributing factors range from lacked of skilled professionals at the bedside to various diseases. It is crucial to identify all of these risk factors and causative agents to the astonishingly high statistics so that measures can be made to prevent such tragedies from occurring.

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Introduction

Childbirth can be one of life's most beautiful moments; however, if complications arise, the results can cause utter devastation. When these complications occur, it affects the mother, the infant, as well as other family members and friends. Unfortunately, in places where there are few resources for obstetric care, women do not receive the necessary treatment to prevent detrimental outcomes, including maternal death. Research has shown that in developing countries, complications related to pregnancy or childbirth is a leading cause of death of women ages 15-49 (Anderson, Morton, Naik, & Gebrian, 2007). This is an incredibly significant issue in our world, and especially in these countries where resources and education to prevent maternal death are lacking. In the country of Haiti, the poorest country of the western hemisphere, maternal mortality is remarkably high compared to the statistics in any other country in this half of the world. In a country that suffers from extreme poverty, governmental corruption, and shattering effects from natural disasters, it is crucial to identify major factors that contribute to such high rates of maternal mortality and to analyze existing research and literature that has found patterns in why Haiti continues to suffer from such devastating outcomes in today's modern world. The main themes that recur as main factors in the hindrance of improving maternal outcomes in Haiti include the lack of access to care, including but not limited to cost, transportation; presence of adequate health care facilities; the lack of skilled attendance during childbirth; disease; and education.

Problem and Significance

According to the World Health Organization (2016), approximately 830 women die daily due to preventable causes related to pregnancy and childbirth. In 2015, it was recorded that around 303,000 women died during or following childbirth globally. These numbers are

astounding and leave detrimental effects on families as well as the child. In developing countries, where it is believed 99% of maternal-related deaths occur (Roos & Xylander, 2016), there are minimal resources that allow for a child to be cared for if their mother dies prematurely. This further contributes to long lasting effects on the child that include but are not limited to psychological and physiological disabilities, exploitation, or abuse if he or she survives infancy without a biological mother.

The difference in rates of maternal mortality in developing countries versus developed countries is striking with the numbers revealed as “239 per 100,000 live births in developing countries versus 12 per 100,000 live births in developed countries,” as of 2015 (WHO, 2016). It is crucial to identify the causative factors of maternal mortality as well as identify why there are such significant differences between the rates of maternal death in underdeveloped versus developed nations. It is essential to simultaneously identify the measures that have been successful in reducing these devastating statistics.

This literature review is primarily concerned with the maternal mortality rates of Haiti; the country with the highest of these rates among the western hemisphere. In 2015, maternal mortality rates in Haiti reached 359 deaths per 100,000 live births, a significantly higher rate than the global statistic among developing nations. This number notably exceeded that of Haiti’s neighboring country the Dominican Republic, which in the same year rates were recorded at 92 deaths per 100,000 live births (World Bank Group, 2016). The question is, why is there such a monumental difference in the number of maternal deaths between two countries that share the same island, have similar geographical characteristics, and are both categorized as “developing nations”? In a country like Haiti, maternal survival is essential for the well being of the infant because there is little funding and nearly no help from the government to insure orphaned

children have a stable environment and caregiver. It is ingrained in the culture of Haiti that the mother is the caregiver her children, insuring they are fed, bathed, taught, and loved. Her role within a family infrastructure is crucial for the development of her child and without her presence in the first few years of life, realistically a child will have little chances of survival. Through the use of descriptive statistics and analysis of variance among data collected over a two-year time span in Jérémie, Haiti, it was found that a maternal death significantly impacted the likelihood of infant and child survival. In fact, this research study found that if a family experienced a death as a result of obstetric causes, there was a 55.0% chance that the family would also experience a death of a child under 12 years old (Anderson, Morton, Naik, & Gebrian, 2007). Another study in Tanzania established that “an infant orphaned within 42 days of birth had a probability of surviving to 1 year of only 51.5 % (40.2 % for late maternal deaths), and likelihood of only 46.4 % (33.0 % for late maternal deaths) for surviving to age 5,” (Finlay et al., 2015, p. 2398). These statistics compared to the 90% likelihood of an infant surviving to his or her first birthday if there was no result of maternal death from the pregnancy (Finlay et al, 2015).

