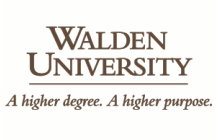

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The Impact of Free Healthcare on Hospital Deliveries in Sierra Leone

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This is to certify that the doctoral dissertation by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
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Abstract

The Impact of Free Healthcare on Hospital Deliveries in Sierra Leone

by

Salifu Salito Samura

MSc, Argosy University, 2011

BSc, Njala University, 1999

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

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Abstract

Improving maternal health has been a challenge for developing nations with very high rates of maternal mortality. Sub-Saharan Africa, particularly Sierra Leone, has some of the highest maternal mortality rates in the world. In an attempt to improve on this, the Sierra Leonean government enacted free maternal healthcare services in 2010. The Sierra Leone Free Healthcare Initiative (SLFHCI) provides free healthcare for pregnant women, lactating mothers, and children under 5 years old. This research explored the impact of the free healthcare on hospital deliveries. The determinant of health model was used to evaluate the effectiveness of the SLFHCI program, and a quantitative study design was used to analyze 1,200 samples of secondary data. Five research questions aimed to determine how the pre and postimplementation periods of the SLFHCI program impacted the rate of antenatal services usage, hospital deliveries, low birth weight deliveries, very low birth weight deliveries, and preterm deliveries. Descriptive statistics, chi-square tests, and logistic regression were used to analyze data. The results indicated improvements in antenatal visits, hospital deliveries, low birth weight deliveries, and preterm deliveries after adjusting for covariates. The results suggest that the SLFCHI program is an effective strategy for preventing low birth weight and preterm deliveries and for improving antenatal visits and hospital deliveries. The knowledge gained from this research could provide a roadmap for improving overall maternal care in Sierra Leone and other affected countries. Strategies to improve the quality of the SLFHCI intervention are worthy of further investigation.

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Dedication

This project is dedicated to my late father, Sana Samura, who believed in me and pushed me to achieve my dreams. May your soul rest in peace

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Chapter 1: Introduction to the Study

In the fall of 2000, the World Health Organization (WHO) issued the Abuja Declaration, in which 189 nations signed a commitment to improving the social and economic conditions of the poorest nations in the world by the year 2015 (WHO, 2011). This was elaborated in a series of Millennium Development Goals (MDGs) that were generated from the Abuja Declaration which required a commitment both from wealthy nations, to provide resources for improvement, and the poor nations themselves, to implement and maintain appropriate effort. The fifth MDG (or MDG 5) was to improve maternal health worldwide, which is a particularly challenging issue in the poorer developing nations (WHO, 2011). The WHO's (2014c) report on trends in maternal mortality from 1990 to 2013 noted that while maternal deaths have declined by 45% globally in that period, 62% of the approximate 289,000 maternal deaths in 2013 occurred in sub-Saharan Africa. Furthermore, this same region had the highest ratio of maternal mortality (MMR), with 550 maternal deaths for every 100,000 live births (WHO, 2011). Within sub-Saharan Africa, the nation of Sierra Leone had one of the highest MMRs in the world, with 1,100 maternal deaths for every 100,000 live births (WHO, 2011). Over a lifetime, a Sierra Leonean woman has a one in 21 (or approximately 5%) chance of dying from childbirth and pregnancy-related causes (WHO, 2014c).

In an attempt to achieve the MDG 5 goal of improving maternal health, Sierra Leone enacted free maternal healthcare services in 2010, which eliminated user fees for such services (Bertone et al., 2014). The Sierra Leone Free Healthcare Initiative

(SLFHCI) provides free healthcare for pregnant women, lactating mothers, and children under 5years old (Government of Sierra Leone, 2013). This and other efforts have indeed resulted in an improvement in maternal mortality in Sierra Leone. Between 2005 and 2013, maternal mortality dropped from 1,600 to 1,100 per 100,000 births (WHO, 2014c). This improvement is in contrast to the period between 1990 and 2000, when maternal mortality stayed relatively flat, with between 2,220 and 2,400 maternal deaths per 100,000 live births (WHO, 2014c). The stagnancy of the MMR in that period reflects the fact that it was a time of civil war and social and economic unrest, lasting from 1991 to 2002 (Bertone et al., 2014). This decade of conflict destroyed much of the health services infrastructure that existed in the country prior to 1990, leaving only 16% of previous health centers still operational, most of which were in the capital city of Freetown (Bertone et al., 2014).

It took almost 10 years, until the fall of 2010, for the government of Sierra Leone to gain a vision and the political will to begin to make substantial headway on the problems of maternal and infant care. In the post-SLFHCI era, several additional policies have been enacted to further advance healthcare in the nation, including establishing a performance-based financing policy, giving healthcare workers incentives to work in remote and rural areas, and increasing government budgets for healthcare (Government of Sierra Leone, 2013). However, despite this improvement, maternal healthcare in Sierra Leone remains unacceptably poor, and in 2013, the government of Sierra Leone admitted they would not achieve the 2015 goal set by the Abuja Declaration in 2000 (Government of Sierra Leone, 2013).

A number of causes have been cited for Sierra Leone's inability to achieve their targets, including the ongoing civil war in the mid-1990s, during which maternal mortality remained flat. The government also noted that until the SLFHCI was instituted in the fall of 2010, there were myriad additional problems: poor women often could not afford healthcare services; high rates of illiteracy meant that most women in Sierra Leone did not attend antenatal services or deliver in the hospital because of a lack of understanding the benefits of attending these services; the healthcare infrastructure was inadequate to care for the number of pregnant women and young children; travel for poor women in rural areas to reach healthcare facilities was long and challenging; and women had poor nutrition and poor or no care before and during pregnancies. In addition, healthcare staff members were often poorly trained and poorly motivated; and there were insufficient supplies, equipment, and medicines to help them (Government of Sierra Leone, 2013).

Complicating the poor nutrition and poor care were significant cultural barriers. Although women in Sierra Leone have a relatively high level of understanding about contraceptives, married women in particular rarely use contraception (Government of Sierra Leone). The government of Sierra Leone estimates that only 8% of married women use contraceptives, for reasons that include opposition from their husbands, a desire for more children, lack of knowledge about contraceptives, and fear of side effects (Government of Sierra Leone, 2013). An additional cultural factor derives from the fact that an estimated 90% of women in Sierra Leone have undergone female genital

mutilation, which also contributes to maternal mortality (Government of Sierra Leone, 2013).

In acknowledging that Sierra Leone will not meet the MDG 5 goals, the government of Sierra Leone (2013) identified four key challenges:

- improving the training and competency of medical staff;
- improving the physical infrastructure in clinics and hospitals, as well as in general (e.g., reliable electricity, clean water, and improved roads);
- providing improved levels of supplies, equipment, and medicines; and
- providing better financial and communications support to ensure that healthcare needs are properly funded and communicated.

Bertone et al. (2014) identified the establishment of the SLFHCI as the catalyst for the start of the large-scale rebuilding of the healthcare system in Sierra Leone. Because the SLFHCI is relatively newly implemented, there exist no research studies that have investigated the impact that the program has had on pregnancy outcomes in Sierra Leone. With this study, health professionals and policy makers can be informed about the benefits of the program and what modifications need to be made to achieve its goals of bringing down the infant and maternal mortality rate. This study also reveals the unknown of the impact of the SLFHCI on pregnancy outcomes in Sierra Leone.

This introductory chapter of the dissertation is organized into several sections. First, a brief review of the background research on the impact of free maternal care in sub-Saharan Africa in general and Sierra Leone, in particular, is presented. That is followed by the problem statement of this dissertation and the purpose of the study. The

theoretical basis for this study is also presented. The nature of the study then follows, which provides a brief outline of the more detailed description of the study methodology in Chapter 3. Key definitions used in this study are provided next, followed by the study assumptions, scope and delimitations, and limitations of the study design, which provide a context for understanding the generalizability of the study results. The final element of this introductory chapter is an explanation of the significance of this study. A brief conclusion then summarizes the key points made in this introduction chapter.

Background of the Study

Previous studies of free maternal healthcare systems in sub-Saharan Africa in general and Sierra Leone, in particular, focus oddly on problems with the initiatives rather than on maternal and pregnancy outcomes. Some of these studies are briefly described in this chapter. However, these studies are more completely investigated in the literature review in Chapter 2.

Studies of the Impact of Removing User Fees

Studies of free healthcare systems for maternal care in sub-Saharan Africa have considered a variety of impacts ascribed to the removal of user fees. For instance, Bosu et al. (2007) investigated how removing user fees for maternal healthcare services affected the maternal death rate (MMR) in two primarily rural and very impoverished districts in Ghana. This study found that the MMR declined in both regions after the removal of user fees for maternal care; though the declines were not statistically significant. The methodology used by Bosu et al. included systematic hand-screening of all reported deaths of women between the ages of 15 and 49 by senior nurses specifically trained in

midwifery. The study was also inconclusive regarding whether or not the decline in MMR in these regions was linked to the removal of user fees because the decline began while user fees were still in place.

A similar study by Dzakpasu et al. (2012) of a different district in Ghana was able to identify statistically significant healthcare trends after the removal of user fees. One difference between these two studies, other than the location, is that the study by Dzakpasu et al. used data collected by a computerized health surveillance system that covered all women of childbearing age in the area studied. The specific trends Dzakpasu et al. examined were the percentage of births at healthcare centers, the percentage of women enrolled in the free government insurance program, and socioeconomic measures. However, Dzakpasu et al. did not focus directly on the MMR, as Bosu et al. (2007) did.

A meta study of the impact of removing user fees for maternal care found a total of 16 studies of user fees, but only five investigated the removal of user fees (as opposed to the introduction of user fees; Lagarde& Palmer, 2008). These studies included two in Uganda and two in Kenya, plus one in South Africa, and all five were considered to have many confounding factors and a high degree of potential bias. However, the arguments posed in these studies were primarily theoretical, rather than being based on field studies showing the actual impact of user fees on maternal outcomes

Some studies have also revealed problems in the implementation of programs that remove user fees for maternal care. Witter et al. (2007) found that the initial attempts to eliminate fees for maternal care were less than successful due to issues with funding distribution, budgeting, and overall program management. By the end of Witter et al.'

study, Ghana was already changing its policy to instead implement a government insurance program that would cover all maternal care. A nearly simultaneous study by Asante et al. (2007) in Ghana measured the household out-of-pocket expenditures for maternal care. The fee-free policy was found primarily to benefit poor women in its early years because even small costs for normal or catastrophic deliveries simply took a larger piece of the poor women's income than of the wealthier women's income (Asante et al., 2007). The idea of eliminating user fees as a way of reducing the MMR was supported by a study by Campbell and Graham (2006).

Studies have also examined how women's use of free maternal care services is impacted by the degree of autonomy they have with respect to their own and their children's healthcare decisions. For example, Bako et al. (2011) noted that when women have insufficient autonomy to make their own healthcare decisions, the delay in getting a spouse, family member, or friend to give informed consent for healthcare practices can cause unnecessary maternal deaths. Women's autonomy in healthcare decisions was also tied to decisions about where they would go to deliver babies (Fotso, Ezeh, &Essendi, 2009). Similarly, Stephenson et al. (2006) found that spousal, family, and community factors were very strong influences on women's access to healthcare facilities.

Studies of the Sierra Leone Healthcare System

Recent (i.e., post-SLFHCI) studies of maternal healthcare in Sierra Leone have often focused on understanding barriers women encounter in receiving healthcare in terms of infrastructure issues, such as lack of staffing in healthcare centers, lack of transportation to healthcare centers, lack of emergency preparation in those centers, and

so on. For example, Kanu, Tang, and Liu (2014) conducted a study of the healthcare-related knowledge of rural women in Sierra Leone to assess how much they knew about the SLFCI and if they knew how to call the ambulance centers, health centers, and health posts during emergencies. As might be expected, the results of Kang et al.'s study indicated that rural women had largely inadequate knowledge of key maternal healthcare services.

Wurie, Samai, and Witter (2014) studied the accessibility of adequate healthcare by researching the level of staffing at health centers in Sierra Leone, looking particularly at the number of unfilled posts in the healthcare system. Wurie et al. found that the establishment of the SLFHCI, which was shortly followed by very substantial increases in healthcare worker salaries, improved the retention rate of healthcare workers, but the simple lack of trained personnel still meant that a huge number of positions are unfilled each year. Coyle and Harrison (2015) approached studying the Sierra Leone maternal healthcare system by researching deficiencies in the emergency medical services capability in Freetown. This study found that the infrastructure needed to provide effective emergency care was severely lacking even in the capital city (Coyle & Harrison, 2015).

Another recent study considered the impact of the type and location of delivery on maternal outcomes (Groen et al., 2013). This study looked at how family planning, type of delivery, and the number of caesarean sections affected the MMR in Sierra Leone. Interestingly, more than 2 years after free maternal healthcare services were instituted in

Sierra Leone, the very poor still reported that financial issues were a substantial barrier to care (Groen et al., 2013).

Studies of the Impact of Ebola on Sierra Leone's Maternal Care

In early 2014, an outbreak of Ebola became a national emergency in West African countries, including Sierra Leone. Nearly 8,500 cases of Ebola were diagnosed in Sierra Leone as of the end of 2014, resulting in more than 2,400 deaths (Jain, Brown, & Oliver, 2015). With the destruction of the healthcare system in the decade of civil unrest between 1991 and 2002, Sierra Leone's recovering healthcare system experienced—and is still experiencing—a further crisis as a result of this public health disaster. It is no surprise that a number of researchers have investigated how that Ebola outbreak has impacted the ability of Sierra Leone to provide quality maternal care.

Ebola certainly affected how women in Sierra Leone perceived the use of healthcare facilities. Dynes et al. (2015) investigated how women post-Ebola perceive using clinics for routine health services, why they may be reluctant to go to a health center, and their perceptions of how safe it was for them to go to such a healthcare center. This resulted in women refusing to go to hospitals during the Ebola outbreak for free deliveries and antenatal services.

The Ebola outbreak has disproportionately affected women in Sierra Leone because they are the caregivers for sick family members and the ones who prepare bodies for burial (Diggins & Mills, 2015). Menéndez et al. (2015) confirmed that assessment, noting that even before Ebola arrived, Sierra Leone was one of the worst places in the world to be a mother and that with Ebola's impact on healthcare, many of the gains made

in maternal health are likely to be erased. Diggins and Mills (2015) also pointed out the gendered inequality of Ebola, adding that factor to their investigation of government failures, infrastructure shortcomings, and cultural blindness. The more fundamental problem of maternal mortality reflects women's inequality with men and the fact that women are more impoverished as a gender (Diggins & Mills, 2015).

While each of these studies investigated aspects of the impact of free maternal care, none of them directly address the problem of how free maternal care, such as that provided by SLFHCI, impacts pregnancy outcomes. This knowledge, if addressed in current research, could provide a map for improving overall maternal care in Sierra Leone. In addition, other countries that provide free care or that deal with similar problems can use this [research as a model in improving healthcare in their respective countries.

Problem Statement

Sierra Leone has long suffered from high maternal morbidity and mortality rates, holding the unenviable position of last in the United Nations Human Development Index because of its alarming health indicators (WHO, 2013b). Maternal and child deaths peaked in 2000 after the civil war, with 1,900 mothers dying for every 100,000 live births; 296 children under 5 dying for every 1,000 live births; and for every woman who dies in childbirth in Sierra Leone, about 40 to 50 women suffer injuries due to complications during pregnancy or delivery (United Nations, 2014). According to Hulton et al. (2014), these problems are driven by myriad issues related to access, financing, and infrastructure within Sierra Leone's healthcare system. The government of Sierra Leone

took action to address these issues in April of 2010 by implementing the SLFHCI, which funds free maternity and child services in all public healthcare facilities (WHO, 2012a). These facilities quickly felt the effects of the new policy (Amnesty International, 2011) with record numbers of hospital births (WHO, 2012b) and significant increases in the numbers of pregnant women seeking maternal care (Government of Sierra Leone, 2013). According to the WHO (2014a), by 2013, the maternal mortality rate dropped to 857 per 100,000 live births, and the under-5 child mortality rate dropped to 140 per 1,000 live births.

Despite the improvements, maternal and child mortality rates remain unacceptably high, and Sierra Leone is not on track to meet the United Nations MDGs of reducing child mortality and improving maternal health by 2015 (Government of the Republic of Sierra Leone, 2013). Additionally, some observers from within the Sierra Leonean healthcare system have expressed concerns that the government's financial commitments will not be nearly enough to meet the additional demand the policy has placed on facilities and staff (Nove, Hulton, Martin-Hilber, & Mathews, 2014). Others have questioned the feasibility and appropriateness of the policy altogether, warning that it might lead to a decline in the quality of services, and hence, poor health outcomes for pregnant women (Amnesty International, 2011). According to the WHO (2014b), there has been no established study to evaluate the effectiveness of the program since its implementation in 2010 vis-a-vis hospital delivery. This study will provide information that will narrow the gap by assessing the impact of the program on antenatal services

usage, hospital delivery, birth weight of babies, and covariates such as smoking status, alcohol usage, age, marital status, geographic location, and educational level.

Purpose of the Study

The purpose of this cross-sectional quantitative study was to evaluate how the SLFHCI has impacted hospital deliveries in Sierra Leone since its inception in 2010.This timeframe allowed for data taken prior to the implementation of the programto be compared with years immediately after the implementation of the program. The independent variable was whether SLFHCI was in effect. The measured dependent variables included the rate of the use of antenatal services, the number of hospital deliveries, and the numbers of low birth weight (LBW), very low birth weight (VLBW), and preterm births (PB). These variables allowed a direct measure of the impact of the SLFHCI on pregnancy outcomes in a way that has never before been done in Sierra Leone.

Research Questions and Hypotheses

Using the determinants of health model, in this research study I evaluated the impact of the SLFHCI on hospital deliveries. The outcome of interest is the rate of use of antenatal services, the number of hospital deliveries, and the LBW, the VLBW of infants and preterm deliveries, which have been identified as the most important factors contributing to infant mortality (United Nations, 2014). According to the WHO (2013a), an LBW infant is one less than 5 lbs 8 oz (2.5 kg) at birth, and a VLBW infant is one less than 3 lbs 4 oz (1.5 kg) at birth. The research questions and the various hypotheses associated with each research question are as follows.