Purpose

The purpose of this literature review is to analyze existing data pertaining to maternal mortality globally in order to identify commonalities among the contributing factors to this major issue. However, it is crucial to also evaluate the differences in rates of maternal deaths between developed and underdeveloped countries and *why* such great differences are found between these nations. From there, this review will narrow its focus on the rates of maternal mortality specific to the country of Haiti, the country that has significantly higher maternal mortality rates than any other nation in the western hemisphere, as well as the reasoning behind the delay in progressing

towards a lower maternal mortality ratio. This literature review will hopefully aid in shifting attention to weaknesses in Haiti's health care system and infrastructure in order to develop implications for future practices in the country.

Background & Orientation

Maternal mortality defined

It is essential to understand that maternal mortality is defined as “a death that occurs to a woman as a direct result of obstetric complications or indirectly as a result of pregnancy-induced exacerbation of pre-existing medical conditions, but not as a result of incidental or accidental causes” (Kassebaum et al., 2016, p. 1777). The World Health Organization definition includes death within 42 days of childbirth or termination of pregnancy within the category of maternal mortality (WHO, 2016). Between 1990 and 2015 there has been extensive analysis and research regarding global maternal death rates and maternal mortality ratios and the contributing factors behind the differences in statistics over these 25 years. According to Kassebaum et al. (2016), the total global decrease from 1990 to 2015, in maternal deaths was roughly 29% and the decrease in maternal mortality ratio (number of maternal deaths per 100,000 live births) was 30%. Global maternal mortality was recorded as 390,185 deaths in 1990, then dropped slightly to 374,321 deaths in 2000, and dropped to 275,288 maternal deaths in 2015, (Kassebaum et al., 2016).

Causes

There are numerous contributing factors that lead to such high maternal mortality rates throughout the world. Research from Kassebaum et al. (2016) found that direct causes of death accounted for about 86% of all maternal deaths globally in 2015. Most of these deaths were caused by hemorrhage, maternal hypertensive disorders, other maternal disorders as well as obstruction of labor and complications during labor. In 1990, direct complications accounted for

87% of all maternal deaths, a statistic revealing a very slight change in cause of maternal death over a twenty-five year span. In most of these cases, maternal death occurred “during actual childbirth or within a few weeks following” (Kassebaum et al., 2016, p. 1797). In middle and lower income countries, the five leading factors that account for 80% of maternal fatalities include hemorrhage, hypertension, various types of infection, obstruction in labor, as well as unsafe abortion procedures, (Jacobs, Judd, & Bhutta, 2016). Indirect causes account for a significant percentage of maternal mortality that include but are not limited to chronic illness such as HIV as well as lack of education, lack of access to care, and quality of care (Roos & von Xylander, 2016). For example, a study of pregnant women with cardiomyopathy found that the high rate of maternal death as a result from their cardiac condition was “due to late referral of patients to our institute thus leading to delay in initiating the treatment” (Suri et al., 2013, p. 198), implying that death caused by underlying conditions can many times, be prevented.

Risk of death during childbirth or during the postpartum period is also affected by region and socioeconomic status. Statistics show that, “the average lifetime risk for a woman to die from pregnancy-related causes in developing regions is 1 in 150. The same risk in a high-income country is 1 in 4900” (Suri et al., 2013, p. 31). Therefore, simply because a woman is located in a certain area, her likelihood of facing grim outcomes of childbirth is affected greatly. Families that live in impoverished areas are more likely to be exposed to infectious diseases such as malaria or cholera and are more likely to lack proper sanitation, further increasing their risk of malnutrition. These conditions ultimately result in a higher chance of maternal complications and death. Another disadvantage to living in poverty is gender inequity resulting in a lack of education about reproductive health and a decreased female literacy among a population (Suri et al., 2013). Gender inequity also contributes to a less concerned outlook on women’s health in

general. Without education, primary prevention, and adequate care during a pregnancy the likelihood of dying as a result of childbirth increases greatly, (Suri et al., 2013).