Research Question 1: SLFHCI and Rate of Use of Antenatal Services

Is the introduction of the SLFHCI related to changes in the rate of use of antenatal services, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)?

- Null Hypothesis 1:The rate of use of antenatal services remains the same before and after the introduction of the SLFHCI, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).
- Alternative Hypothesis 1: There is adifference in the rate of use of antennal services before and after the introduction of the SLFHCI, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).

Research Question 2: SLFHCI and Hospital Delivery

Is the introduction of the SLFHCI related to changes in the number of hospital deliveries, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)?

- Null Hypothesis 2: The number of hospital deliveries is similar before and after the introduction of the SLFHCI, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).
- Alternative Hypothesis 2: There is a statistical difference in the number of hospital deliveries before and after the introduction of the SLFHCI, controlling

for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).

Research Question 3: SLFHCI and Number of Low Birth Weight Babies Delivered

Is there an association between SLFHCI and the number of LBW babies delivered, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)?

- Null Hypothesis 3: There is no difference in the number of LBW babies delivered before and after the introduction of the SLFHCI, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).
- Alternative Hypothesis 3: There is a difference in the number of LBW babies delivered before and after the introduction of the SLFHCI, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).

Research Question 4: SLFHCI and Number of Very Low Birth Weight Babies Delivered

Is there an association between SLFHCI and the number of VLBW babies delivered, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)?

- Null Hypothesis 4: There is no difference in the number of VLBW babies delivered before and after the introduction of the SLFHCI, controlling for

maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).

- Alternative Hypothesis 4: There is a difference in the number of VLBW babies delivered before and after the introduction of the SLFHC services, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).

Research Question 5: SLFHCI and Number of Preterm Babies Delivered

Is there an association between SLFHCI and the number of preterm babies delivered, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)?

- Null Hypothesis 5: There is no difference in the number of preterm babies delivered before and after the introduction of the SLFHCI, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).
- Alternative Hypothesis 5: There is a difference in the number of preterm babies delivered before and after the introduction of the SLFHCI, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).

Conceptual Framework

As Patton (1990) stated, intervention theory examines the interaction between variables that can be used as a basis for predicting the impact of multiple variables on a target population, and it guides study designs in identifying target populations, treatments

protocols, and outcome measurements. According to Creswell (2009), the determinants of health model is one of the intervention models suggested by Evans and Stoddart that provides a broad conceptual framework for explaining multiple factors that influence health in a community. This model looks at the general factors that affect the health of the community instead of the factors that affect individuals, approaching health from different angles by combing public health, statistics, education, and epidemiology (Sidani& Braden, 1998). The present study used the determinants of health model to examine the SLFHCI, which provides assessments, treatments, and teaching in all areas of a pregnant woman's life based on the model that a healthy pregnancy outcome is determined by many intertwined economic, social, and physical factors such as access to care, education, marital status, smoking status, and past medical history.

While governments and nongovernmental organizations have operated on the desire to increase healthcare delivery by increasing spending (Frankfort-Nachmias&Nachmias, 2008), increased spending has not been matched byan appropriate increase in health outcomes, meaning there are other factors that influence health besides the provision of healthcare (Essendi, Mills, &Fotso, 2011). However, the goal of the SLFHCI is to produce healthy birth outcomes by providing a healthcare service that focuses on multiple determinants of health rather than focusing only on spending to solving the issues of maternal and child health. As part of the "war on reducing maternal and infant mortality," the SLFHCI was implemented to provide healthcare to the most vulnerable populations (pregnant women, lactating mothers, and children under 5) by

providing healthcare services that recognize the multiple determinants of health (social, biology, wellbeing, life behaviors, and physical; (Essendi, Mills, &Fotso, 2011, p. 27).

Nature of the Study

The present study was a cross-sectional quantitative study of the effect of the SLFHCI on hospital deliveries in Sierra Leone, with the outcomes measured as the rate of antenatal service usage, number of hospital deliveries, normal birth weight baby, a preterm baby, a LBW baby, or a VLBW baby. A cross-sectional study was used to compare infants born to women who received the SLFHCI services (2010–2013) to infants born to women before the implementation of the program (2007–2009). This study design helped to compare the independent variable (SLFHCI) and the dependent variables (rate of antenatal services used, the number of hospital deliveries, LBW, VLBW, and PB). The study used secondary data collected from the Ministry of Health and Sanitation in Sierra Leone, namely antenatal records issued between 2007and 2013 from the four major district hospitals in Sierra Leone, including Ola During Hospital in Freetown, Bo Government Hospital in the southern province, Makeni Government Hospital in the northern province, and Kenema Government Hospital in the eastern province. Demographic variables were also collected via immunization records, hospital admissions records, antenatal records, and under 5 records. Examples of these covariables include education, geographic locations, smoking status, age, alcohol use, cultural beliefs, and previous experiences.

This cross-sectional design was suitable for this study because it helps to look at the impact of the outcome variables on the program. The impact of the covariables such

as age, education, marital status, smoking status, and geographic locations can also be assessed. In addition, this design, with little or no cost, allows for an impact evaluation of the SLFHCI in general.

Definitions

Antenatal Records: It documents demographic characteristics, course of the pregnancy, identifies risk factors and the plan of management in a standardized format.

*Low birth weight (LBW):*An infant born weighing less than 2.5 kg but at least 1.5 kg (WHO, 2014d).

MDG 5: An acronym for the fifth MDG to improve maternal healthcare worldwide by the year 2015; these goals arose from the Abuja Declaration, signed by 189 nations in the year 2000 (WHO, 2011).

*Maternal mortality ratio (MMR):*A measure of maternal healthcare, defined as the number of mothers who die during delivery per every 100,000 live births (WHO, 2014c).

Normal birth weight: An infant born weighing between 2.5 kg and 4.2 kg (National Institute of Health [NIH], 2014).

Preterm birth (PB): A baby born at less than 37 weeks of gestational age (NIH, 2014).

Very low birth weight (VLBW): An infant born weighing less than 1.5 kg (WHO, 2014d).

Assumptions

This study assumed that the antenatal records in the four major government hospitals are representative of all births in Sierra Leone during the period in question.

This assumption may not reflect all births in the country, particularly those in very rural areas and where the births occurred outside a healthcare facility. Such births may not have appropriate birth certificates at all. The use of antenatal records from all four government hospitals provides broad coverage of all urban areas of Sierra Leone and their immediate vicinity.

A second assumption is that stillbirths can be ignored. No antenatal record is issued for such failed deliveries. Without scouring all female admissions at the hospitals during the periods in question, it was impossible to determine how many resulted in failed pregnancies.

Scope and Delimitations

The study providesinformation on the impact of SLFHCI on hospital deliveries in four hospitals. The study did not provide information on other hospitals in the country. It is not the scope of this study to prove causation, and therefore, cannot conclude that the policy change caused changes in hospital deliveries. In addition, the districts in which the study was conducted may differ from other districts inSierra Leone, and therefore, the findings may not be generalized to the entire country.

Limitations

An important limitation of the study was the omission of births not occurring in hospitals. Data from these were not in the system. If a systematic change occurred in the outcomes of these births, the study might suffer from selection bias. Unfortunately, no method is available for assessing the potential impact of this limitation on study findings. And since the SLFHCI program is a government-funded program, it was impossible to

design a study that would allow for full randomization. The study depended on Sierra Leone antenatal records, which are issued by the government hospitals in the four provinces of the country. Births that were not recorded in this way were not included in this study. There is no easy way to determine how many such births were omitted from this study. The inability to do so presents a threat to external validity and lack of randomization limits the generalizability of the results.

Further, the use of secondary data limits the researcher's ability to define variables and in turn, limits the robustness of the data analysis. This, in addition to the use of a preexisting data set, resulted in a study sample that may not be representative of the general population, and hence, posed a risk to the study's external validity. Also, important determinants of health, such as psychosocial health, support system, employment, housing, transportation, or nutrition, which may have coexisted with the significant determinants identified in this study, were not evaluated due to data limitations of the original data set.

Significance of the Study

The unknown fact about the SLFHCI is how much worse pregnancy outcomes, infant mortality, and maternal mortality might have been today if this initiative had not been implemented in 2010 (Donnelly, 2011). An effort to evaluate the impact of the initiative is essential to ensure that the program achieves its intended purpose of improving the health of mothers and increasing the survival of infants. And so, the purpose of this study is to measure the effectiveness of the SLFHCI and its impact on pregnancy outcomes. A secondary data analysis of the Sierra Leone linked birth data set

that comprises of all the birth records from villages, chiefdoms, districts, and provinces stored in the Ministry of Health office website was conducted to explore elements of the SLFHCI that have never been evaluated in any study. This research helps reveal whether the SLFHCI is able to meet its objectives of preventing pregnancy complications, bringing down the infant and maternal mortality rates, and improving general health indicators in line with the United Nations MDGs (WHO, 2012b). The research could also aid the evaluation of whether or not the implementation of the SLFCHI in 2010 affected the incidence of LBW and PBs for pregnant women at risk for poor birth outcomes. In addition, this study could help investigations of how the program has impacted pregnant women in terms of access to care and continuous treatments.

This study adds to the body of knowledge about the SLFHCI by evaluating its impact on hospital deliveries; hospital deliveries according to the provincial headquarter towns; and the influence of confounding variables such as the age of the mothers, maternal education, smoking, alcohol usage, marital status, and geographic location. This assessment could allow Sierra Leone public health professionals to understand the impact of the program and gain information that could guide changes to the initiative. It also adds to the existing research that examines ways to improve the SLFHCI in order to achieve the MDGs. This research helps to identify the antenatal services usage rate, the number of hospital deliveries, and birth weight. It provides an opportunity to impact social change, as the findings could facilitate evidence-based policy decisions, and therefore, improve healthcare in the public sector.

Summary

Sierra Leone has one of the worst records in the world for maternal and infant mortality (WHO, 2011). After a decade of civil unrest between 1991 and 2002, the healthcare infrastructure of Sierra Leone was all but destroyed, contributing to this problem. In 2010, the government instituted free maternal healthcare for women during pregnancy, delivery, and while lactating, and free care for children under the age of 5 (Government of Sierra Leone, 2013). Despite this new policy, the government of Sierra Leone admitted that it will not meet the MDG 5 for improving maternal care by 2015. The reasons proposed for this failure are complex, but they include the lack of healthcare infrastructure, illiteracy, lack of suitable roads allowing women to reach health clinics and hospitals, a lack of health facilities in rural areas, lack of antenatal nutrition and care, and lack of properly trained healthcare workers (Bertone et al.,).

While studies have been conducted on free maternal healthcare in sub-Saharan Africa in general, and Sierra Leone in particular, these studies tend to be qualitative investigations of perceptions of mothers and the barriers they encounter to reaching such care, the financial impact on government and mothers of such care, and how the autonomy (or lack of autonomy) of women impacts their abilities to use healthcare services. Studies in Sierra Leone, specifically, have mostly been similarly qualitative in nature or have addressed such issues as the staffing levels of healthcare centers or the ability of hospitals to provide emergency services, whether obstetric or other (Coyle & Harrison, 2015). One study (Groen et al., 2013) did investigate SLFHCI impact on maternal outcomes for rural women, but that study primarily found that more than 2 years

after the initiation of free healthcare, rural women still could not get maternal services at no cost.

A further group of studies in Sierra Leone has recently focused on how the ongoing Ebola outbreak has all impacted the healthcare infrastructure and usage that had been constructed since the end of the civil unrest 15 years earlier. These studies again have tended to be qualitative rather than quantitative (Bertone et al., 2014).

This brief review found that a significant gap in the literature exists that relates the establishment of SLFHCI directly to pregnancy outcomes, as measured by the birth weight of babies born before and after free maternal care was instituted. The purpose of this study was to evaluate that relationship using SLFHCI as the independent variable and the category of the babies' weights as the dependent variable (i.e., normal weight, LBW, VLBW, and PB). The research questions focus on the relationships between SLFHCI and the use of antenatal services, the use of hospital delivery services, and pregnancy outcomes.

The theoretical framework for this study was based on the determinants of health model, which provides the kind of broad conceptual framework that explains the influences on the health of the community. The design of this study was a cross-sectional quantitative study using secondary data from birth records from each of the four government hospitals in each province of the country. Other sources of data included immunization records and hospital admissions records to provide demographic data.

Key assumptions of this study include that the birth records in the four major government hospitals are representative of all births in Sierra Leone during the period in

question. The use of birth records from all four government hospitals provides broad coverage of all urban areas of Sierra Leone and their immediate vicinity. A second assumption is that stillbirths can be ignored. No birth certificate is issued for such failed deliveries. The scope of this study is all hospital births recorded in the four government hospitals in Sierra Leone during the period from 2007 to 2013.

The key significance of this study is that the results presented here may be used to understand better what needs to be done to achieve future MDGs in maternal health. The research also evaluated whether or not the implementation of the SLFCHI in 2010 affected the incidence of LBW and PBs for pregnant women at risk for poor birth outcomes. In addition, this study investigated how the SLFCHI has impacted pregnant women in terms of access to care and continuous treatments. The following chapter of this dissertation presents an in-depth review of the literature on this research topic.

Chapter 2: Literature Review

Introduction

Sierra Leone is a very poor developing country with a healthcare system rated by the WHO as one of the worst in the world (WHO, 2013b). A particular problem for the country has been maternal and child morbidity and mortality, a problem that is driven by issues that include access, cost, and availability of healthcare for mothers and children (Nove et al., 2014). The importance of quality maternal care as a determinant of the overall health of a nation is emphasized by the fact that 99% of maternal deaths in the world occur in low-income countries, and that in most areas, each woman who dies in childbirth is matched by between 15 and 30 others who sustain lifelong illness and disability as a result of childbirth and pregnancy complications (Atinga& Baku, 2013). Specifically in Sierra Leone, a 2012 report found that even those mothers who delivered in hospitals had a 34% rate of severe acute maternal morbidity and a 1% mortality rate (Tamura et al., 2012). Causes of morbidity and mortality in this study included factors such as hemorrhage, obstructed labor, sepsis, hypertensive disorder, and other conditions. The study by Tamura et al. (2012), conducted between January 2009 and July 2011, included three other nations as well as Sierra Leone: Burundi, Democratic Republic of Congo, and Somaliland. This study found that out of the four nations, Sierra Leone had the highest rate of hemorrhage, sepsis, and undetermined severe morbidity, and a very high rate of obstructed labor and hypertensive disorders. Sierra Leone also had the highest rate of mortality across all categories except hypertensive disorders and other morbidities, where it was the second highest among these nations (Tamura et al., 2012).

The introduction in February 2010 of the SLFHCI was designed to address these issues by providing free maternal and child care in all public healthcare facilities in the nation (WHO, 2012a). While the SLFHCI has dramatically improved overall maternal and child mortality, the rates are still too high, and the country is not likely to meet United Nations goals for the year 2015 (Government of the Republic of Sierra Leone, 2013). In this study, I investigated the impact of the SLFHCI in terms of understanding if it is achieving the goal of reducing morbidity and mortality in mothers and infants.

This literature review is organized into several sections. First, I present a description of the literature search strategy. That is followed by a review of the theoretical foundation of the study. Next, studies that present factors that influence women using medical services for obstetric care are reviewed. This section is followed by studies that present evidence of the impact of the SLFHCI in Sierra Leone. Since similar fee-exempt and free medical services for maternal care have been instituted in various ways in other sub-Saharan nations, the next section investigates how those policies have affected maternal and infant outcomes. The following section considers the impact of the 2014 outbreak of Ebola in Sierra Leone—an outbreak that was ongoing as this dissertation was written. A number of very recent studies have begun to appear in the literature that assessed those impacts. Finally, the literature review is summarized for the types of research approaches taken in the literature, summaries of the results discovered in this search and a description of a significant gap in the research that this current study attempts to address.

Literature Search Strategy

This literature search was conducted using the databases of MEDLINE, ERIC, CINAHL and Academic Search Premier to access contemporary journal articles. In addition, recent references from the articles identified provided further depth to the search. A variety of search terms was used to explore the topics of interest, including various combinations of *maternal healthcare, Sierra Leone, Africa, free healthcare, maternal morbidity, maternal mortality, impact of free healthcare*, and so on.

Excluded from this review were papers that addressed issues outside of sub-Saharan Africa. Papers from other sub-Saharan Africa countries, excluding South Africa, were included to provide perspective on similar cultural and economic environments. Since the SLFHCI began 5years ago, in 2010, papers also were generally excluded if they were more than 5 years old, although some papers slightly older were included if they were of particular relevance or provided pre-SLFHCI background and context. All papers were taken from peer-reviewed sources or from recognized government agencies or other well-respected organizations.

Conceptual Framework

Many factors influence health-seeking behavior such as access to antenatal services and hospital deliveries. This cross-sectional study of the impact of the Free Healthcare Initiative on pregnancy outcomes in Sierra Leone required the use of a theoretical framework that examines the different factors within the social, physical, healthcare services, and lifestyle behavior of its population. Many studies do not explicitly use a theoretical framework when evaluating the impact of free healthcare on

pregnancy outcomes. However, there are few researchers who have used determinants and intervention models to determine which variables to measure and the relationships among those variables. An example of such research is one conducted by Hulton et al. (2014).

Hulton et al. (2014) identified a key model for establishing accountability in maternal and newborn health policies both at a national and a regional level. Using data from six African countries, Ethiopia, Ghana, Malai, Nigeria, Sierra Leone, and Tanzania, the Evidence for Action (E4A) program created this multilevel model to provide a mechanism for improving maternal and newborn morbidity and mortality rates in these developing countries (Atinga & Baku, 2013). The core of the model involves the collection of evidence in maternal and newborn healthcare experiences in an efficient manner that allows it to be updated to fill any gaps detected (Abor et al., 2011). In conjunction with this evidentiary effort, the model also establishes accountability mechanisms based on that evidence and evidence-based advocacy to establish appropriate and timely political decisions (Hulton et al., 2014). In the next tier of the model, stakeholders make evidence-based decisions while the accountability mechanisms feed forward to establish political momentum directed at improving maternal and infant mortality and morbidity (Bertone et al., 2014). Advocacy and accountability combine to generate more resources and more efficient use of those resources to address the issue (Atinga & Baku, 2013). These, in turn, generate better healthcare services for mothers and children, and this ultimately saves lives (Hulton et al., 2014).