Research shows that girls who are born into poverty are more likely to enter a child marriage, putting them at greater likelihood for pregnancy at a young age. This puts the girl at a higher risk of premature labor, maternal death and morbidity following childbirth (Suri et al., 2013). In fact, “maternal causes of death are globally the second major cause of mortality among women 15-19 years of age. In the same age group, it is the leading cause of death in the Eastern Mediterranean Region and among the top four causes in the African Region, South-East Asia Region and the Americas Region” (Suri et al., 2013). Maternal death is not the only concern for this age group of women. The newborn is at a 50% higher risk of mortality among women 15-19 years of age compared to women 20-29 years of age, (Suri et al, 2013).

Trends - - How/Why it has improved

The overall rate of maternal mortality has declined over the past 25 years attributed to a combination of research identifying the leading causes of such high rates as well as outreach from health institutions, governments, and organizations that advocate for women and children around the world. In order to identify ways to continue the decline of maternal deaths, it is essential to analyze the methods that have improved maternal outcomes with regards to mortality during childbirth and the postpartum period. The countries or regions that improved more rapidly than originally expected after 2000 were also the biggest recipients of Development Assistance for Health, a logical correlation between improvements in promotion of quality health care.

Unpreventable factors that contribute to delays in progression towards a lower maternal mortality ratio include natural disasters, epidemics, and armed conflicts. These detrimental situations hinder a country's ability to work towards improvements within their own country and

can also prevent aid from other nations due to lack of accessibility, destruction and safety concerns. (Kassebaum et al, 2016).

Quality of care and quality improvement impacts the childbirth process greatly. Research proves better outcomes for those women who are cared for by those who have a substantial level of competency when it comes to the labor, delivery, and postpartum processes. Past studies have also shown the importance of interventions in maternal health care in order to reduce the adverse outcomes of complications that accompany childbirth. One study, conducted in Zanzibar, Tanzania, implemented the use of misoprostol over a 10-month period to reduce the prevalence of post-partum hemorrhage (PPH) and found that it significantly improved cases of PPH resulting in less blood transfusions, fewer PPH-related referrals, and fewer maternal deaths (Grossman, Graves, Rwamushaij, & Park, 2010). Registered, educated and trained professionals such as doctors, nurses, and midwives that are equipped to implement interventions and know how to recognize signs and symptoms of an obstetric complication should be the ones providing care to women in labor because their attendance at the bedside during the labor and delivery process contributes to a decrease in maternal and neonatal mortality (Lavender, 2016)

Haiti

Haiti is a country that unfortunately has undergone devastation, especially within the past decade. In 2010, Haiti experienced the infamous earthquake that caused utter destruction among the capital and surrounding territories. The earthquake claimed over 200,000 lives, injuring over 300,000 and displacing over one million people (Amibor, 2013). Nearly seven years later, in October of 2016, Hurricane Matthew targeted the country that has still not fully recovered structurally nor economically causing 1,000 fatalities and leaving the western portion of the country in ruins. (Delva, 2016). These uncontrollably detrimental circumstances negatively

impact the progression of the entire country and can cause particular improvements to plateau in their success. However, with recognition of these influences on maternal mortality statistics, as well as recognition of other contributing factors, there is opportunity to improve and implement strategies to combat against these circumstances in order to progressively lower the rates. As a result of ruinous events such as natural disasters, disease outbreak is not an uncommon result. Haiti has suffered from cholera outbreaks especially following major natural disasters and it is important to consider these factors when analyzing contributing factors of maternal mortality. Following the earthquake in 2010, researchers identified 263 pregnant women positive for cholera; however, with treatment of IV fluids and erythromycin, there were zero outcomes of maternal death (Tran, Taylor, Antierens, & Staderini, 2015).

Hemorrhage accounts for the highest cause of maternal death in the Caribbean at 23% with hypertension at a close second at 22%. In Haiti, hypertensive disorders including preeclampsia and eclampsia account for 37.5% of maternal deaths with hemorrhage accounting for 22% (Jacobs, Judd, & Bhutta, 2016). In a study done in Deschapelles, Haiti, out of 270 women diagnosed with preeclampsia or eclampsia, five pregnancies resulted in maternal death (Raghuraman, 2014). Major contributing factors that can lead to these complications in pregnancy are chronic hypertension, obesity, and severe anemia. Research shows that Haitian women generally do have higher rates of high blood pressure (33%) versus those of other Caribbean countries (26.3%), (Jacobs, Judd, & Bhutta, 2016). This could be a result of many different factors such as diet and exercise, as well as socioeconomic status. A study done in 2005 correlated social capital with rates of hypertension in Haitian women of childbearing age. Out of 306 women 69% of the women who presented with hypertension were unaware of their medical status. Ultimately, women who were from a higher socioeconomic status had a decreased