Specifically in Sierra Leone, the Hulton et al. (2014) report noted that while there was strong political will to improve both the transparency and accountability of healthcare financing, the supporting data simply was not available and was often incomplete. This made it difficult for district health managers to plan budgets appropriately, resulting in inefficient, inequitable resource allocation (Government of Sierra Leone, 2013). The identified problem resulted in the development of a health budget scorecard that was then used in the next election to lobby candidates for improved data collection and increased healthcare allocation (Hulton et al., 2014). Hulton et al. concluded that the union of social accountability, political will, and improved data collection and analysis should ultimately provide improved healthcare for mothers and children.

The importance of conducting research to understand the impact of reducing user fees in low-income nations was underlined by a metastudy of available evidence conducted by Lagarde and Palmer (2008). This study noted that the lack of strong evidence was real, and called for a series of carefully designed studies (Lagarde & Palmer, 2008). Coyle and Harrison (2015) suggested that impact studies to identify the actual impacts of significant changes to national healthcare policy should be conducted so that the chosen actions have the desired impacts (Lagarde& Palmer, 2008).

Factors Influencing Use of Maternal Services

This study follows the advice from Creswell (2009) in using the determinants of health model as one that can offer a foundation of the elements in a community that impact the health of mothers. The specific factors addressed by the SLFHCI program

include social, biological, well-being, life behaviors, and physical aspects of the community that enable proper healthcare for the vulnerable groups of pregnant and lactating women, and children under the age of 5 (Government of Sierra Leone, 2013). This section considers the factors that previous studies have found to be determinants of the use of maternal services in prior studies.

It is essential to be aware that despite the rush to eliminate or strongly reduce fees for maternal care, the factors that influence use and availability of maternal healthcare are fluid and impacted by changes in political policies. McPake et al. (2013) noted that early assessments of the impact of such fee-exemption policies on theuse of resources often reached conclusions that are no longer sustained by more recent studies. Changing government policies have also caused corresponding changes to those impacts, to the extent that now the most pressing problem in most countries is a shortage of trained healthcare workers (McPake et al., 2013). The effect of this is to emphasize the urgent need for policymakers to coordinate with human resources management to provide needed staff levels of healthcare workers who are properly trained (McPake et al., 2013).

The importance of community factors such as the status of women in determining the usage of healthcare facilities has often been a neglected issue, with researchers focusing more on individual factors such as the status of women, education, income, and so on. Goen et al. (2009) found that a combination of individual, household-level, and community-level influences was important in determining whether a woman would use healthcare facilities to deliver her child. Atinga and Baku (2013), found that if

community factors are well coordinated with individual factors there is greater possibility for women to deliver their babies in a health center.

Stephenson et al. (2006) studied communities in six African nations, three in West Africa (Ivory Coast, Burkina Faso, and Ghana) and three in East Africa (Kenya, Malawi, and Tanzania). While specifics varied from country to country, there were two common factors in determining the use of maternal healthcare services in all six nations: receiving antenatal care and having delivered a previous child in a healthcare facility (Goen et al., 2009). This finding indicates that some form of selectivity bias may come into play: Those who choose to seek antenatal care from a healthcare facility may be more inclined to want to deliver there too. The specific community-level factors that most influenced this decision were similar across all nations in the study and included community-level socioeconomic success, female autonomy, and community fertility norms (Goen et al., 2009).

Burkina Faso

A useful framework for understanding the use of maternal services was identified in a study of rural Burkina Faso, a West African nation which, like Sierra Leone, is ranked as one of the poorest countries in the world (De Allegri et al., 2011). Burkina Faso also has reduced user fees for maternal care for its poorest women in an attempt to improve maternal and infant morbidity and mortality (De Allegri et al., 2011). While antenatal care and basic drugs such as iron and antimalarial prophylaxis drugs are free, women are required to pay low fees for birth (Groen et al., 2013). De Allegri et al. (2011) estimated those fees as approximately $1.70 (USD) for an uncomplicated delivery,

approximately $3.40 for a complicated delivery, and approximately $20.60 for a caesarean section; these fees are approximately 20% of the actual cost to perform these services. De Allegri et al.assessed the impact of these fee reductions on maternal care through a framework based on a variety of determinants. One surprise in this study was that the factors generally considered important from other studies were not statistically significant; these included mother's age and education(De Allegri et al., 2011). Household income was negatively associated with theuse of antenatal services but unrelated to childbearing in healthcare facilities (Bertone et al., 2014). While the reduced costs facilitated access across all income groups, they could not overcome the barriers due to difficulty in travel to facilities (De Allegri et al., 2011). In fact, thedistance between the woman's home and the healthcare facility was the single biggest determinant of using maternal care. Other factors identified included religion (Christian, Muslim, or African animism) and tribal ethnicity, possibly due to different perceptions of risk and benefits from medical care in childbirth from different ethnocultural backgrounds (De Allegri et al., 2011).

Ghana

Ghana's free maternal healthcare has provided at least some antenatal care for nearly all mothers, yet almost half of babies are still born at home rather than in a hospital (Atinga& Baku, 2013). While most women attend antenatal visits as suggested, the use of antenatal, delivery, and postnatal services tends to be very low in Ghana (Abor, Nbekah-Nkrumah, &Sakyi, 2011). The types of factors that influenced maternal services usage in Ghana included basic demographics such as mother's age, type of birth, education,

ethnicity, location, and economic status (Abor et al., 2011). Factors that have been shown to explicitly impact the decision of whether or not to use healthcare facilities for childbirth irrespective of the use of antenatal care, included how pleasant antenatal care interactions were, whether the mothers had privacy during antenatal visits, how attentive the mothers perceived the medical staff to be, whether the healthcare facilities were perceived to be adequate, whether medications were available when needed, and whether their spouses accompanied them to the antenatal visits (Atinga& Baku, 2013). Interestingly, these factors remained statistically significant even adjusting for such factors as the mother's age, education, trimester of antenatal visit, and distance to the healthcare facility (Atinga& Baku, 2013).

Kenya

In understanding why women make use of healthcare services for maternity care, a qualitative study in two Nairobi slums found that women preferred to use healthcare facilities, but they faced a variety of barriers (Essendi, Mills, &Fotso, 2011). Among these barriers were poor or ineffective families decision-making, inadequate access to transportation to reach the healthcare facilities, the cost of such maternity services, and poor quality healthcare as defined by poor customer service and poorly equipped and supplied hospitals serving the slums (Essendi, Mills, &Fotso, 2011). These authors emphasized the importance of providing support for the family, community, and health center levels. Essendi et al. (2011) identified the further need for ongoing intensive community education to inform women of the availability of maternity care services.

A separate review of the impact women's autonomy has on their utilization of maternal healthcare services was conducted in the slums of Nairobi. While rural women may have difficulties, Fotso, Ezeh, and Essendi (2009) focused on the urban poor, in part because they claimed United Nations statistics indicate that by 2030, the majority of sub-Saharan Africans will live in urban areas. Specifically, Fotso et al. focused on where the women chose to deliver their babies, either not at any facility, at a facility deemed "inappropriate" because of its unlicensed state and inability to meet minimal healthcare standards, or at a facility deemed "appropriate" because it met basic healthcare standards for maternal care. The inappropriate facilities were all located in the slums where the women lived; the appropriate healthcare facilities were located outside the slums, either on the outskirts or other locations in the city far from where the women lived. Fotso et al. used five determinants of autonomy: discretion over earned income, ability to make economic decisions, freedom from violence or intimidation, freedom of movement, and ability to make healthcare decisions. The results demonstrated that greater overall autonomy, greater freedom of movement, and greater decision-making ability did not affect the choice of delivery locations (Fotso et al., 2009). Despite that result overall, Fotso et al. (2009) did find that in the lowest-income women, lower autonomy resulted in greater usage of appropriate maternity services. Overall, however, the greatest correlates of maternity service usage were those of women's education and income, along with the use of antenatal services during pregnancy. This was particularly true if, during the antenatal care visits, the women were advised to give birth in the hospital (Fotso et al., 2009).

Zambia

In contrast to that experience in Ghana, in Zambia, 15 months after free healthcare for the poorest people was put in place, overall experiences with the government-run healthcare were generally positive and usage of public health facilities increased by 55% (Masiye, Chitah, & McIntyre, 2010). Some drug shortages were identified in Zambia (Masiye et al., 2010), but nothing like the shortages reported in Ghana (Atinga& Baku, 2013). Further, when fee-free, high-quality healthcare was made available in Kenya via a research program, the number of infants seen in sick-child visits increased 191%, with the greatest increases seen about 3to 6 months after the initiation of the program (Burgert et al., 2011). The perceived high quality of the provided free medical care, combined with its zero-cost, were considered key factors in increasing the willingness of parents to bring their infants and young children in for treatment when they were ill (Burgert et al., 2011).

Various African Nations

In three West African nations (Senegal, Mali, and Ghana), the use of community-based health insurance has also been positively associated with maternal healthcare as long as the health insurance program includes maternal healthcare in the benefits packages (Smith &Sulzbach, 2008). Hsia et al., (2012) found strong evidence that community-based health insurance provides some financial protection by reducing out-of-pocket spending. There is evidence of moderate strength that such schemes improve cost-recovery (McCarthy et al., 2012).

The African Health Profession Regulatory Collaborative for Nurses and Midwives (ARC) includes a broad swath of eastern African nations from Ethiopia and South Sudan in the north to Namibia and South Africa in the south (McCarthy et al., 2014). This 17-nation organization uses an Institute of Healthcare Improvement conceptual framework to identify specific areas of improvement through collaborative efforts and expert input, then construct a short-term (6 to 15 month) action plan designed to address those specific needs (McCarthy et al., 2014). This framework for improvement addresses a five-stage stepwise progression from low capabilities to high capabilities through an evolutionary process of improvement. McCarthy et al. (2014) illustrated how regulatory functions transition from basic data collection about specific healthcare issues made through an ad hoc, manual process to one in which the data collection process is optimized and includes technological collection of data in such a manner that the healthcare process involved is continually improved and refined (McCarthy et al., 2014). This type of capability maturity model is one that can be applied to a broad spectrum of healthcare issues.

Another framework for assessing emergency medical care in sub-Saharan Africa used a combination of six determinants to assess the quality of healthcare available in five countries: Ghana, Kenya, Rwanda, Tanzania, and Uganda (Hsia et al., 2012). The determinants used included basic infrastructure, equipment available, medicine storage, infection control procedures, education of staff, and overall quality control. The results provided a measure of how far these five nations have to go to provide effective care for their people. Between half and three-quarters of the hospitals had no reliable electricity or

even running water; between half and four-fifths could not provide 24-hour emergency care. Only 18% to 41% of the facilities had medications that were both current and unexpired. Fewer than half the facilities had adequate supplies to control infection and dispose of biomedical waste properly. The number of trained personnel varied substantially, from a low of 14% to a high of 76%, depending on the nation (Hsia et al., 2012). Even more distressing, no hospital surveyed met even the minimum standards set by the WHO (Hsia et al., 2012).

Free Healthcare in Sierra Leone

After the implementation of the SLFHCI in 2010, one intervention implemented in rural communities was the provision of trained community healthcare volunteers to provide care. The use of the free healthcare for children under the age of five for three specific conditions, pneumonia, diarrhea and malaria, was tested pre- and postimplementation of this program (Yansaneh et al., 2014). Having such community healthcare volunteers increased the numbers of those seeking appropriate treatments for pneumonia by 105% and decreased those using traditional medical treatments for diarrhea by 55%. Those locations with community healthcare volunteers also showed a decrease in traditional treatment for malaria (Yansaneh et al., 2014). Overall, this study identified a significant improvement in healthcare for infants and children for these three common diseases when community healthcare volunteers were available locally. This reduced the overall burden on the free healthcare facilities and reduced reliance on traditional medical treatments (Yansaneh et al., 2014). In addition, the use of motorbike ambulances in rural Sierra Leone, through a program established in 2006, created a

mechanism for overcoming the distance-access barrier for obstetric emergencies (Bhopal, Halpin,& Gerein, 2012). This system of emergency transport, although available in only a few locations, appears to have achieved substantial acceptance in local communities and has demonstrated both accessibility and acceptability (Bhopal et al., 2012).

The success of the SLFCI in Sierra Leone, as based on initial assessments, can be explained in part by the well-organized implementation of the policy. Donnelly (2011) noted that a year after the 2010 SLFHCI implementation, the initiative was well organized, and had managed to establish good cooperation with stakeholders and development parties, something that did not occur in other nations' efforts to establish free or fee-exempt medical care for mothers. This occurred, according to Donnelly, because the president of Sierra Leone made healthcare a top national priority and political will were focused on establishing an organizational structure that could work to implement the policy effectively.

Longer-term assessments of Sierra Leone's free maternal care policies, however, are less rosy. Evidence indicates that women often still delay starting for the hospital until well after they begin labor, and that they often have to pay for transportation instead of receiving free government-supplied transportation; in addition, clinics and hospitals are often not prepared to deal with obstetric emergencies (Maxmen, 2013). Maxmen (2013) found that problems included the misappropriation (or simple loss) of donated and received medications and medical supplies; as much as one-quarter of medications never reached their intended hospitals or clinics. Furthermore, clinics and hospitals do not have reliable sources of electricity in many cases, in part because the nation's infrastructure

cannot supply 24-hour electricity (Maxmen, 2013). And while mothers are encouraged to stay in temporary housing near the hospital as their delivery date approaches, a policy that appears to be meeting with some success at avoiding long and painful travel while in labor, the clinics and hospitals often have too few trained medical staff people, something not easily or quickly corrected (Maxmen, 2013). Other studies support the notion that free medical care for mothers was not yet fully in place as of 2013. Groen et al. (2013) found that only 20% of women of childbearing age (i.e., 12 to 50) used contraceptives, and nearly 60% of deliveries still took place outside a healthcare facility. This study identified 53 maternal deaths in the year prior to the study, and 30 of those women received no medical care. More than half of these women's families cited financial issues as the reason for that lack of medical care (Groen et al., 2013). With supposedly free maternal care in place for 3 years prior to this study, Groen et al. concluded that the government's policies were still not fully implemented for all women.

Maxmen (2013) also noted there are specific cultural norms that fly in the face of improving maternal morbidity and mortality. These include a consistent desire for many children on the assumption that few will survive to adulthood, and the consequent early (early teen) and frequent pregnancies, both of which tend to be markers for increased maternal risk (Maxmen, 2013). Though contraceptives are free to new mothers, only 6% of married women use them (Maxmen, 2013).

One factor consistently associated with improved maternal morbidity and mortality is the availability of quality emergency care. Coyle and Harrison (2015) recently assessed the emergency medical services in Freetown, Sierra Leone's capital and

largest city. While deficiencies in emergency care were noted in the study, the availability of medications and quality staff were good, though the infrastructure was described as poor (Coyle & Harrison, 2015). While Coyle and Harrison citied a broad range of deficiencies, it should be noted that these hospitals are likely among the best in the nation, with rural and outlying facilities likely to have even lower assessments for emergency care capabilities.

Maternal healthcare was also investigated by Kanu, Tang, and Liu (2014), who assessed the healthcare knowledge of women with at least one child younger than 5 living in rural Sierra Leone. These researchers found that the basic knowledge of the participants lacked in terms of key topics such as pregnancy, delivery, neonatal care, basic sanitation, and prevention strategies for malaria, diarrhea, and pneumonia (Kanu et al., 2014). In addition Coyle & Harrison (2015) also found that pregnant women they lack the knowledge in calling the ambulance center when there is medical emergency.

Free Healthcare in Other Sub-Saharan Nations

Free healthcare as implemented in various sub-Saharan nations has presented substantially different outcomes depending on the implementation method and other factors. Other studies have looked at infrastructural problem, financial issues and budgeting. This section summarizes studies that have explicitly looked at the impact of free healthcare in various sub-Saharan African nations.

Burkina Faso

In Burkina Faso, various methods for identifying those most in need of free healthcare were tested. In this nation, individuals pay for government-sponsored health

insurance, but the costs of those fees are too high for the poorest citizens to afford (Ridde et al., 2011). Methods identified to determine who should be exempted from those user feeds included community-based targeting of the poor, individual identification of the needy, and state-led interventions (Ridde et al., 2011). All three methods had significant drawbacks, and none of the approaches yielded an effective mechanism for identifying those most in need of assistance, but the most effective was a community-based approach, in large part because of its emphasis on community solidarity (Riddle et al., 2011).

Ghana

Ghana instituted delivery of free healthcare in 2003 in an attempt to remove the financial barriers to quality care for mother and child in delivery and thus reduce morbidity and mortality (Asante et al., 2007). The primary mechanism for providing this healthcare was in the form of a national health insurance program (Dzakpasu et al., 2012). This was to ensure access to basic healthcare services to Ghanaians through district mutual and private health insurance schemes (Asante et al., 2007).

By 2007, households in Ghana paid about one-quarter less in out-of-pocket costs than before the fee exemptions were put into place (Asante et al., 2007). In spite of the intent of the program, however, Asante et al. (2007) found that rich households benefited more than the poorest families (the lowest 20% of income). Such results implied that early targeting of the fee-exemptionswas unsuccessful and did not provide the relief intended for poor mothers (Asante et al., 2007). With that said, maternal morbidity and mortality both decreased in two separate regions of Ghana, the Central Region and the

Volta Region, but the decreases were not statistically significant, providing further evidence that the initial implementation of the fee exemptions failed to achieve overall policy goals (Bosu et al., 2007).

Dzakpasu et al.'s 2012 longitudinal study of the usage rate of healthcare facilities for deliveries found that the number of women giving birth in hospitals has significantly increased, as has the percentage of families covered by the national insurance program. Furthermore, although the initial improvements in maternal care were weighted toward the rich, as noted in Bosu et al. (2007), by 2012 the improvements in maternal care had equalized, as the poor achieved greater support and greater levels of insurance coverage (Dzakpasu et al., 2012). Bosu et al., (2007) concluded that the goal of improving access to health care has been achieved at least among adult women living in the Accra Metropolitan Area.