likelihood of having hypertension (Malino, Kershaw, Anglely, Frederic, & Small, 2014). The study demonstrates that women from higher socioeconomic status were less likely to have uncontrolled or unknown diagnoses of hypertension because they were more likely to seek care from primary health care providers.

Through research in the past 25 to 30 years it is evident that some measures have helped in reducing such high incidences of maternal deaths; however, there is much to improve as a global community, especially within the borders of developing countries like Haiti. Research showed that globally, “more than 250,000 women died during or following pregnancy in 2015, most of which were preventable deaths. Every woman that died left children, widowers, family, and their communities behind,” (Kassebaum et al., 2016, p. 1803). This avowal is crucial to remember as it reminds us of the significance of maternal roles and the impact her loss would have on her surrounding loved ones.

Methodology

The data collected for this literature review includes a compilation of research articles that were analyzed in order to find trends with regards to causes of maternal mortality in Haiti as well as finding gaps in the literature. Research collection began with a broader scope of global rates and commonalities among contributing factors to such high rates of mortality. The research was then narrowed to focus on the rates and reasoning behind maternal mortality specific to the country of Haiti.

The articles for this review were compiled using CINAHL, Healthsource: Nursing/Academic Edition, and Medline with full text. They were found using various search terms including MATERNAL MORTALITY, CAUSES, INTERVENTIONS: HAITI, MATERNAL MORTALITY: HAITI, MATERNAL HEALTH, and search parameters including

full text, abstract available, peer reviewed, English language, and limited to articles published between 2006-2017. Abstracts were read to analyze relevance to the literature review topic. They are outlined in the Appendix.

Findings

Skilled attendance at birth

Research shows that a main contributing factor to maternal death is the lack of skilled birth attendance during labor. A retrospective designed study in Edo State of Nigeria implemented a Midwives Service Scheme (MSS) and analyzed outcomes of the incorporation of the program in order to find relationships between infant and maternal mortality rates and having skilled birth attendants available to women in labor. The findings of this study show significantly better outcomes for women and children and saw a drop in maternal mortality after implementation of the MSS (Adeyemo & Enuke, 2014). Skilled birth attendants are expected to have adequate knowledge and provide good quality care to patients. In a cross-sectional study done over a 10-year time span in West Azerbaijan Province, Iran, data was collected and analyzed in order to identify major contributing factors that led to maternal death. Significant findings were that substandard care and medical errors were the major factors that led to maternal death (Farrokh-Eslamlou, Aghlmand, & Oshnouei, 2014) and that out of 183 deaths, “54 cases (29.5%) had some chance to prevent, 45 women (24.6%) had good chance and finally, 66 cases (36.1%) had strong chance to prevent death” (Farrokh-Eslamlou, Aghlmand, & Oshnouei, 2014, p. 1400). Quality attendance and care was proven to reduce maternal mortality rates in another study done at Ridge Regional Hospital, Accra, Ghana. Through implementation of collaborative quality improvement activities in the hospital, the maternal mortality rate

decreased by 22.4% between 2007 and 2011, from 496 to 385 deaths per 100,000 live births (Srofenyoh, Kassebaum, Goodman, Olufolabi, & Owen, 2016).

Prior to the earthquake, it was estimated that only 25% of Haitian women delivered in a health care facility, with an estimated 16% of women having access to a skilled birth attendant for their delivery (Amibor, 2013). In 2009, it was reported that in Haiti there were approximately 1,949 physicians equivalent to 3 per 10,000 inhabitants, and 834 nurses and midwives or about one per 10,000 inhabitants (O'Malley Floyd, 2016). With the lack of trained health care personnel, it is no surprise that research has found that many Haitian women utilize matrones, or a traditional birth attendant, during childbirth and “as many as 90% of rural Haitian women still give birth at home without a skilled attendant” (p. 107). A study done in the Grand Anse Region of Haiti collected qualitative data through interviews with 379 women to determine perceived complications during a previous pregnancy and to analyze utilization of skilled birth attendance as well as health care facilities. The study found that only 4.5% of the women had a skilled birth attendant during delivery and 82.6% utilized a traditional birth attendant. Two women in this study died during the pregnancy or follow-up period consistent with a high maternal mortality rate (Anderson et al, 2008).