In Ghana, a number of barriers to quality maternal care exist even in locations where government programs promise free care. Various studies have found that barriers to quality maternal care include inadequate access, inadequate essential supplies, too few trained healthcare personnel (Bosu et al., 2007). Furthermore, inadequate or no emergency transportation to healthcare facilities, poor referral services, and even rumors of debilitating outcomes for those who do use government free healthcare (Atinga& Baku, 2013; Briesen et al., 2010).

Nigeria

A study of determinants of maternal care services in Nigeria found that the only factors that significantly indicated utilization of maternal care services were maternal

education at the individual level, household income at the household level, and living in an urban area with media saturation of information at the community level (Bibalola & Fatuisi, 2009). This study demonstrated that different indicators operate at different levels, and the overall determinants of usage vary substantially. Therefore, successful interventions should reflect this underlying variability (Bibalola & Fatuisi, 2009).

Delivery of emergency obstetric care in Nigeria is further complicated by cultural issues in which the woman is not the arbiter of consent for medical procedures she undergoes. Bako et al. (2011) found that delayed consent was an important factor that tended to increase maternal morbidity and mortality and that the woman was able to give consent less than 6% of the time. The remainder of the time, consent had to be obtained from husbands (63%), in-laws, relatives, and others. When consent had to be obtained from someone other than the woman herself, receiving that consent was significantly delayed, and that delay resulted in statistically significant higher morbidity and mortality of both mother and child (Bako et al., 2011).

Uganda

Free healthcare was initiated in Uganda in 2001, but as of 2010, fewer than 22% of Ugandans actually took advantage of the free public healthcare services (Twikirize & O'Brien, 2010). The rationale for opting for paid private healthcare instead of free public healthcare was that the public services were perceived to be of poor quality, with medication frequently unavailable, staff that is poorly trained, and facilities that are overcrowded (Twikirize & O'Brien, 2010). Instead of the public services, Twikirize and O'Brien (2010) found that rural Ugandans commonly use paid community health

insurance plans, which are perceived to provide easier access, higher quality care, financial protection from catastrophic healthcare costs, and a sense of mutual assistance that fits with their community ethic. These authors concluded that the concept of free healthcare in Uganda existed only in principle but not in actuality. Even poor Ugandans were active consumers of healthcare services who evaluated their options in a rational way and made decisions based on receiving better quality care rather than the minimum cost.

Ugandan community health insurance programs, however, are still too expensive for the very poorest members of society to afford, and these people were dependent on government-provided healthcare in some form. Twikirize and O'Brien (2010) noted the potential to use basic demographic qualities (landlessness, physical location, orphan hood, etc.) as determinants of those who most need government healthcare assistance, allowing such aid to be better targeted. A separate study of rural Ugandans' usage of maternal healthcare services investigated the number of women who bypassed local health centers to travel to a more remote one for maternal healthcare (Parkhurst & Ssengooba, 2009). The impact of mothers going to preferred-but-not-local centers resulted in some facilities being underused while others were overburdened with mothers from relatively distant locations (Parkhurst &Ssengooba, 2009).

A government program that provides free 24-hour ambulance and communication service was found to increase the percentage of hospital deliveries significantly, double the rate of Caesarian sections, and slightly improve the percentage of stillbirths in rural areas of northern Uganda (Mucunguzi et al., 2014). This increase in accessibility to

healthcare facilities was determined to have saved lives while providing the service at a reasonable cost to the providers (Mucunguzi et al., 2014). Jain, Brown, and Johnson (2015) also found that in Sierra Leone the use of ambulance in emergency increases hospital deliveries and triple the rate of Caesarian sections in villages.

The Current Ebola Outbreak and Healthcare in Sierra Leone

The impact of delays in treatment for obstetric cases in Sierra Leone has been exacerbated due to the outbreak of Ebola in 2014. This global health emergency has dramatically increased the challenges to providing quality maternal care. Black (2015) noted that obstetric care is always highly hazardous for the spread of infection due to the prevalence of blood, sweat, breast milk, and other body fluids in the process of childbirth and postnatal care of both mother and infant. Because women often attend antenatal clinics where Ebola may be present, the mothers are placed at great risk even prior to childbirth (Black, 2015). Furthermore, Black noted that early clinical symptoms of Ebola are generic and are very similar to conditions such as malaria or typhoid, which do not carry the same extreme risk of infection to others. The result is that women with obstetric complications may present to a healthcare facility with symptoms that could be similar to those of an early Ebola condition (Black, 2015).

Menédez et al. (2015) supported Black's assessment of the vulnerability of women in an Ebola outbreak, noting a triple threat of reduced access to maternal care, the vulnerability of being primary caregivers for the sick in the home, and the vulnerability of having responsibility for preparing bodies for burial. Furthermore, Menédez et al. noted that some evidence exists to support the idea that Ebola may be sexually

transmitted by those who have recovered from the infection. In addition this makes women even more vulnerable since control of sex practices (abstinence, protected sex) is firmly in the hands of their spouses and not in the control of women (Dynes et al., 2015)

The Ebola outbreak has dramatically decreased the usage of healthcare facilities in Sierra Leone, with many reports of dramatic drops in usage starting after the epidemic broke out (Dynes et al., 2015). Gradually, however, usage of these clinics has increased, though it is not yet back to pre-Ebola levels (Dynes et al., 2015). The rationale for not using the clinics cited by the overwhelming number of respondents surveyed in Sierra Leone was fear of catching Ebola while there (Dynes et al., 2015). Even staff members had concerns, though according to Dynes et al. (2015), their fears decreased after the being trained in infection control procedures.

While Dynes et al. (2015) presented a fairly positive assessment of Ebola's impact in Sierra Leone, Jain, Brown, and Johnson (2015) have a less rosy perspective. They point out that Sierra Leone's healthcare system was already stretched very thin prior to the outbreak of Ebola, and the resulting disease has left that system as shattered as it was prior to the gains of the past decade. Jain et al. point out that Sierra Leone currently ranks fifth in the world for maternal mortality, with one in ten mothers at risk of death during childbirth; it ranks first for child mortality, with one in three children dying before the age of 5; and its ability to deal with existing tuberculosis and HIV cases has been destroyed as Ebola raged over the past year. Jain et al. urged that future responses to healthcare crises must take into account the need to preserve and enhance the healthcare

infrastructure in the affected countries in order to preserve the wellness levels that existed prior to any future outbreak.

Part of the impact of Ebola on women derives from cultural considerations. As Menédez et al. (2015) noted, Diggins and Mills (2015) also examined how women in Sierra Leone are typically tasked with both caring for the ill and preparing the dead for burial by washing the corpses. They cited Ebola as linked to maternal mortality in Sierra Leone, noting that there are gender distinctions even for diseases that may strike either men or women, and that women are frequently especially vulnerable to both maternal mortality and morbidity as well as to the impact of diseases such as Ebola. This disease has thus emphasized the socio cultural aspects of maternal mortality in the pandemic regions of West Africa (Diggins & Mills, 2015). According to Diggins and Mills, it is of vital importance to understand women's vulnerabilities not on an individual basis, but on the basis of the whole society's cultural patterns that make both women and men vulnerable, though in different ways and to different degrees.

The result of this combination of factors has been that women with obstetric emergencies may be suspected of Ebola and isolated while waiting for the 24 or more hours needed for a blood test to clear her of that disease and allow her entry to the healthcare facility (Black, 2015). Many women with an obstetric emergency may be bleeding profusely from pregnancy-related complications, may be unconscious at the time of arrival at the clinic, or may deliberately withhold contact information in order to protect the family, friends, and traditional birth attendants and to avoid being both stigmatized and refused treatment (Black 2015).

The ethical dilemmas presented by such circumstances are manifest, including concerns over delaying treatment to women suffering a life-threatening emergency due to fears that they might have Ebola, and concerns over forcing medical personnel into circumstances where they may be unavoidably exposed to the disease if the patient really does have Ebola. Complications are added because the personal protective equipment impedes the ability to do emergency obstetric surgery, making it highly risky for both patient and medical staff. Black (2015) reported that those health facilities that women depended on for obstetric assistance have been deserted by medical staff over thefear of the disease, death from Ebola, or being called to work in emergency Ebola clinics.

In addition, the Ebola crisis has interfered with the process of rebuilding the staffs of trained medical professionals in Sierra Leone that were completely destroyed during the rebel war. Miland and Bolkan (2015) cited a surgical training program that was severely disrupted by the reassignment of students to Ebola treatment. In particular, Miland and Bolkan noted that members of the community feared to be around medical professionals for fear that they somehow carried Ebola out of the healthcare facilities to where it might infect the general population. The authors also noted that maternal healthcare has suffered badly as a result of the Ebola crisis (Miland &Bolkan, 2015).

Summary and Conclusions

Research Methodologies Discovered

The research literature reviewed represents a wide variety of methodologies used to address the research questions. Many relied on qualitative techniques including interviews and community observations to understand the rationales for various decisions

and actions. Others used statistical analysis based on data collected by governments, non-governmental organizations, or healthcare facilities to determine their results. A few conducted meta studies using prior published research to identify trends and determine the reliability of results. Each of these approaches has inherent problems. Examples of each type of study are noted in the discussion that follows.

Qualitative studies have the advantage of being able to reach out to women who do not normally appear in government statistics to understand how and why they made their decisions about using maternal care facilities (Asante et al., 2007; Bertone et al., 2014; Kanu et al., 2014; McPake et al., 2013). The disadvantage of this approach is that the number of individuals who can be included in such an approach is limited by researcher time and availability. Fotso et al. (2009) extended this approach to a surprisingly large number of women individually interviewed, a total of more than 1,900, and Groen et al. (2013) interviewed more than 1,200 women. Studies involving multiple countries often made use of large-scale government or NGO-conducted survey data (Babalola &Fatusi, 2009; Essendi et al., 2011; Stephenson et al., 2006). These studies are often restricted to a single physical community within each country studied.

Quantitative studies generally have the advantage of larger numbers of participants. Generally these studies had participants numbering in the hundreds or thousands, providing the means to do proper statistical analyses (Bako et al., 2011; Bosu et al., 2007; Coyle & Harrison, 2015; Mucunguzi et al., 2014) The disadvantage of this type of study is that it may exclude or under represent those women who choose not to use healthcare facilities. Large-scale quantitative studies often used secondary data from

previous government or NGO data collection efforts as the basis for their studies (Dzakpasu et al., 2012). This limits the specific data items that can be used in the analysis to those collected in the prior survey. This is particularly true in cases where the source of data is based on the records of healthcarefacilities since such facilities have no way of keeping track of women who do not go there for medical care. On the other hand, most of the studies relying on healthcare facility data addressed questions specific to that facility, such as understanding where women going there for delivery lived, how far the traveled, and so on.

Meta studies reviewed published literature and evaluated them for content to draw large-scale conclusions about the issue studied (Lagarde& Palmer, 2008; Say & Raine, 2007). Often these studies covered multiple nations, so the results of individual contributing works had to be evaluated for consistency of measurement. While such metastudies are often considered the highest quality of evidence, conducting them can be challenging when each individual study considered uses different methodologies, different populations and samples, and different research questions.

Relevant Factors Identified in the Literature

The decisions women make in poor sub-Saharan African communities regarding where to deliver their babies and whether to seek medical assistance in those deliveries are based on a variety of factors identified in the literature. These include economic considerations, such as the socioeconomic status of the women, their households, and their communities, combined with the cost of care (Abor et al., 2011; Asante et al., 2007; De Allegri et al., 2011; Maxmen, 2013; Ridde et al., 2011; Smith &Sulzbach, 2008).

Simple distance and lack of affordable transportation to the healthcare facilities is another factor that recurred multiple times in the literature (Bibalola &Fatuisi, 2009; Burgert et al., 2011; De Allegri et al., 2011; Masiye et al., 2010). Another set of key issues, noted particularly in Sierra Leone, were problems with infrastructure, including lack of roads, and poorly funded, staffed, maintained, and supplied healthcare facilities (Atinga& Baku, 2013; Briesen et al.; 2010; Coyle & Harrison, 2015; Maxmen, 2013). The perception of the mothers and families of the quality of medical care available at the healthcare facility was also important (Atinga& Baku, 2013; Essendi et al., 2011). Cultural issues were similarly significant, including women's level of autonomy (Bako et al., 2011; Fotso et al., 2009; Maxmen, 2013). In addition, in Sierra Leone in particular, the Ebola outbreak that began in 2014 has had a devastating impact on maternal healthcare. Studies that identified the effect of this epidemic include Black (2015), Diggins and Mills (2015), Dynes et al. (2015) Jain et al. (2015), Menédez et al. (2015), and Miland and Bolkan (2015).

Studies also noted that a key to understanding the decisions made about maternal healthcare is the recognition that the determinants of those decisions occur on multiple levels, from the individual woman to her household, to her community (Goen et al., 2009), to national and regional policies (McPake et al., 2013). Two studies field-tested specific interventions, one that that provided community healthcare volunteers to assist with the three most common causes of childhood mortality (pneumonia, malaria, and diarrhea; Yansaneh et al., 2014), and one that provided free emergency transportation from rural areas to healthcare facilities (Bhopal et al., 2012).

Two studies provided an overarching framework for evaluating maternal health at a national or regional level (Hsia et al., 2012; McCarthy et al., 2014). McCarthy et al. (2014) focused on the sociopolitical dynamics between healthcare consumers, stakeholders, and government and regulatory agencies. Hsia et al. (2012) focused more on establishing a mechanism to evaluate healthcare quality at a national and regional level.

Gaps in the Research

The ongoing Ebola outbreak in Sierra Leone has complicated understandings of the state of maternal healthcare in that nation. Sierra Leone was hard-hit by Ebola, and one researcher described the healthcare system there as destroyed (Jain et al., 2015). Even research conducted as little as 2 years ago may not reflect current reality in that nation. Therefore, it is important to identify how the implementation of the SLFHCI has affected maternal and infant health outcomes. Almost no research was discovered that specifically investigated the effect of birth weight on infant outcomes in any sub-Saharan African nation and none in Sierra Leone in particular. Filling this research gap will result in an updated understanding of the state of maternal and infant health in Sierra Leone in the Ebola era. The current study attempts to fill this gap in part, through an analysis of the birth weights of infants and how they have been impacted by the implementation of the SLFHCI. The following chapter presents a complete description of the methodology used in conducting the research of this report.

Chapter 3: Research Method

Introduction

The purpose of this cross-sectional quantitative study was to evaluate how the SLFHCI that was introduced in 2010 to provide healthcare services for pregnant women, lactating mothers, and children under 5 has impacted pregnancy outcomes since its inception. Chapter 2 provided a detailed analysis of the literature to establish what is known about free healthcare access and use in developing nations. In this chapter, I give a thorough description of the steps that I took to conduct the research which includes the research questions and hypothesis, study design and approaches, study population and study sites, the steps that were taken to protect participants, data management and analysis, and dissemination of the study findings.

Research Design and Rationale

The independent variable in this study was whether SLFHCI is in effect. The measured dependent variables (outcomes) included antenatal service visits, hospital deliveries, the number of children with LBW, the number of children with VLBW, and the number of PBs. These variables allowed a direct measure of the impact of SLFHCI on hospital deliveries in a way that has never before been done in Sierra Leone. The covariates selected for analysis were age, education, marital status, geographic location, smoking status, and alcohol use during pregnancy. I analyzed data taken from the years just prior to the implementation of the SLFHCI and the years immediately following implementation of this program from the antenatal services databases of the Ministry of Health and Sanitation to answer the five research questions.

Justification for Using this Design and Approach

This study was designed to evaluate the outcomes of a free healthcare initiative that is intended to decrease infant and maternal mortality and its associated costs by reducing poor birth outcomes. I used a cross-sectional research design study to analyze secondary data in order to answer the research questions. This approach was suitable for this study because data on antenatal visits, hospital deliveries, and birth weights were readily available, as this information is regularly collected by community health clerks. The data collected from hospitals, clinics and health posts are stored in the Ministry of Health and Sanitation database. This database contains birth records and information on antenatal visits, hospital deliveries, and birth weights for health facilities over a 10-year period, making it possible to compare data on an annual basis at the district and chiefdom level.

It is noted in the literature that national survey databases capture data on large populations, which can be considered representative of the general population (Gilson & McIntyre, 2005). Secondary data provide information on past occurrences which otherwise would depend on individual recall. Different studies have used secondary data to assess the effect of user fees on healthcare provision and delivery. These studies conducted secondary data analysis using chi-square, logistic regression, and various statistical methods to investigate the past and present use (Lagarde& Palmer, 2008). Similarly, based on the intent of this study, the analysis of secondary data using simple descriptive statistics and logistic regression was most appropriate to compare the impact of the SLFHCI before and after the implementation of the program.

Methodology

Target Population/Size

Sierra Leone, a poor West African nation with a population of 6,500,000, was selected as the focus for this study (Government of Sierra Leone, 2013).In 2010, its healthcare system transitioned from a user fee system to one providing free healthcare for pregnant women, lactating mothers, and children under 5 (Donnelly, 2011). No comprehensive evaluation of the program has taken place since it implementation. The country is comprised of four provinces with major cities that provide healthcare to their respective regions: Makeni in the north, Bo in the south, Kenema in the east, and Freetown in the west. Freetown, the capital of Sierra Leone, has a population of about 1,200,000and is home to the largest children's hospital, Ola During hospital (Government of Sierra Leone, 2013). This government-owned and funded hospital is where most pregnant women and lactating mothers in Freetown go for medical care when needed (Donnelly, 2011). In Freetown, 528,000 women are between the age 15 and 49, and of this population, it is estimated that 1,100 women gave birth annually (Jain, Brown, & Johnson, 2015). The city of Makeni is the largest city in the north, and the Makeni government hospital is the largest government-owned and funded hospital (Government of Sierra Leone, 2013). The city has a population of 112,486 people, with 49,494 women between the childbearing ages of 15 and 49, of which 659 women give birth yearly (Government of Sierra Leone, 2013). The city of Bo is one of the six municipalities locally governed by the Bo city council and is currently estimated to have a population of 300,000 people, with about 130,000 women of childbearing age, of whom approximately

872 women give birth annually (Maxmen, 2013).Kenema is located in the east and has the Kenema government hospital, which serves a population of 188,463, of which 82,923 are women of childbearing age, and of this population, 701 women give birth annually (Coyle & Harrison,2015). These government hospitals are responsible for the management and delivery of healthcare services in their respective localities.

Sample and Sampling Procedure

Sample strategy. Data for this study were drawn from the years 2007 to 2013from the antenatal services database of the Ministry of Health and Sanitation Sierra. This database includes all Sierra Leone births, records from antenatal visits, and records for children under 5. This study included all women in the database and used elements from the antenatal records; the sources of data are the mothers.

The antenatal records provide information about the parents and infants including the delivery date, time and place, birth weight and length, plurality, marital status of the mother, smoking status, alcohol usage, and educational level. The records on children under 5 have information on immunizations, newborn health conditions, and follow-up visits. The antenatal records also include information on the medical history of the mother, number of pre-antenatal visits, and mother and father's occupation.

A number study conducted by Lagarde and Palmer (2008) investigated the reliability, validity, and congruence between birth certificate, antenatal records, hospital records, and maternal recall, and results show that there appears to be fairly consistent accuracy for birth weight, antenatal visits, gravidity, demographics, method of delivery, and parity. However, there is less congruence between birth certificate, antenatal records,

or hospital records on maternal medical history and smoking and alcohol use during pregnancy (Sidani& Braden, 1998).

Sample procedure. The original sample for this study included 1,200 women who gave births before and after the implementation of the SLFHCI in 2010. Once the data were received and cleaned for missing values, 1,190 births remained in the study. Dobie et al. (1998) found that data missing from various birth certificate elements and other hospital records ranged from 0 to 24%. In this study, the missing data ranged from 0 to 2.7%, meaning the Antenatal Services Database of Ministry of Health Sierra Leone contained complete data. While the SLFHCI has been in effect since 2010, which means that there is potentially 4 years of data available for analysis, this study only looked at 2011, 2012, and 2013 after implementation, and 2007, 2008, and 2009 before implementation. The exclusion of data from the years 2010 and 2014 is based on two factors: the initiation of the program in April 2010 (resulting in missing data from the first quarter) and the 2014 Ebola outbreak (resulting in potentially skewed study results). Demographic variables, which were collected from the Antenatal Services Database, included maternal age, marital status, educational level, smoking status and alcohol use, and geographic region.

Sample frame. Selection of the sample was based on the following eligibility/inclusive criteria. The inclusion criteria was composed of service utilization data from before the implementation of the SLFHCI, in 2007, 2008, and 2009 as included in the Ministry of Health and Sanitation antenatal services database from the four provincial government hospitals and service utilization data after the implementation of

the SLFHCI for 2011, 2012, and 2013 in the four provinces hospitals. Utilization data from private hospitals and healthcare facilities were excluded, as information from these facilities is not included in the database. Utilization data for the year 2010 were excluded, as the policy change took effect on April27, 2010, which prevented a true comparison for that period. Data for 2014 was excluded from the analysis because of the Ebola outbreak, which could potentially affect the results of the study.

Power Analysis

The Power and Precision^{TM} software program was used to conduct a power analysis to determine the adequacy sample size. Using a sample distribution for LBW infants in a binary logistic, 27 women would be required in each group, to test the null hypothesis that the SLFCHI did not have an effect on low birth weight (alpha 0.05, power=80%). In a multivariate analysis, Katz (2006) suggested that in addition to a sample size calculation, one could also consider that for every independent variable, the model requires, at least, 10 outcomes. Because this analysis used six covariates and five outcome variables for each analysis, this rule would indicate the need for at least 100 women in each group to be considered an adequate sample. The sample size of 1,200, of whom 312 had LBW babies, was adequate to detect even a small association between the intervention and the outcomes.

Data Management

I met with a research analyst from the Ministry of Health of Sierra Leone that had expertise in antenatal records, as well as the process used to link these documents from various hospitals, clinics, and health posts throughout the entire country. This meeting

was to determine which data elements should and should not be included in the research study files. The first database contained selected fields from the 2007, 2008, and 2009 antenatal records and the second database contained selected fields from 2011, 2012, and 2013 antenatal records. Each case in the records had a unique number that was linked to one woman and her infant.

The database information was saved in Word documents. All data in the databases were converted from Word documents to Excel with the assistance of the Central Statistic Office statistician. Data were reviewed to assure that there was the same number of records in the Word files as in the Excel files. Data were also reviewed for accurate conversion. In addition, I reviewed 10% of the hard copies of the antenatal records and compared them with the data set. If errors were found, the sample of the hard copies reviewed increased by 5% each time until no errors were found. This method allowed for a cleansing of the data if errors were made during entry or conversion of the variables. A data code was created to be used in Epi Info 7.1 to identify data elements such as the type of variables and variable values. As new variables were created by combing data or grouping data, these variables were added to the data codebook.

Data Analysis Plan

Pre-analysis data screening. Normality of the sample was based on the sample size (Frankfort-Nachmias&Nachmias, 2008). All variables were screened for missing data by reviewing frequency tables for each variable. While there were almost no missing data from the records, a number of fields did have unknown values that were eliminated

by subtracting from the total sample size. The combined missing data and unknown fields were lower for this population than reported by other research.

Data collection and analysis. I analyzed secondary data collected by the Ministry of Health and Sanitation of Sierra Leone to determine antenatal visits, hospital deliveries, and increase or decrease in birth weights and PBs. Records of antenatal visits, hospital visit and deliveries, and birth weights are maintained at the regional office in Freetown and based on data submitted by the hospitals, health centers, and health posts in the four major district hospitals on a monthly basis. The district antenatal visits and hospital deliveries, as well as VLBW, LBW, and PBs were compared before and after the introduction of the SLFHCI. Data from 3 years before the introduction of the program for 2007, 2008, and 2009 were compared with data after the introduction of the program for 2011, 2012, and 2013. Data from 2010 and 2014 were excluded from the analysis because the program was introduced in April2010 and because of the outbreak of the Ebola virus in 2014.

Intervention variable (SLFHCI). A dichotomized variable was created to indicate whether a woman had received the SLFCI or not. This was determined by whether data was from 2007, 2008, and 2009 antenatal service database of the Ministry of Health of Sierra Leone, or from 2011, 2012, and 2013 files.

Outcome variables.

- Antenatal visits: Data were categorized by entry into antenatal care by month. A dichotomized variable was created that included categories of one to three

months, or 4 to 6 months, 7 to 9 months, or whether they visited or not (yes or no).

- Hospital deliveries: Data were provided in a dichotomized fashion indicating whether or not the mother delivered in the hospital (yes or no).
- LBW babies: Babies were categorized as normal birth weight when the weight was greater than or equal to 2,500 grams or LBW when the weight was less than 2,500 grams.
- VLBW babies: Babies were categorized as very low birth weight when the weight was less than or equal to 1,500 grams. Babies with a weight that fell in the range of 1,501 to 2,499 grams were not included.
- Gestational period: This variable was provided in weeks and dichotomized by infants born 37 weeks or later (term) and less than 37 weeks (preterm).

Covariates.

- Age: Data on the age of the mother in the antenatal database were provided in years. The data were grouped into (a) 12–19.5, (b) 19.51–23, (c) 23.1–29, and (d) 29.1–46.
- Education: These data were categorized by the number of years in school (primary or none, some secondary, secondary and college, or graduate).
- Marital status: Data were grouped into married or not married.
- Geographic: Data were provided by district headquarter town of residence. Data were categorized as Freetown/Bo, Kenema/Bo and Makeni/Bo.
- Smoking during pregnancy: Data were dichotomized as yes or no.

- Alcohol usage during pregnancy: Data were categorized as yes or no.

Main Analysis

Research Question 1: Is the introduction of the SLFHCI related to changes in the rate of use of antenatal services, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)?

- Null Hypothesis 1: The rate of use of antenatal services remains the same before and after the introduction of the SLFHCI controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).
- Alternative Hypothesis 1: There is a difference in the rate of use of antennal services before and after the introduction of the SLFHCI controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).

Data analysis 1: Multiple logistic regressions were used to predict the impact of the program on outcome variable, antenatal services usage, adjusting for covariates (education, geographic location, marital status, age, smoking status, and alcohol usage).

Research Question 2: Is the used of the SLFHCI related to changes in the number of hospital deliveries, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)?

- Null Hypothesis 2: The number of hospital deliveries is similar before and after the introduction of the SLFHCI, controlling for maternal status

covariables(education, geographic location, marital status, age, smoking status, and alcohol usage).

- Alternative Hypothesis 2: There is a difference between hospital deliveries before and after the introduction of the SLFHCI, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).

Data analysis 2: Multiple logistic regressions were used to predict the impact of the program on outcome variable, hospital deliveries, adjusting for covariates (education, geographic location, marital status, age, smoking status, and alcohol usage).

Research Question 3**:** Is there an association between SLFHCI and the number of LBW babies delivered, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)?

- Null Hypothesis 3: There is no difference in the number of LBW babies delivered before and after the introduction of the SLFHCI, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).
- Alternative Hypothesis 3: There is a difference in the number of LBW babies delivered before and after the introduction of the SLFHCI, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).

Data analysis 3: Multiple logistic regressions were used to predict the impact of the program on outcome variable LBW babies, adjusting for covariates (education, geographic location, marital status, age, smoking status, and alcohol usage).

Research Question 4: Is there an association between SLFHCI and the number of VLBW babies delivered, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)?

- Null Hypothesis 4: There is no difference in the number of VLBW babies delivered before and after the introduction of the SLFHCI, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).
- Alternative Hypothesis 4: There is a difference in the number of VLBW babies delivered before and after the introduction of the SLFHC services, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).

Data Analysis 4: Multiple logistic regressions were used to predict the impact of the program on outcome variable VLWB adjusting for covariates (education, geographic location, marital status, age, smoking status, and alcohol usage).

Research Question 5: Is there an association between SLFHCI and the number of preterm babies delivered, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)?

- Null Hypothesis 5: There is no difference in the number of preterm babies delivered before and after the introduction of the SLFHCI, controlling for

maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).

- Alternative Hypothesis 5: There is a difference in the number of preterm babies delivered before and after the introduction of the SLFHCI, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage).

Data Analysis 5: Multiple logistic regressions were used to predict the impact of the program on outcome variable preterm babies delivered adjusting for covariates (education, geographic location, marital status, age, smoking status, and alcohol usage).

Instruments and Materials

I used a cross-sectional study design with secondary data collected through the Ministry of Health and Sanitation of Sierra Leone in the four provincial headquarters of Freetown, Bo, Kenema, and Makeni. These databases contain information on all services in government hospitals, health centers, and health posts from the entire country. The data were compiledby each health center using a standardized reporting system established by the Antenatal Services department of the Ministry of Health and Sanitation of Sierra Leone. The data are then collected monthly and submitted to the Health Office in Freetown. The submissions of reports from these health services are mandatory (Amnesty International, 2011). These records are maintained by the chief medical records administrator at the Ministry of Health and Sanitation in Freetown, in the Antenatal Services Database.

Protection of Human Participants/Ethical Considerations

I received approval from the Walden University IRB (Approval # 08-25-15-0302748) before I started the study. I submitted a copy of the study proposal to the Ministry of Health and Sanitation head office in Freetown, and I received a permission letter to use the dataset. Because there was no personally identifiable information available in the dataset, I could not link data to an individual mother. All electronic data in my possession were encrypted, and an external hard drive that contained backup information was stored at the Ministry of Health and Sanitation head office in Freetown.

Frankfort-Nachmias and Nachmias (2008) stated that there are many barriers in balancing the demand for scientific integrity in the research process with the demands of policymakers who want to know if the program worked, and what its associated costs were. This researchprovidesuseful information for both policymakers and the scientific community by analyzing secondary data of the SLFHCI and using the data to describe the target population. It also measures the outcome variables (number of antenatal visits, the number of hospital deliveries, LBW babies, VLBW babies, and preterm babies). Thus, this research could ethically be used by policy makers to make informed decisions regarding the successes and failures of the program. During the gathering of data, I had the obligation to make sure that results are clearly presented with all limitations articulated. It was my responsibility to explain the results of the research to policymakers who may want to use the results of this research to support a policy position.

Dissemination of Findings

This study provides the first assessment of the impact of the SLFHCI on hospital deliveries, which may be useful to health professionals, policymakers, and academics. The results of the findings were disseminated in towns, villages, and cities through radio stations, TV stations, and local newspapers. Presentations were made at various professional conferences such as the Sierra Leone Association of Researchers and Department of International Development (DFID) that helped fund the program. The findings were submitted to the *Sierra Leone Journal of Biomedical Research* to be accessed by students and health professionals. A report was submitted to the council chairperson of each provincial headquarter town, and a meeting was held with district medical officers, community health officers, nurses, and community members to provide information about the findings.

Summary

This study determined the effects of the SLFCHI on hospital deliveries through the use of five research questions. A cross-sectional study design using secondary data from the Antenatal Services database of the Ministry of Health and Sanitation was used. This database was analyzed to determine changes in rates of used antenatal services, hospital deliveries, and the number of LBW, VLBW, and preterm babies delivered before and after the introduction of the program. Logistic regression was used to predict the impact of the SLFHCI on five different outcome variables. Inclusion and exclusion criteria, data analysis, ethical considerations, dissemination of results were discussed in this chapter. In Chapter 4, I discuss the results of the analysis.

Chapter 4: Results

Introduction

The purpose of this study was to measure the effectiveness of the benefits of the SLFHCI on hospital deliveries. A secondary data analysis of Sierra Leone antenatal records was conducted to explore elements of the SLFHCI program. Logistic regression was used to predict the impact of the intervention variable (SLFHCI) on five different dependent variables (antenatal visits, hospital deliveries, LBW, VLBW, and preterm deliveries).

This study also focused on evaluating the contribution of specific determinants of health (age, education, marital status, smoking, alcohol usage, and geographic location) to the outcome of healthy hospital deliveries for women who received services by including these as covariates in the logistic regression. These covariates were selected because they were identified in the theoretical model as determinants of health that have been shown to have an impact on hospital deliveries. In addition, this study also evaluate the impact of the outcome and covariates pre/postimplementation.

This chapter includes a description of the study sample, and data analysis for each research question using descriptive statistics, bivariate analysis, and multiple logistic regressions. It also includes summary of the analysis. Statistical analysis was conducted using Epi Info (version 7).

Description of Study Sample

The study sample included women who gave birth to an infant between 2007 and 2009 (designated as the preimplementation period) and 2011 and 2013 (designated as the

postimplementation period) in four government hospitals (Ola During hospital, Bo government hospital, Kenema government hospital, and Makeni governmental hospital). A total of 1,200 women were included in the analysis, of which 50 women were abstracted from each hospital each year pre- and postimplementation. This generated a sample of 600pre- and postimplementation cases from the four hospitals. The sample size facilitated detection of differences in odds ratios, such as antenatal visits, hospital deliveries, LBW, VLBW, and preterm deliveries. Twenty-nine cases were dropped due to missing data.

Descriptive Statistics

Table 1 shows the demographic characteristics of all mothers who were included in the study. Of the 1,179 women that remain after missing data were dropped, 27.8% fell into the age category of 23.1 to 29 years, with another 27.6% represented by the age category of12 to 19.5 years. Twenty-three percent fell into the age category of 19.51 to 23 years; and 21.6% were represented by the age group of 29.1 to 46 years. Married women comprised 68.1% of the sample (815 women); unmarried women comprised 31.9% of the sample (381 women). Almost half of the women (46.8%) reported having either no education or primary school education; and some (140, or 25.7%) reported having some secondary school education. About 150 or 14.2% of the women had some college or graduate school education; and some 271 or 13.3% women had some secondary school education. Also 973 or 82.4% of the women reported that they did not smoke during pregnancy; and 208 or 17.6% indicated that they did smoke during pregnancy. Most (1,013, or 88.8%) reported not using alcohol during pregnancy; and 128

or 11.2% indicated some alcohol usage during pregnancy. Regarding geographic location, 300 women were sampled from each of the four hospitals, each representing 25% of the total population of women sampled.

Table 1

Demographic Characteristics of Study Participants

Demographic Characteristics	Frequency	Percentage (%)
Age group (years)		
12–19.5	330	27.6%
19.51–23	275	23.0%
23.1–29	332	27.8%
29.1–46	259	21.6%
Total	1,166	100%
Marital status		
N	381	31.9%
Y	815	68.1%
Total	1,194	100%
Educational level		
Primary or None	495	46.8%
Secondary	140	25.7%
Some Secondary	271	13.3%
College/Graduate School	150	14.2%
Total	1,056	100%
Smoking status		
N	973	82.4%
Y	208	17.6%
Total	1,181	100%
Alcohol usage		
N	1,013	88.8%
Y	128	11.2%
Total	1,141	100%
Geographic location		
Bo	300	25%
Kenema	300	25%
Makeni	300	25%
Freetown	300	25%
Total	1,200	100%

Table 2 shows the descriptive statistics of outcome variables that were included in the study for analysis. When the total number of visits pre- and postimplementation was considered, 443 or 37.8% of women attended all three recommended visits during pregnancy. Another 279 or 23.8% of women attended two-thirds of the recommended

visits, 186 or 15.5% of women attended one-third of the recommended visits, and 263 or 21.9% women never attended any of the antenatal services during pregnancy. Regarding the number of hospital deliveries pre- and postimplementation, more than half of the sample (815 or 68.2% women) reported delivering in a hospital; and 380 or 31.8% of women reported delivering outside the hospital. Regarding VLBW deliveries, the number of women who delivered babies less than 1.5kg (WHO, 2014d) was 27 (2.3%); and the remaining1,159 women (97.7%) delivered babies that can be classified as low birth or normal. Women who delivered LBW babies, defined as less than 2.5 kg but at least 1.5 kg (WHO, 2014d), were 322 or 27.1%; and the remaining 864 women or 72.9% delivered babies of normal weight. Regarding preterm deliveries, Table 2 shows that 511 or 43.2% of women delivered babies less than 37 weeks of gestational age; and 671 or 56.8% delivered term babies greater than 37 weeks of gestational age (NIH, 2014).