There is a lack of skilled medical personnel in Haiti; however, there are other reasons why Haitian women do not utilize skilled birth attendants for their pregnancies. Babalola (2014) found that Haitian women who have had previous pregnancies are less likely to utilize maternal health services and skilled birth attendants because they felt they had experience with pregnancy and childbirth.

Access to care

Many women, especially in developing countries, face various barriers to accessing health care including but not limited to physical accessibility, economic accessibility, time, cost, as well as transportation. Through interviews, researchers found that 50% of rural Haitian women stated they were unable to go to health care facilities and 83% could not access care due to financial barriers (White et al, 2006). Qualitative data collection through focus group discussions revealed that rural Haitian women surrounding Legoane, Haiti felt that the principal barriers to accessing health care facilities were corruption, distance to facilities and lack of transportation, as well as cost (Peragallo Urrutia et al, 2012). Babalola (2014) similarly found that women identified that the perception that distance to a health care facility is a major barrier to access to care and seeking skilled medical personnel for delivery.

Education

A participant in an interview conducted in Legoane, Haiti stated, “we not only lack institutions to take care of the people but we also lack education. If the people were at least educated, they would know that when they are sick, they would have to go see a doctor,” (Peragallo Urrutia et al, 2012, p. 98). It was also found that many women of rural Haiti stated that they did not know reasons why women die when they are pregnant (White et al, 2006). Some studies show that a high level of education is linked with a higher likelihood of utilizing maternal health services and having a skilled birth attendant during childbirth (Babalola, 2014). When women lack education and knowledge of the health care system, it can create a negative association with health care professions and creates social distance, which discourages use of maternal health services (Babalola, 2014). It was also found that specific knowledge about the risks of pregnancy and childbirth as well as the benefits of skilled birth attendance increases a

woman's likelihood to seek care during her pregnancy (Gabrysch & Campbell, 2009). On the contrary, sometimes higher education and knowledge of poor quality of care in certain health care facilities was associated with a lower likelihood that a woman would seek maternal health services (p. 7). Although most studies find a positive relationship between education level and use of maternal health services and delivery in a health care facility, in one study among women of Fond des Blancs and Villa, a rural Haitian village, lower level of education was associated with a higher likelihood of delivering in a health care facility (S raphin et al, 2015).

Discussion

Maternal mortality has been and continues to be a major problem in today's society and no person is excluded from its devastating outcomes. Although it is a global issue, developing nations especially suffer incredibly from high rates due to lack of resources and greater barriers to receiving maternal health care. It is crucial to identify these barriers in order to find and implement ways to improve outcomes of pregnancy and childbirth altogether.

Specific to Haiti, the major barriers that ultimately lead to increased rates of maternal mortality include lack of skilled attendance at birth, lack of access to health care facilities and services, as well as lack of education among women of childbearing age of the importance of seeking care during pregnancy and how to recognize potential complications of gestation.

Among various countries such as Ghana, Nigeria and Iran, research has found that implementation of quality care improvement systems and skilled birth attendance by trained physicians, midwives and nurses, have proven to create better outcomes for mothers and infants with regards to pregnancy and childbirth.

In Haiti, there is little research done on implementing interventions that facilitate skilled birth attendants; therefore, it is difficult to analyze the benefits of trained professionals at the

bedside specific to the country. Haiti has the highest rate of maternal mortality in the Western hemisphere, and research shows that a trained health professional attends a very small percentage of births (Jacobs, Judd, & Bhutta, 2016). This implies that Haiti could potentially benefit from the implementation of a program similar to the Midwives Service Scheme (MSS) of Nigeria, where skilled birth attendants would be more available to women in labor. If there were greater accessibility to trained birth attendants, there would be a greater likelihood that a woman would not die from preventable obstetric causes. Since the presence of a skilled birth attendant during childbirth is usually associated with better maternal outcomes, over time these results may incidentally influence Haitian women to experience a shift from utilizing traditional birth attendants and family members, to trusting and seeking care from trained health professionals, ultimately creating a decline in maternal mortality rates in this country.