Table 2

Statistics of Outcome Variables Descriptive

Outcome Variable(%)	Frequency	Percentages
Antenatal Visits		
0	263	21.9%
1	186	15.8%
2	279	23.8%
3	443	37.8%
Total	1171	
Hospital Deliveries		
0	380	31.8%
1	815	68.2%
Total	1195	
Very Low Birth Weight		
0	1159	97.7%
1	27	2.3%
Total	1186	
Low Birth Weight		
0	864	72.9%
1	332	27.1%
Total	1196	
Preterm		
0	671	56.8%
1	511	43.2%
Total	1182	

Table 3 shows the frequency of covariates pre- and postimplementation and the *p* values using the chi-square test. When the educational level, geographic location, alcohol usage, and marital status was dichotomized into pre- and postimplementation groups, there were no significant differences in the services used by women who received services and women who did not receive services as shown by their *p* values respectively

(p>.1071, p>0.9999, p >0.0510, p>0.9510). When age, antenatal visits, and smoking status were separated into pre- and postimplementation groups there were significant differences in services usage between those who received services and those who did not receive services as shown by p values respectively (p <0.0454, p <0.0001, p<0.0001).

Table 3

Frequency of Covariates Pre- and Postimplementation and P Values Using Chi-Square Tests

Variable	Pre	%	Post	%	Total	X^2 valves
Educational Level						
Primary or None	261	52.7%	234	47.3%	495	
Some Secondary	139	51.3%	132	48.7%	271	X^2 (6.0946)
Secondary	71	50.7%	69	49.3%	140	P=0.107
College/Vocational/College	62	41.3	88	58.7%	150	
Age Category						
12–19.5	148	44.9%	182	55.2%	330	
19.51–23	134	48.8%	141	51.3%	275	X^2(8.0311)
23.1–29	185	55.7%	147	44.3%	332	P=0.0454
29.1–46	130	50.2%	129	48.8%	259	
Alcohol Usage						
N	501	49.5%	512	50.5%	1013	X^2(3.7950)
Y	75	58.6%	53	41.4%	128	P=0.051
Smoking						
N	433	44.5%	540	55.5%	973	X^2(74.21)
Y	161	77.4%	47	22.6%	208	P=0.0001
Geographic Location						
Bo	150	50%	150	50%	300	X^2(0.00001)
Freetown	150	50%	150	50%	300	P=0.99999
Kenema	150	50%	150	50%	300	
Makeni	150	50%	150	50%	300	
Marital Status						
N	190	49.9%	191	50.1%	381	X^2(0.0039)
Y	408	50.1%	407	49.9%	815	P=0.951
Antenatal Visits						
0	261	99.2%	2	0.77%	263	
1	139	74.7%	47	52.3%	186	X^2(547.5041)
2	126	45.2%	153	54.8%	279	P=0.0001
3	57	12.9%	386	87.1%	443	

Table 4 represents each of the individual covariates compared to the number of the antenatal visits outcome variable. Chi-square analysis was conducted to determine if there were significant differences in observed and expected frequencies in antenatal visits between the preimplementation group of women and the postimplementation group of women. The analysis showed significant differences between observed and expected frequencies of antenatal visits for educational level (χ^2 =21.1671, p <0.00001), smoking (χ^2 =31.9476, p<0.0001), geographic location (χ^2 =14.5338, p<0.0023), and year (χ^2

=332.7636, $p<0.0001$). These differences, combined with congruence with the determinants of health model, clearly supported including these elements as covariates in the logistic regression.

There were no significant differences between the expected and observed values in antenatal visits for alcohol usage (χ^2 =1.7228, $p>0.18933$), age (χ^2 =4.2375, $p>0.2369$), and marital status (χ^2 =0.1550, $p>0.6937$). Based on the consistency with other analyzes and the congruence with the determinants of health model, they were included as covariates in the logistic regression analysis.

Table 4: *Frequencies and Bivariate Analysis of Covariates and Antenatal Visits*

Variable	Low Birth Weight					
	0	%	1	%	Total	X^2 (P)
Educational Level						
Primary or None	348	71.9%	136	28.1%	484	
Some Secondary	208	78.2%	58	21.8%	266	X^2 (21.167)
Secondary	103	78.0%	29	22.0%	132	P=0.0001
College/Graduate	132	89.8%	15	10.2%	147	
Age						
12–19.5	253	79.3%	66	20.7%	319	
19.51–23	200	74.6%	68	25.4%	268	X^2 (4.2375)
23.1–29	245	75.9%	78	24.1%	323	P=0.2369
29.1–46	208	81.0%	49	19.0%	257	
Alcohol Usage						
N	772	77.8%	220	21.2%	992	X^2 (1.7228)
Y	90	72.6%	34	27.4%	124	P=0.18933
Smoking						
N	765	80.5%	185	19.5%	950	X^2 (31.947)
Y	127	62.3%	77	37.7%	204	P=0.00000
Geographic Location						
Bo						
Freetown	237	82.6%	50	17.4 %	287	X^2 (14.538)
Kenema	221	74.7%	75	25.3%	296	P=0.0023
Makeni	242	81.5%	55	18.5%	297	
	208	71.5%	83	28.5%	291	
Marital Status						
N						X^2 (0.1550)
Y	284	76.8%	86	23.2%	370	P=0.6937
	620	77.8%	177	22.2%	797	
Year						
2007	110	57.0%	83	43.0%	200	X^2 (332.76)
2008	108	55.4%	87	44.6%	197	P=0.00000
2009	104	53.3%	91	46.7%	195	
2011	195	90.0%	2	1%	200	
2012	194	100.0%	0	0.0%	192	
2013	197	100.%	0	0.0%	198	

Table 5 represents each of the individual covariates compared to the hospital delivery outcome variable. Chi-square analysis was conducted to determine if there were significant differences in observed and expected frequencies in hospital deliveries between the pre-implementation group of women and the postimplementation group of women. There were significant differences between observed and expected frequencies in hospital deliveries for educational level (χ^2 =25.095, p<0.0001), alcohol usage (χ^2 =4.8070, p<0.0283), smoking (χ^2 =28.29, p<0.0001), antenatal visits (χ^2 =46.38, p<0.0001) and year (χ^2 =328.79, p<0.0001). These differences, combined with congruence with the determinants of health model, clearly supported including these elements as covariates in the logistic regression.

There was no significance between the expected and observed values for geographic location (χ^2 =4.48, p<0.2138), age (χ^2 =3.307, p<0.3467), and marital status (χ^2 =0.1023, p<0.7491). Based on the consistency with other analyzes and the congruence with the determinants of health model, they were included as covariates in the logistic regression analysis.

Table 5

Frequencies and Bivariate Analysis of Covariates and Hospital Deliveries

Variable	Low Birth Weight					
	0	%	1	1 %	Total	X^2 (P)
Educational Level						
Primary or None	298	60.5%	195	39.5%	493	
Some Secondary	186	69.1%	83	30.9%	269	X^2 (25.095)
Secondary	96	68.6%	44	31.4%	140	P=0.0000
College/Graduate	122	81.9%	27	18.1%	149	
Age						
12–19.5	99	30.2%	229	69.8%	328	
19.51–23	78	28.5%	196	71.5%	274	X^2 (3.307)
23.1–29	114	34.4%	217	65.6%	331	P=0.3467
29.1–46	87	33.7%	171	66.3%	258	
Alcohol Usage						
N	313	31.0%	696	69.0%	1009	X^2 (4.8070)
Y	52	40.6%	76	59.4%	128	P=0.0283
Smoking						
N	69	71.4%	277	28.6%	970	X^2 (28.29)
Y	108	52.4%	98	47.6%	206	P=0.0000
Geographic Location						
Bo	210	70.5%	88	29.5 %	298	
Freetown	201	67.2%	98	32.8%	299	X^2 (4.482)
Kenema	212	71.0%	86	28.9%	298	P=0.2138
Makeni	192	64.0%	108	36.0%	300	
Marital Status						
N	256	67.6%	123	32.4%	379	X^2 (0.1023)
Y	556	68.5%	256	31.5%	812	P=0.7491
Antenatal Visits						
0	53	20.3	08	79.7%	261	
1	115	2.2%	70	37.8%	185	X^2 (46.3804)
2	226	81.3%	52	18.7%	278	P=0.00000
3	402	91.0%	40	9.0%	442	
Year						
2007	88	44.0%	112	56.0%	200	
2008	84	42.4%	114	57.6%	198	X^2 (328.79)
2009	88	44.7%	109	55.3%	197	P=0.00000
2011	182	91.0%	18	9.0%	200	
2012	185	92.5%	15	7.5%	200	
2013	188	94.0%	12	6.0%	200	

Table 6 represents each of the individual covariates compared to the low birth weight outcome variable. Chi-square analysis was conducted to determine if there were

significant differences in observed and expected frequencies LBW between the preimplementation group of women and the postimplementation group of women. There were significant differences between observed and expected frequencies in low birth weight for alcohol usage (χ^2 =48.76, p<0.0000), smoking (χ^2 =141.03, p<0.0001), geographic location (χ^2 =17.94, p<0.0005), antenatal visits (χ^2 =55.086, p<0.0001), and year (χ^2 =63.69, p<0.0001). These differences, combined with congruence with the determinants of health model, clearly supported including these elements as covariates in the logistic regression.

There were no significance between the expected and observed values for education (χ^2 =4.204, p<0.2403), age (χ^2 =0.3579, p<0.9488), and marital status (χ^2 =1.384, p<2.2395). Based on the consistency with other analyzes and the congruence with the determinants of health model, they were included as covariates in the logistic regression analysis.

Table 6

Frequencies and Bivariate Analysis of Covariates and Low Birth Weight

Variable	Low Birth Weight					
	0	%	1	%	Total	X^2 (P)
Educational Level						
Primary or None	361	74.3%	125	25 %	486	
Some Secondary	199	74%	70	26%	269	X^2 (4.204)
Secondary	92	66.2%	47	33.8%	139	P=0.2403
College/Graduate	105	70.5%	44	29.5%	149	
Age						
12–19.5	234	71.6%	93	28.4%	327	
19.51–23	200	73.5%	72	26.5%	272	X^2 (0.3579)
23.1–29	240	73.2%	188	26.8%	328	P=0.9488
29.1–46	186	72.9%	69	26.1%	255	
Alcohol Usage						
N	763	75.9%	242	24.8%	1005	X^2 (48.76)
Y	58	46.4%	67	53.6%	125	P=0.00000
Smoking						
N	768	79.9%	193	20.1%	961	X^2 (141.03)
Y	81	39.3%	125	60.7%	206	P=0.0000
Geographic Location						
Bo	191	64.5%	105	35.5 %	296	
Freetown	213	71.5%	85	28.5%	298	X^2 (17.94)
Kenema	228	76.8%	69	23.2%	297	P=0.0005
Makeni	232	78.6%	63	21.4%	295	
Marital Status						
N	283	75.1%	94	24.9%	377	X^2 (1.384)
Y	578	71.8%	227	28.2%	805	P=2.2395
Antenatal Visits						
0	152	58.9%	106	41.1%	258	
1	123	68.0%	58	32%	181	X^2 (55.086)
2	199	71.8%	78	28.2%	277	P=0.0000
3	370	83.9%	71	16.1%	441	
Year						
2007	117	59.4%	80	40.6%	197	
2008	135	67.8%	64	32.2%	199	X^2 (63.69)
2009	121	61.5%	76	38.5%	197	P=0.0000
2011	164	83%	34	17%	198	
2012	160	81.2%	37	18.2%	197	
2013	167	84.3%	31	15.7%	198	

Table 7 represents each of the individual covariates compared to the preterm outcome variable. Chi-square analysis was conducted to determine if there were significant differences in observed and expected frequencies between groups. There were significant differences between observed and expected frequencies in preterm deliveries for alcohol usage (χ^2 =13.5741, p<0.0022), smoking (χ^2 =86.968, p<0.0001), antenatal visits (χ^2

=75.36, p<0.0001), and year (χ^2 =134.119, p<0.0001). These differences, combined with congruence with the determinants of health model, clearly supported including these elements as covariates in the logistic regression.

There were no significant differences between the expected and observed values for educational level (χ^2 =4.7514, p<0.1909), (χ^2 =1.2192, p<0.7484), geographic location, age (χ^2 =1.0622, p<0.7862), and marital status (χ^2 =0.4653, p<0.4951). Based on the consistency with other analyzes and the congruence with the determinants of health model, they were included as covariates in the logistic regression analysis.

Table 7

Frequencies and Bivariate Analysis of Covariates and Preterm Delivery

Variable	Low Birth Weight					
	0	%	1	%	Total	X^2 (P)
Educational Level						
Primary or None	281	57.2%	210	42.8%	491	
Some Secondary	139	52.7%	125	47.3%	64	X^2 (4.7514)
Secondary	78	56.6%	60	43.5%	138	P=0.1909
College/Graduate	93	63.7%	53	36.3%	146	
Age						
12–19.5	178	54.6%	148	45.4%	326	
19.51–23	157	58.4%	112	41.6%	269	X^2 (1.0622)
23.1–29	87	56.8%	142	43.2%	329	P=0.7862
29.1–46	147	57.9%	107	42.1%	254	
Alcohol Usage						
N	588	58.9%	410	41.1%	998	X^2 (13.5741)
Y	53	41.7%	74	58.3%	127	P=0.00022
Smoking						
N	606	63.1%	355	36.9%	961	X^2 (86.968)
Y	56	27.5%	148	72.5%	204	P=0.0000
Geographic Location						
Bo	166	56.1%	130	43.9 %	296	
Freetown	166	56.1%	130	43.9%	296	X^2 (1.2192)
Kenema	162	55.5%	130	44.5%	292	P=0.7484
Makeni	177	59.4%	121	40.6%	298	
Marital Status						
N	207	55.4%	167	44.6%	374	X^2 (0.4653)
Y	462	57.5%	342	42.5%	804	P=0.4951
Antenatal Visits						
0	104	40.0%	156	60.0%	260	
1	86	46.5%	99	53.5%	185	X^2 (75.361)
2	156	57.1%	117	42.9%	273	P=0.00000
3	312	71.2%	126	28.8%	438	
Year						
2007	80	40.0%	120	60.0%	200	
2008	77	39.1%	120	60.9%	197	X^2(134.119)
2009	81	41.5%	114	58.5%	195	P=0.00001
2011	141	70.5%	59	29.5%	200	
2012	146	6.0%	46	24.0%	192	
2013	146	73.7%	52	26.3%	198	

Table 8 shows the results of the multiple logistic regression analysis of attending antenatal services. The number of cases used in this logistic regression analysis was 1,171. The adjusted odds of attending antenatal services was significantly higher during the pre-implementation period compared to postimplementation period OR=205.79, p=0.0001. The adjusted odds of attending antenatal services was significantly lower for women with some secondary school education and college/graduate education compared

to women with primary or no education OR=0.60, p=0.0288, OR=0.35, p=0.0036 respectively. In two locations, Freetown and Makeni, women had significantly higher odds of attending antenatal services compared to the Bo location OR=1.76, p=0.0341, OR=2.29, p=0.0022.

Age, smoking, drinking, the Kenema hospital location, and marital status were not associated with attending antenatal services. We can conclude that the rate of attending antenatal services was higher in the preimplementation period even after adjusting for covariates.

Table 8

Multiple Logistic Regression Analysis for Antenatal Visits Showing Odds Ratio, 95 CI, and P Values (N=1171)

Covariates	OR	95% CI	p
Age			
12–19.5			
19.51–23	1.37	0.79, 2.37	0.2473
23.1–29	1.18	0.70, 1.97	0.5264
29.1–46	1.03	0.57, 1.86	0.8963
Education			
Primary or none			
Some secondary	1.60	0.38, 0.94	0.0288
Secondary	0.74	0.42, 1.29	0.2902
College/graduate	0.35	0.17, 0.71	0.0036
Geographic Location			
Bo			
Freetown	1.76	1.04, 2.96	0.0340
Kenema	1.18	0.69, 2.02	0.5356
Makeni	2.29	1.34, 3.91	0.0022
Smoking			
N			
Y	1.14	0.74, 1.72	0.5603
Alcohol Usage			
N			
Y	1.10	0.64, 1.92	0.7200
Marital Status			
N			
Y	1.20	0.79, 1.81	0.3854
Preimplementation/ Postimplementation			
Pre	205.79	50.43, 839.70	0.00000

Table 9 shows the results of the multiple logistic regression analysis of hospital deliveries. The number of cases used in this logistic regression was 1,195. The adjusted odds ratio of hospital deliveries was significantly higher in the preimplementation period compared to the postimplementation period OR=18.57, p=0.0001. The adjusted odds ratio of hospital deliveries were significantly lower for all three education categories

compared with primary or no education. The odds ratio for the three education categories compared with primary or no education were OR=0.60, p=0.0132, OR=0.57, p=0.0324, OR=0.27, p=0.0000. Makeni had significantly higher odds of hospital deliveries compared to Bo OR=1.60, p=0.0465.

Age, the Freetown and Kenema locations, smoking, alcohol usage, and marital status were not associated with hospital deliveries. We can conclude that the rate of hospital deliveries was higher during the preimplementation period even after adjusting for covariates.