Common themes amongst the existing literature with regards to access to care include geographic isolation with a lack of transportation as well as cost. In a country that has mountainous terrain and is considered the poorest nation of the Western hemisphere, these findings are not surprising. In many rural areas of Haiti, there may not even exist a paved road or any sort of public transportation, making it incredibly difficult for any person living in rural areas to travel to urbanized areas; regions where the majority of health care facilities are. Financial cost is also a huge barrier to accessing care. Provided there is a way of transportation, usually it costs money to utilize it, whether it is a car or motorcycle that requires gas, or a public bus that requires a ticket fee. Many women in Haiti do not have these required funds to pay for transportation, and some may live too far to walk to the nearest health care facility. Building health care facilities that are evenly dispersed across the country with roads that are easily accessible or the implementation of a mobile service accompanied by trained health

professionals in obstetrics that focuses on reproductive health would be ideal interventions for the country of Haiti in order to help minimize the barrier of lack of access to necessary health care.

Lack of education, especially amongst women in Haiti, remains a significant problem. Even in today's society, many women do not have the accessibility or funds to attend schools, and reproductive health is a subject that is commonly avoided. In most studies in Haiti regarding education related to pregnancy and childbirth, there was a positive correlation between higher education and utilization on maternal health services; however, one study did contradict this common finding and suggested that lower level of education was associated with a greater likelihood of delivering in a health care facility. This finding could be a result of the possibility that women who had lower levels of education may have sought care from a trained professional when they felt something was wrong during their pregnancy out of fear or variance in usual physical status. The study also found that women under 25 years old were more likely to deliver in a health care facility versus older women, who generally had a higher level of education (S raphin et al, 2015). This study was also done in a smaller village Fond des Blancs where there is a health care facility in close proximity in comparison to other rural areas of Haiti.

This literature review has limitations that include the lack of quantitative research in Haiti, especially with regards to maternal health and care. There are many gaps in the literature and few primary research articles that analyze existing data and then implement interventions with follow-up analysis in order to identify accurate statistics on why the rates of maternal mortality are so high compared to the rates of other countries in the Western hemisphere. There are barriers to conducting primary research in Haiti due to its lack of infrastructure and governmental corruption; however, it would be ideal to implement interventions, such as a

midwifery service or a teaching hospital that focused on educating Haitians on obstetric care and analyze the outcomes to determine if such interventions have a positive impact on reducing maternal mortality in Haiti.

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Appendix

Pub. Date	Author	Purpose	Design	Sample	Method	Findings	Research implications
2014	Adeyemo & Enuku	Focused on a target population in Edo State of Nigeria and analyzed the positive impact that having trained midwives at the bedside during childbirth had on the reduction of incredibly high maternal mortality rates	Data collected from patient records from January 2005 to December 2012.	Random selection of health centers in Edo South	Retrospective descriptive design	Better outcomes for maternal and child mortality rates with incorporation of Midwives Service Scheme	The government should include stakeholders in all health-related issues in their communities.
2007	Anderson, Morton, Naik, & Gebrian	To determine the probability of death of a child when the mother dies from maternal causes versus non maternal causes in rural Haiti	Interviews with family members of deceased mothers	Deaths between 1997 & 1999 in Jeremie, Haiti	Descriptive statistics and analysis of variance	If a family experiences a death related to maternal causes, there is a 55% chance the family will experience a death of a child that is under 12 years old. Non-maternal related deaths had no significant impact on probability of	Maternal death has a direct impact on probability of infant and child survival in rural Haiti. If a mother dies related to obstetric causes, children under the age of 12 are at an increased risk of mortality.