Table 9

Multiple Logistic Regression Analysis for Hospital Deliveries Showing Odds ratio, 95 CI, and P Values (N=1195)

Covariates	OR	95% CI	p
Age			
12–19.5			
19.51–23	0.77	0.47, 1.25	0.2904
23.1–29	1.21	0.76, 1.92	0.4213
29.1–46	1.61	0.95, 2.72	0.0751
Education			
Primary or none			
Some secondary	0.60	0.40, 0.89	0.0132
Secondary	0.57	0.35, 0.96	0.0324
College/graduate	0.27	0.14, 0.48	0.0000
Geographic Location			
Bo			
Freetown	1.13	0.72, 1.79	0.5902
Kenema	1.12	0.70, 1.80	0.6293
Makeni	1.60	1.01, 2.55	0.0465
Smoking			
N			
Y	1.09	0.73, 1.64	0.6630
Alcohol Usage			
N			
Y	1.16	0.69, 1.93	0.5633
Marital Status			
N			
Y	1.08	0.75, 1.58	0.6677
Preimplementation/ Postimplementation			
Pre	18.57	12.42, 27.76	0.00000

Table 10 shows the results of the multiple logistic regression analysis of low birth weight deliveries. The number of cases used in this logistic regression was 1,196. The adjusted odds of LBW deliveries were significantly higher for women in the preimplementation period compared to the postimplementation period OR=2.31,

p=0.0001.The adjusted odds of low birth weight deliveries were significantly lower for women in age categories 23.1 to 29 and 29.1 to 46 compared to women in the age category 12 to 19.5. The OR for the two age categories compared to age category 12 to 19.5 were OR=0.54, p=0.0092 and OR=0.57, p=0.0324 respectively. Smoking and alcohol usage were two more covariates that were statistically significant in LBW deliveries. The adjusted odds of LWB deliveries were significantly higher in women who smoked or drank alcohol compared to women who did not smoke or drink alcohol OR=4.97, p=0.002, and OR=3.14, p=0.000. Additionally, the adjusted odds ratio of low birth weight deliveries were significantly lower for women in Makeni compared to women in Bo OR=0.42, p=0.0002.

The age category 19.51 to 23, the three education categories, the two geographic locations (Freetown and Kenema), and marital status were not associated with LBW deliveries. We can conclude that the rate of LBW deliveries was higher during the preimplementation period even after adjusting for covariates.

Table 10

Multiple Logistic Regression Analysis for Low Birth Weight Showing Odds Ratio, 95 CI, and P Values (N=1196)

Covariates	OR	95% CI	p
Age			
12–19.5			
19.51–23	0.85	0.55, 1.33	0.4920
23.1–29	0.54	0.34, 0.86	0.0092
29.1–46	0.57	0.35, 0.95	0.0324
Education			
Primary or none			
Some secondary	1.15	0.77, 1.70	0.0288
Secondary	1.43	0.86, 2.67	0.2902
College/graduate	1.22	0.73, 2.04	0.0036
Geographic Location			
Bo			
Freetown	0.66	0.43, 1.02	0.0522
Kenema	0.66	0.42, 1.03	0.0657
Makeni	0.42	0.26, 0.65	0.0002
Smoking			
N			
Y	4.97	3.41, 7.26	0.00000
Alcohol Usage			
N			
Y	3.14	1.99, 4.94	0.0000
Marital Status			
N			
Y	0.81	0.57, 1.167	0.2604
Preimplementation/ Postimplementation			
Pre	2.31	1.66, 3.22	0.00000

Table 11 shows the results of the multiple logistic regression of preterm deliveries. The number of cases used in this logistic regression was 1,182. The adjusted odds of preterm delivery was significantly higher in the preimplementation period compared to the postimplementation period OR=3.58, p=0.0001. The adjusted odds of women delivering preterm was significantly higher for women who smoked and/or used

alcohol compared to women who did not smoke or use alcohol OR=3.19, p=0.000, OR=1.81, p=0.0009 respectively).

Age, location, education, and marital status were not associated with preterm deliveries. We can conclude that the rate of preterm deliveries was higher during the preimplementation period even after adjusting for covariates.

Table 11

Multiple Logistic Regression Analysis for Preterm deliveries Showing Odds Ratio, 95 CI, and P Values (N=1182)

Covariates	OR	95% CI	p
Age			
12–19.5			
19.51–23	0.74	0.49, 1.12	0.1531
23.1–29	0.76	0.50, 1.13	0.1773
29.1–46	0.81	0.52, 1.27	0.3610
Education			
Primary or none			
Some secondary	1.34	0.95, 1.89	0.1009
Secondary	1.09	0.71, 1.68	0.6955
College/graduate	0.79	0.49, 1.26	0.3296
Geographic Location			
Bo			
Freetown	1.05	0.71, 1.56	0.8066
Kenema	1.08	0.72, 1.61	0.7155
Makeni	0.87	0.26, 0.65	0.5102
Smoking			
N			
Y	3.19	2.18, 4.69	0.00000
Alcohol Usage			
N			
Y	1.81	1.162, 2.83	0.0090
Marital Status			
N			
Y	1.09	0.79, 1.51	0.5893
Preimplementation/ Postimplementation			
Pre	3.58	2.68, 4.76	0.00000

Summary

The results of the data analysis used the sample of women who delivered a baby between 2007 and 2009 (designated the preimplementation period,) and 2011 and 2013 (designated the postimplementation period). Logistic regression analysis was conducted to predict the impact of the implementation of the SLFHCI program on five different outcome variables: antenatal visits, hospital delivery, LBW, VLBW, and preterm delivery. The study also investigated the contribution of specific determinants of health to the outcome of a healthy birth for those women who benefited from the free healthcare program by including these determinants as covariates in the logistic regression.

The study was based on five research questions and hypotheses. The first research question asked: Is the introduction of the SLFHCI program related to changes in the rate of use of antenatal services, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)? Based on the above results, the null hypothesis can be rejected OR=205.79, p=0.0001. It was found that women with some secondary school education and college or graduate school education had significantly lower odds of attending antenatal services compared to women with primary school education or no education OR=0.60, p=0.0288 compared to OR=0.35, p=0.0036.Women in Freetown and Makeni had significantly higher odds of attending antenatal services compared to Bo OR=1.76, p=0.0341comapred to OR 2.29, p=0.0022.

The second research question asked: Is the use of the SLFHCI program related to changes in the number of hospital deliveries, controlling for maternal status covariables

(education, geographic location, marital status, age, smoking status, and alcohol usage)? Again, based on the above results, the null hypothesis can be rejected OR=18.57, p=0.0001. The results of the analysis revealed that a woman with some education (some secondary, college, or graduate education) had significantly lower odds of delivering in a hospital compared with a woman with primary school education or no education OR=0.60, p=0.0132, OR.57, p=0.0324 and OR=.27, p=0.0001. In Makeni, women had significantly higher odds of delivering in a hospital compared with women in Bo OR=1.60, p=0.465.

The third research question asked: Is there an association between the SLFHCI program and the number of LBW deliveries, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)? The above findings suggest that the null hypothesis can be rejected OR=2.31, p=0.0001. The results show that women who smoked and used alcohol had higher odds of delivering LBW babies compared with women who did not smoke or use alcohol OR=4.97, p=0.0001, OR 3.14, p=0.0001. Age categories 23.1 to 29 and 29.1 to 46 had lower odds of delivering LBW babies compared to women in the age category 12 to 19.5 OR=0.54, p=0.0009 and OR=.57, p=0.0324 respectively. Women in Makeni had significantly lower odds of delivering LBW babies compared to women in Bo OR=0.42, p=0.0002.

The fourth research question asked: Is there an association between the SLFHCI program and the number of VLBW babies delivered, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and

alcohol usage)? This research question was not tested because of insufficient data and numerous errors in the statistics.

The final research question asked: Is there an association between the SLFHCI program and the number of preterm deliveries, controlling for maternal status covariables (education, geographic location, marital status, age, smoking status, and alcohol usage)? The above analysis suggests that the null hypothesis can be rejected OR=3.58, p=0.0001. Women who smoked and/or used alcohol had significantly higher odds of delivering preterm babies compared to women who did not smoke or use alcohol OR=3.19, p=0.0001 and OR=1.81, p=0.0009.

The study found several covariates that consistently contributed to the likelihood of poor birth outcomes in line with the determinants of health model, such as smoking, alcohol usage, the level of education, age, and geographic location. In Chapter 5, I discuss the findings, interpret the analysis, and explain the limitations of the current study. Implications for social change and recommendation for further studies are also discussed.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this study was to measure the effectiveness of the SLFHCI and its impact on hospital deliveries. A secondary analysis of Sierra Leone's Antenatal Services Database was conducted to explore the elements of the program. A total of 1,200 antenatal records were obtained for the study, with 600 records from women who gave birth from 2007 to 2009 (designated the preimplementation period) and 600 records from women who gave birth from 2011 to 2013 (the postimplementation period) in four government hospitals (Makeni government hospital, Bo government hospital, Kenema government hospital and Ola During hospital in Freetown). The year 2010 was omitted because it was a transition period. Additionally, a subgroup of 50 women was obtained from each hospital each year; 29 were dropped from the analysis due to missing data on some variables. All personal health identifiers were removed, and data were transcribed into an Excel spreadsheet which was coded and uploaded into Epi Info 7.1 for analysis.

Logistic regression was used to predict the impact of the intervention variable (SLFHCI), preimplementation and postimplementation, on five different outcome variables: antenatal services usage, hospital deliveries, LBW, VLBW, and preterm deliveries. I also evaluated the contribution of the age of the mother, educational level, marital status, geographic location, smoking, and alcohol usage of the mother to the birth outcome by including these as covariates in the logistic regression. The results were presented to allow for confirmation or rejection of the research questions and hypotheses.

The data showed that the adjusted odds of attending antenatal services were significantly higher in the preimplementation period compared to the postimplementation period. Education and geographic location were statistically significant while age, smoking, alcohol usage, and marital status were not statistically significant. The data also revealed that the adjusted odds ratio of hospital deliveries was significantly higher in the preimplementation period compared to the postimplementation period. Education and geographic location were statistically significant while age, smoking, alcohol usage, and marital status were not statistically significant. The results also showed that the adjusted odds of delivering LBW babies were significantly higher for women in the preimplementation period compared to the postimplementation period. Age, smoking, alcohol usage, and geographic location were statistically significant, whereas education and marital status were not statistically significant. Additionally, the results showed that the adjusted odds of preterm delivery were significantly higher in the preimplementation period compared to the postimplementation period, and smoking and alcohol usage were statistically significant. Age, education, geographic location, and marital status were not statistically significant.

Interpretation of Findings

The first goal of this study was to identify if the introduction of the SLFHCI program was related to changes in the rate of use of antenatal services. The null hypothesis regarding this research question stated that the rate of use of antenatal services remained the same before and after the introduction of the SLFHCI program. The second goal of this study was to identify if the use of the SLFHCI program was related to

changes in the number of hospital deliveries. The null hypothesis regarding this research question stated that the number of hospital deliveries was similar before and after the introduction of the SLFHCI program. The third goal of this study was to identify if there was an association between the SLFHCI program and the number of LBW deliveries. The null hypothesis for this research question stated that there was no difference in the number of LBW deliveries before and after the introduction of the SLFHCI program. The research question about VLBW was dropped from the analysis because of insufficient data and numerous errors in the analysis. The final goal of this study was to assess if there was an association between the SLFHCI program and the number of preterm deliveries. The null hypothesis for this research question stated that there was no difference in the number of preterm babies delivered before and after the introduction of the SLFHCI program. Covariates for each research question included age, educational level, geographic location, marital status, and smoking and alcohol usage. Each of these covariates was included in the final logistic regression model.

The first research question determined if the introduction of SLFHCI was related to the use of antenatal services. The descriptive analysis revealed a 41% increase in antenatal visits after the introduction of the SLFHCI compared with the preimplementation period. But the logistic regression otherwise indicated the rate of antenatal visits was higher in the preimplementation period compared to the postimplementation period after adjusting for covariates. A similar trend was noted in other studies with an increase in antenatal services usage during the preimplementation period compared to postimplementation period (Abor, Nbekah-Nkrumah, &Sakyi, 2011).

A study by Atinga and Baku (2013) highlighted a decrease in antenatal services usage after a similar policy was implemented but indicated it was not statistically significant. It is my belief that following the introduction of the SLFHCI program, antenatal services usage increased, causing clinics to become overcrowded. This then resulted in longer wait times and less time with healthcare providers, which could have caused a drop in attendance. The insignificant increase in antenatal services usage following the introduction of the SLFHCI program could also be attributed to the expansion of antenatal services and the upgrading of existing ones at minimal cost. The difference in cost was not significantly different between the pre- and postimplementation period and likely did not act as a barrier. In addition, the introduction of the SLFCHI program has not yet been shown to be related to an increase in birth rates. This is likely because the population of Sierra Leone has not increased in the past 6 years because women are now turning their attention to the use of contraceptives for birth control. Therefore, Sierra Leone would not have expected increase in antenatal services usage because the rate of pregnancies has not increased. This may explain why the implementation of a free healthcare program has not had a significant impact on antenatal services usage. Further, a study by Maxmen (2013) indicated that the problem of transportation is the single most important barrier to women attending antenatal services—even free services—in developing countries. It is my belief that this is the case in Sierra Leone and that the difficulty of accessing transportation is one of the reasons that the introduction of the SLFHCI program did not increase antenatal visits.

The second research question asked if the introduction of the SLFHCI program was related to changes in the number of hospital deliveries. The descriptive analysis showed a 47% increase in the number of hospital deliveries after the introduction of the SLFHCI program, and this result was statistically significant. This increase in hospital deliveries could be attributed to an increase in the number of pregnant women seeking care for pregnancy complications. One study conducted by Mucunguzi et al. (2014) reached a similar conclusion that a free healthcare service offering 24-hour services significantly increased the percentage of hospital deliveries in northern Uganda. Health professionals and researchers in Sierra Leone believe that Sierra Leone's free healthcare services for pregnant women attract women from the neighboring countries of Guinea and Liberia, who then cross the border to deliver in Sierra Leone's nearby clinics and health centers (Maxmen, 2013) This has not been confirmed, but it is believed to be contributing to the overall increase in hospital deliveries.

The third research question asked if there was an association between SLFHCI and the number of LBW deliveries. The descriptive statistics showed a 38% decrease in low birth deliveries after the implementation of the SLFHCI program, and this finding was statistically significant. A study conducted in northern Ghana found a 42% reduction in LBW deliveries after the introduction of the free healthcare services in (Asante et al., 2007), and a similar program instituted in southern Ghana resulted in a 49% reduction (Bosu et al., 2007). These findings suggest that an opportunity exists for SLFHCI to produce an even greater impact on birth outcomes.

The determinants of health model used as the theoretical framework for the current study provides insight into how a greater impact might be achieved by the SLFHCI program. For example, several determinants continued to have an adverse effect on LBW deliveries, including smoking and alcohol use during pregnancy, the age of the mother, and the mother's geographic location. Other determinants, such as education and marital status, were not associated with LBW deliveries. The introduction of the SLFCI program reduced adverse birth outcomes by 38%. However, other studies (Bako et al., 2011) have shown a 62% reduction in adverse birth outcomes. This suggests that there may be room for improvement. Although the findings of this study show that the SLFHCI program protects against the incidence of LBW deliveries, this protective effect could be enhanced by increasing the number of women who use the SLFHCI program. The fourth research question was dropped from the analysis because of insufficient data and numerous errors in the analysis.

The fifth research question aimed to determine if there was an association between the SLFHCI program and the number of preterm deliveries. The descriptive statistics showed an 82% reduction in preterm deliveries after the introduction of the SLFHCI program, and this was statistically significant. The result of this study clearly shows that the SLFHCI program has had a positive impact on reducing preterm deliveries. This was not only supported by the logistic regression that controlled for the six covariates (age, education, marital status, geographic location, smoking, and alcohol usage), but it was also supported by the simple chi-square analysis that showed a significant difference in expected versus observed incidence of preterm deliveries for

women in the postimplementation period compared to women in the preimplementation period.

Limitations of the Study

An important limitation of the study was the omission of births not occurring in hospitals. Data from these were not in the system. If a systematic change occurred in the outcomes of these births, the study might suffer from selection bias. Unfortunately, no method is available for assessing the potential impact of this limitation on study findings. And since the SLFHCI program is a government-funded program, it was impossible to design a study that would allow for full randomization. The study depended on Sierra Leone antenatal records, which are issued by the government hospitals in the four provinces of the country. Births that were not recorded in this way were not included in this study. There was no easy way to determine how many such births were omitted from this study. The inability to do so presents a threat to external validity and lack of randomization limits the generalizability of the results.

Further, the use of secondary data limited my ability to define the variables, and therefore limited the robustness of the data analysis. This, in addition to the use of a preexisting data set, resulted in a study sample that may not be representative of the general population, and hence, posed a risk to the study's external validity. Also, important determinants of health, such as psychosocial health, support system, employment, housing, transportation, or nutrition, which may have coexisted with the significant determinants identified in this study, were not evaluated due to data limitations of the original data set.

Another limitation was the potential for errors in the antenatal records and in the other forms of documentation used as secondary data sources for this study. Again, there is no way to know how many or how large those errors were. It is assumed that errors are random and not systematic, meaning that equally as many data items are too high as are too low, so the errors self-cancel. However, there is no way to know if this assumption was valid.

Additionally, database challenges posed another limitation. The original database had significant data entry and management issues, particularly associated with the recording of VLBWs. This resulted in numerous errors that made this variable impossible to investigate fully. Strategies were utilized to manage these data issues, but the issues present a possible threat to the reliability of the data and the analysis of the VLBW variable.

Recommendations for Further Study

The results of this study coupled with the literature review of other studies on the impact of free healthcare for pregnant women and lactating mothers on hospital deliveries have implications for further research. The recommendations listed below are from Sierra Leone perceptive which can be of use to countries implementing similar program. Some of these implications are discussed below.

This study included data from only four government hospitals in the provincial headquarter towns. Further studies should include all hospitals in the 11 districts in the country using the same methodology to allow for direct comparison. This would allow for a more comprehensive and accurate representation of the impact of the SLFHCI

program on hospital deliveries. In addition, further studies should seek to assess other hospitals run by NGOs that provide the same type of free health care services. Assessing the impact over the same period and comparing them with government-run hospitals could yield vital information. Further research is also necessary to look at other covariates that were not included in this study to evaluate their impact on healthy birth outcomes such as income, nutrition status, parity, transportation to services, exposure to violence, and mental health.

The SLFHCI program is delivered in a variety of settings, including at clinics, hospitals, and health posts. Further research is needed to evaluate if there are differences in outcomes based on these different settings. The opportunity to create new systems of care that link hospitals, clinics, and health posts throughout the country calls for an evaluation that will help improve hospital deliveries and healthy birth outcomes. In addition, the impact of the SLFHCI program on hospital deliveries and on the quality of care from the perception of the healthcare professionals and from the general population could also be of interest to researchers.