						a child dying within the same family.	
2015	Finlay et al.	Analyzed the probability of infant survival following maternal death.	Analyzation of all maternal deaths in two rural sites in Tanzania: Ifakara and Rufiji between September 1996 and December 2012	All maternal deaths in Ifakara and Rufiji Tanzania	Longitudinal research design	An infant who loses his or her mother during or within one year of childbirth has a significantly decreased likelihood of surviving to 1 year old.	Identify and implement strategies to decrease the rates of maternal mortality as it directly correlates with infant and child survival and development.
2013	Suri, Aggarwal, Kalpdev, Chopra, Sikka, & Vijayvergia	Examination of maternal outcome in patients with peripartum and dilated cardiomyopathy	Patient records from 1994 to 2010 of patients with cardiomyopathy at PGIMER, Chandigarh, India	38 women between 20 and 35 years old	Retrospective review of records	Maternal outcome is poor in patients with PPCM and high mortality is due to late referral of patients to our institute thus leading to delay in initiating the treatment.	Educating women on how to recognize cardiac signs and symptoms is crucial in preventing cardiac complications during pregnancy and early treatment is strongly advised for better outcomes.
2014	Farrokh-Eslamlou, Aghlmand, & Oshnouei	Data collected over a 10-year time span in West Azerbaijan Province, Iran on maternal deaths and contributing factors that caused them.	Patient records over a 10 year time span	183 patients that died from obstetric causes	Descriptive cross-sectional study	Substandard care and medical errors are the major contributing factor in both obstetric hemorrhage and HDP leading to	It is necessary to improve the quality of care at all levels especially in hospitals to respond obstetric emergencies

						maternal mortality	
2010	Graves, Rwamushaija, & Park	Evaluation of ability of misoprostol to help in reduction of postpartum hemorrhage.	Record review at nine facilities in Zanzibar on various indicators from April 2008 to March 2009.	19,303 cases pre-intervention. 17,033 cases post-intervention	Quantitative data collection	Use of misoprostol for PPH rapidly increased over the 10-month period surveyed, and the outcomes of PPH cases improved. The need for blood transfusions was significantly reduced, and significantly fewer PPH-related referrals and maternal deaths were witnessed	Misoprostol should be considered as a medication to have in birth facilities in case mothers experience post partum hemorrhage following childbirth.
2016	Srofenyoh, Kassebaum, Goodman, Olufolabi, & Owen	To evaluate the performance of a continuous quality improvement collaboration at Ridge Regional Hospital, Accra, Ghana, that aimed to halve maternal and	97 improvement activities were implemented from January 2007 to December 2011. Data were collected on outcomes and implementation rates of		Quasi-experimental, pre- and post-intervention analysis	Maternal mortality at RRH decreased by 22.4% between 2007 and 2011, from 496 to 385 deaths per 100 000 deliveries	Collaboration between health care workers, patients and activity coordinators are crucial in the development of successful programs to reduce rates of maternal mortality. Time and finances should be invested in these types of programs

		neonatal deaths	improvement activities				as this study reveals they provide benefit and better outcomes for maternal health.
2014	Babalola	To assess factors associated with utilization of maternal health services among women giving birth in Haiti between 2007 and 2012	Observational data from 2012 Haiti Mortality, Morbidity and Service Use Survey	14,287 women were interviewed and out of these, 5,414 (study population) gave birth between 2007 and 2012	Multilevel analysis	Women who have lower economic status, lack of education, and who have previously had multiple births have a lower probability of using maternal health services, predisposing them to maternal complications during childbirth	Education should be provided to women of rural Haiti, especially to those who have had previous births to re-emphasize the importance of skilled birth attendance and how to recognize signs and symptoms of complications of pregnancy.

2009	Gabrysch & Campbell	To analyze existing literature to identify the determinants of delivery service use	Databases PubMed and OVID's EMBASE, Global Health, Medline and Health Management Information Consortium were searched and 20 major determinants were identified	2 previous reviews and over 80 original articles	Literature review	Increased maternal age, education, household wealth, and lower parity were associated with an increased use of delivery services. Increased distance from facility was associated with a decreased use of delivery service.	It is crucial to educate women of childbearing age the importance of seeking care during pregnancy and childbirth and identifying ways for women to readily access health care facilities.
2006	White, Small, Frederic, Joseph, Bateau, & Kershaw	To further knowledge of health care seeking behaviors among pregnant women in rural Haiti	Semi-structured interviews between November 2003 and May 2004	82 women between 16 and 44 years old seeking prenatal care	Descriptive view	Major findings included: 25% of women did not seek care for a pregnancy-related illness, 32% delayed seeking care during their pregnancy, 65% identified that the reason why women die during pregnancy is from not seeking medical care,	The largest barriers to seeking care had to do with economic accessibility and inability to leave the household. Also, lack of education is an important determinant whether a pregnant woman having complications will seek care. Educating women in rural settings as well as minimizing costs for women to seek care are significant implications

						15% stated they did not know reasons why women die during pregnancy, 50% were unable to go to health care facilities, and 83% could not get care because of financial barriers	of this study.
2014	Raghuraman et al.	To define prevalence and clinical characteristics of preeclampsia and eclampsia at a hospital in rural Haiti	Analysis of medical records at Hopital Albert Schweitzer in Deschapelles, Haiti	270 women	Retrospective review and statistical analysis	Prevalence of severe preeclampsia, eclampsia and the incidence of associated complications, such as abruption, maternal mortality and stillbirths, is high at a rural Haitian hospital. 48 (17.8%) of the cases resulted in stillbirths and 5 (1.9%) of the cases resulted in maternal death	It is important to keep updating research on the prevalence of preeclampsia and eclampsia in pregnant Haitian women and figure out a way to triage women during the third trimester who are at high risk for poor outcomes in a low resource setting.

2014	Malino, Kershaw, Angley, Frederic, & Small	To assess the association between hypertension and social capital in rural Haitian women	30- to 45-minute interviews recording anthropometric information on all non-pregnant female patients aged 18-49	354 women were screened, 309 were eligible, and 306 was the final sample	Cross-sectional design	Social capital level score above the conceptual midpoint showed a 41% reduction in the likelihood of hypertension	Increasing social capital components that communities lack may ultimately reduce the rates of hypertension in these communities
2012	Peragallo Urrutia, Merisier, Small, Urrutia, Tinfo, & Walmer	To assess personal views of women's most pressing health needs, barriers, and how needs can be addressed	Focus group discussions among six communities surrounding Leogane, Haiti	52 adult women	Qualitative data collection	The most pressing needs were accessible, available and affordable health care, potable water, enough food to eat, employment, sanitation and education among other needs with barriers including corruption, distance to facilities and lack of transportation, as well as cost	To improve these barriers and meet needs of Haitian women, implementation of foreign and local groups to foster partnerships with government and prioritize community partnership and leadership is crucial

2015	Tran, Taylor, Antierens, & Staderini	To assess risk of fetal, neonatal, and maternal death associated with cholera during pregnancy	Meta-analysis from 1991-2013	737 women from six different countries	Random-effect non-linear logistic regression	Compared to results of 5.0% maternal death between 1969-1990, the rate of maternal death related to cholera in pregnancy reduced to 0.2% in this study.	Standard clinical protocols, early warning and preparedness and sanitation are pertinent in preventing maternal death related to cholera
2015	Séraphin et al.	To study the prevalence and determinants of institutional delivery in Fond des Blancs and Villa, Haiti	Cross-sectional two-stage sampling strategy from October to November 2011	575 women, ages 15-49 years old who gave birth in the 5 years preceding the survey	Descriptive and multivariate logistic regression	Prevalence of delivery was 45.4% (compared to national average of 25%) and women under 25 years old, women with less than a primary education and women who scored below the median on a poverty score index were more likely to deliver in a health care facility in this study.	Public health professionals should emphasize outreach and accessibility of care to women in rural Haiti. Educating women of childbearing age of the risks associated with pregnancy is incredibly important for preventing maternal death.

2008	Anderson, Naik, Feresu, Gebrian, Karki, & Harlow	To determine the incidence of perceived pregnancy complications & associated factors	15-20 minute interviews with women in the Grand Anse region of Haiti to determine what complications they experienced during previous labor	379 women	Descriptive statistics, multivariate logistic regression	Bleeding, fever, “great pain”, and perineal lacerations were among the most commonly reported complications. 3.2% of the women delivered in the hospital and 4.5% had a skilled birth attendant at the bedside during childbirth.	Visits to doctors were associated with lower reports of complications, implying a referral system and prenatal care is important in recognizing signs and symptoms of complications during pregnancy and can prevent unfavorable outcomes.
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