Implication for Social Change

This study was conducted during a period when the president of Sierra Leone made it a priority to cut the infant mortality rate by half at the end of his term in 2018 (Government of Sierra Leone, 2013). He focused on strengthening the public health system in Sierra Leone, with a special emphasis on pregnant women, lactating mothers, and children under5 years old (Government of Sierra Leone, 2013). There is uncertainty among stakeholders as to how the introduction of the SLFCI program in 2010 has

affected healthy birth outcomes, and this study helps to answer some of those concerns by assessing the impact of the intervention on antenatal visits, hospital deliveries, LBW deliveries, and preterm deliveries before and after the implementation of the program.

The government of Sierra Leone is working to undertake assessments of the intervention before the end of 2016, meaning this study will guide the government, policy makers, and health professionals about the gains made by the program and the areas that need improvement. This study provides the opportunity to impact social change, as the findings can facilitate an evidence-based decision-making process. In addition, the results of this study can be used to improve healthcare provisions to women and infants.

Recommendations for Further Action

The elimination of fees for maternal and child healthcare works to remove cost as a barrier to care and hence improve access to care (Witter et al., 2007). Several studies have shown that policies aimed at improving access to healthcare for women and children are effective when there is corollary improvement in funding distribution, budgeting, program planning, and management (Witter et al., 2007). However, the literature indicates that the decision to eliminate fees for services is usually done hastily and is usually politicized (Kanu, Tang, &Lui, 2014). This suggests that free healthcare programs may lack sufficient finances, infrastructure, and resources. It also suggests that services need to be thoroughly evaluated before the implementation of this kind of user fee removal. This study will help guide the way forward. The recommendations for action are based on five main factors: conducting assessments, engaging in continuous monitoring and evaluation, allocating resources, strengthening healthcare systems, and

improving communication among stakeholders. The results of this study show that there were changes in antenatal visits, hospital deliveries, LBW deliveries, and preterm deliveries after the introduction of the SLFHCI program. The question is, were these changes the result of the elimination of fees?

The first recommendation for action is conducting further assessments to explain the need for the elimination of fees for maternal and child healthcare and hence determine if the target population benefits from the policy change. Riddetal (2011) indicated that an effective mechanism to reduce cost as a barrier for poor women to access care is to implement user-fee exemption systems. As Asante et al. (2007) pointed out, it is important to do a cost and benefits analysis for the removal of fees to determine the impact of the policy change. Bako et al. (2011) explained that it is also important to determine the no-cost barriers to accessing healthcare (cultural barriers, lack of transportation, and educational level) and their impacts on the utilization of healthcare services.

The second recommendation for action is engaging in continuous monitoring and evaluation. Literature has shown that many adverse effects of fee elimination for services become obvious 5 or 6 years after the implementation of the policy (Mucunguzi et al., 2014). Continuous monitoring is recommended as part of the planning and implementation process of the policy. Evaluation of the policy change should be based on health outcomes and prevention of adverse health events (Dzakpasu et al., 2012).

The third recommendation is for allocating resources to meet the increasing need for the delivery of healthcare services. The elimination of fees for services cuts one

source of funding for healthcare. It is, therefore, important that adequate funding be available to undertake the increase in demand revealed by the findings of this study. A study conducted by Bibalola and Fatuisi (2009) revealed that when the fee for healthcare service is eliminated without adequate reallocation of resources, there is usually a negative impact on the quality of services due to lack of medical supplies and equipment.

Another recommendation for action is strengthening the collection of data within the healthcare system. This study shed light on the healthcare services in four regions in Sierra Leone, but it is important to strengthen the healthcare system in the whole country. One way of doing this is to introduce a health information system to capture detailed data from all hospitals, clinics, and health posts that can then be used to determine the impact of the SLFCHI on hospital deliveries, antenatal visits, low birth weight and preterm deliveries. This could be the key to continuous monitoring and evaluation.

Another important recommendation for action is improving communication among stakeholders—politicians, public health professionals, and the general public—regarding the necessity of policy changes and the expected outcome in terms of reducing adverse birth outcomes. General assessments should be done based on the perception of the general public and healthcare providers of the strengths, weaknesses, and benefits of a policy change. Twikirize and O'Brien (2010) found that when health care fees were removed, there was a correspondent increase in hospital deliveries, antenatal visits, and other services; however, as time went on, many community members opted for community health insurance plans, because they perceived the community health insurance plan to provide quality care compared to public health facilities.

In addition to the above recommendations, the Sierra Leone National Health Strategic Plan should be utilized to provide an appropriate framework for guidance in policy development, planning, and implementation of necessary changes. This will help subsequent governments to adhere to Sierra Leone's current political mandate to improve the health and wellbeing of all Sierra Leoneans.

Summary

The purpose of this study was to assess the impact of SLFHCI on hospital deliveries. In order to achieve this, specific outcome variables were selected: antenatal visits, hospital deliveries, LBW deliveries and preterm deliveries. A significant increase in hospital deliveries was observed during the postimplementation period of the SLFHCI program. No significant increase occurred in antenatal visits after the implementation of the program. There was a decrease in the incidence of LBW and preterm deliveries after the implementation of the SLFHCI program.

The quantitative cross-sectional study design and analysis were appropriate to answer the research questions. The above findings underscore the importance of the SLFHCI program and support the need for program expansion to improve the health of Sierra Leonean women and infants. A number of specific areas of the program need improvement, including data management, coordination of various health sectors, customization of programs, and expansion of the program to cover all women, especially the most vulnerable portions of the population.

The findings and limitations that have been identified in this study merit further investigation. It is also important that ongoing monitoring and evaluation of the

intervention include all hospitals, clinics, and health posts involved in the implementation process.

This study revealed the positive impacts of the intervention years after its implementation. While it appears that the SLFHCI program had data management, monitoring, and evaluation issues, this study shows that even in an imperfect form, the SLFHCI program increases hospital deliveries and reduces LBW and preterm deliveries. It is my belief that implementing this study's recommendations will move the SLFHCI program to the next level of effectiveness with the goal of further improving the health of Sierra Leonean pregnant women, lactating mothers, and infants.

References

Abor, P. A., Nbekah-Nkrumah, G.,&Sakyi, K. (2011). The socio-economic determinants of maternal health care utilization in Ghana. *International Journal of Social Economics, 38*(7), 628–648. doi:10.1108/03068201111139258

Amnesty International. (2011). *At a crossroads: Sierra Leone's free health care policy*. Retrieved from Amnesty International website: http://www.amnesty.org/en/library/asset/ AFR51/001/2011/en/4de27bf1-aebb-4944-8005-1458b4c44edb/afr510012011en

Asante, F., Chikwama, C., Daniels, A, &Armar-Klemesu, M. (2007). Evaluating the economic outcomes of the policy of fee exemption for maternal delivery care in Ghana. *Ghana Medical Journal, 41*, 110–117.

Atinga, R. A. & Baku, A. A. (2013).Determinants of antenatal care quality in Ghana.*International Journal of Social Economics, 40*(10), 852-865. doi:10.1108/IJSE-2011-0075

Babalola, S. &Fatuisi, A. (2009). Determinants of use of maternal health services in Nigeria: Looking beyond individual and household factors. *BMC Pregnancy and Childbirth, 9*, 43-55. doi:10.1186/1471-2393-9-43

Bako, B., Umar, N.I., Garba, N., & Khan, N. (2011).Informed consent practice and its implication for emergency obstetric care in Azare, North-Eastern Nigeria.*Annals of Medical and Health Sciences Research, 1*(2), 149-158.

Bertone, M. P., Samai, M., Edem-Hotah, J., & Witter, S. (2014). A window of opportunity for reform in post-conflict settings?The case of human resources for health policies in Sierra Leone, 2002–2012. *Confl Health*, *8* (11-23).

Bhopal, S. S., Halpin, S. J., &Gerein, N. (2012). Emergency obstetric referral in rural Sierra Leone: What can motorbike ambulances contribute? A mixed-methods study.*Maternal and Child Health Journal, 17*(6), 1038-1043. doi:10.1007/s10995-012-1086-8

Black, B. O. (2015). Obstetrics in the time of Ebola: Challenges and dilemmas in providing life-saving care during a deadly epidemic. *Obstetric Anesthesia Digest*, *35*(4), 180-181.

Bosu, W., Bell, J., Armar-Klemesu, M., &Tornui, J. (2007). Effect of delivery care user fee exemption policy on institutional maternal deaths in the Central and Volta Regions of Ghana. *Ghana Medical Journal, 41,* 118–124.

Burgert, C. R., Bigogo, G., Adazu, K., Odhiambo, F., Buehler, J., Brieman, R. F., Laserson, K.,…Feikin, D. R. (2011).The impact of implementation of free high-quality health care on health facility attendance by sick children in rural western Kenya.*Tropical Medicine & International Health, 16*(6), 711-720. doi:10.1111/j.1365-3156.2011.02752.x

Campbell, O., & Graham, W. (2006). Strategies for reducing maternal mortality: getting on with what works. *The Lancet, 368*, 1284–1299. doi:10.1016/s0140-6736(06)69381-1

Coyle, R. M., & Harrison, H. L. (201 5). Emergency care capacity in Freetown, Sierra Leone: A service evaluation. *BMC emergency medicine*,*15*(1), 1.

Creswell, J. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*(3rd ed.). Thousand Oaks, CA: Sage Publications.

De Allegri, M., Ridde, V., Louis, V. R., Sarker, M., Tiendrebéogo, J., Yé, M.,…Jahn, A. (2011). Determinants of utilization of maternal care services after the reduction of user fees: A case study from rural Burkina Faso. *Health Policy, 99*(3), 210-218. doi:10.1016/j.healthpol.2010.10.010

Diggins, J.,& Mills, E. (2015). The pathology of inequality: Gender and Ebola in West Africa. *Institute of Development Studies.*Retrieved from http://opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/5856/ID564%20Online.pdf?sequence=1

Donnelly, J. (2011). How did Sierra Leone provide free health care? *The Lancet, 377,* 1393-1396.

Dynes, M. M., Miller, L., Sam, T., Vandi, M. A., &Tomczyk, B. (2015). Perceptions of the risk for Ebola and health facility use among health workers and pregnant and lactating women: Kenema district, Sierra Leone, September 2014. *Centers for Disease Control and Prevention: Morbidity and Mortality Weekly Report 63*(51-52), 1226-1227.

Dzakpasu, S., Soremekun, S., Manu, A., Ten Asbroek, G., Tawiah, C., Hurt, L.,... Kirkwood, B. R. (2012). Impact of free delivery care on health facility delivery and insurance coverage in Ghana's BrongAhafo region. *PloS one*,*7*(11), e49430.

Essendi, H., Mills, S., &Fotso, J. (2011). Barriers to formal emergency obstetric care services' utilization. *Urban Health, 88*, 356-369.

Fotso, J. C., Ezeh, A. C., &Essendi, H. (2009). Maternal health in resource-poor urban settings: How does women's autonomy influence the utilization of obstetric care services. *Reprod Health*, *6*(9), 1-8.

Frankfort-Nachmias, C., &Nachmias, D. (2008). *Research methods in the social sciences* (7th ed.). New York, NY: Worth.

Gilson & McIntyre (2005).Removing user fees for primary care in Africa: The need for careful action. *British Medical Journal, 331*, 762-765.

Government of Sierra Leone.(2013). Millennium development goals progress report 2013. Retrieved fromhttp://www.undp.org/content/dam/undp/library/MDG/english/MDG%20Country%20Reports/Sierra%20Leone/sierraleone_september2010.pdf

Groen, R. S., Solomon, J., Samai, M., Kamara, T. B., Cassidy, L. D., Blok, L.,…Stekelenburg, J. (2013). Female health and family planning in Sierra Leone.*Obstetrics & Gynecology, 122*, 525-531. doi:10.1097/AOG.0b013e31829a2808

Hsia, R. Y., Mbembati, N. A., Macfarlane, S.,& Kruk, M. E. (2012). Access to emergency and surgical care in sub-Saharan Africa: The infrastructure gap. *Health Policy and Planning, 27*(3), 234-244. doi:10.1093/heapol/czr023

Hulton, L., Matthews, Z., Martin-Hilber, A., Adanu, R., Ferla, C., Getachew, A.,…Yilla, M. (2014). Using evidence to drive action: A "revolution in accountability" to

implement quality care for better maternal and newborn health in Africa. *International Journal of Gynecology and Obstetrics, 127*(2014), 96-101. doi:10.1016/j.ijgo.2014.07.002

Jain, V., Brown, C. S., & Johnson, O. (2015). Sierra Leone: The forgotten mortality. *Global Health Action* 28(*8) 19*-24

Kanu, J. S., Tang, Y., & Liu, Y. (2014). Assessment on the knowledge and reported practices of women on maternal and child health in rural Sierra Leone: A cross-sectional survey. *PloS one*, *9*(8), e105936.

Lagarde, M., & Palmer, N. (2008). The impact of user fees on health service utilization in low- and middle-income countries: How strong is the evidence? *Bulletin of the World Health Organization, 86,* 839–848.

Magadi, M., &Brockerh, A. (2000). The inequality of maternal health care urban sub-Saharan Africa in the 1990s.*Population Studies 57*(3), 347-366.

Masiye, F., Chitah, B. M.,& McIntyre, D. (2010). From targeted exemptions to user fee abolition in health care: Experience from rural Zambia. *Social Science & Medicine, 71*(4), 743-750. doi:10.1016/j.socscimed.2010.04.029

Maxmen, A. (2013). Sierra Leone's free health-care initiative: Work in progress. *Lancet, 381,*191-192.

McCarthy, C. F., Kelley, M. A., Verani, A. R., St. Louis, M. E., & Riley, P. L. (2014).Development of a framework to measure health profession regulation strengthening.*Evaluation and Program Planning, 46*(2014), 17-24.doi:10.1016/j.evalprogplan.2014.04.008

McPake, B., Witter, S., Ensor, T., Fustukian, S., Newlands, D., Martineau, T., &Chirwa, Y. (2013). Removing financial barriers to access reproductive, maternal and newborn health services: The challenges and policy implications for human resources for health. *Hum Resour Health*, *11*(46), 1478-4491.

Menéndez, C., Lucas, A., Munguambe, K., & Langer, A. (2015). Ebola crisis: The unequal impact on women and children's health. *Lancet Global Health*, *3*, e130.

Milland, M.,&Bolkan, H. A. (2015).Enhancing access to emergency obstetric care through surgical task shifting in Sierra Leone: Confrontation with Ebola during recovery from civil war.*ActaObstetriciaetGynecologica, 94*(2015), 5-7. doi:10.1111/aogs.12540

Moszynski, P. (2011). Sierra Leone's maternal health reforms fail to deliver free treatment, says amnesty international. *BMJ*, *343 (123-136)*.

Mucunguzi, S., Wamani, H., Lochoro, P. &Tylleskar, T. (2014). Effects of improved access to transportation on emergency obstetric care outcomes in Uganda. *African Journal of Reproductive Health, 18*(3), 87-94.

National Institute of Health.(2014). *Preterm labor and birth: Condition information.*Retrieved from http://www.nichd.nih.gov/health/topics/preterm/conditioninfo/Pages/default.aspx

Nove, A., Hulton, L.,Matthews, Z, &Martin-Hilber, A. (2014).Establishing a baseline to measure change in political will and the use of data for decision-making in maternal and newborn health in six African countries.*International Journal of Gynecology and Obstetrics, 127*(1), 102-107.

Parkhurst, J. O.,&Ssengooba, F. (2009). Accessing access barriers to maternal health care: Measuring bypassing to identify health centre needs in rural Uganda. *Health Policy and Planning, 24*(5), 377-384. doi:10.1093/heapol/czp023

Patton, M. (1990).*Qualitative evaluation and research methods.* London, England: Sage Publications.

Ridde, V., Yaogo, M., Kafando, Y., Kadio, K., Ouedraogo, M., Bicaba, A. & Haddad, S. (2011). Targeting the worst-off for free health care: A process evaluation in Burkina Faso.*Evaluation and Program Planning, 34*(4), 333-342. doi:10.1016/j.evalprogplan.2011.03.007

Sidani, S.,& Braden, C. (1998).*Evaluating nursing interventions: A theory-driven approach.*Thousand Oaks, CA: Sage Publications.

Smith, K.V.,&Sulzbach, S. (2008). Community-based health insurance and access to maternal health services: Evidence from three West African countries. *Social Science & Medicine, 66*(12), 2460-2473. doi:10.1016/j.socscimed.2008.01.044

Stephenson, R., Baschieri, A., Clements, S., Hennink, M.,&Madise, N. (2006).Contextual influences on the use of health facilities for childbirth in Africa.*American Journal of Public Health, 96*(1), 84-93.

Tamura, M., Hinderaker, S. G., Manzi, M., Van Den Bergh, R., & Zachariah, R. (2012). Severe acute maternal morbidity and associated deaths in conflict and post-conflict settings in Africa.*Public Health Action, 2*(4), 122-125.

Twikirize, J. M.,& O'Brien, C. (2012). Why Ugandan rural households are opting to pay community health insurance rather than use the free healthcare services.

International Journal of Social Welfare, 21(1), 66-78. doi:10.1111/j.1468-2397.2010.00771.x

United Nations.(2014).*Crude death rate (per 1,000 population).*Retrieved from http://data.un.org/

Witter, S., Arhinful, D., Kusi, A., &Zakariah-Akoto, S. (2007). The experience of Ghana in implementing a user fee exemption policy to provide free delivery care.*Reproductive Health Matters, 15*(30), 61-71.

Witter, S., Dieng, T., Mbengue, D., Moreira, I., &De Brouwere, V. (2010). The national free delivery and caesarean policy in Senegal: Evaluating process and outcomes. *Health Policy and Planning, 25*, 384–392.

World Health Organization. (2011). *The Abuja Declaration: Ten years on*. Retrieved from http://www.who.int/healthsystems/publications/abuja_report_aug_2011.pdf

World Health Organization. (2012a). *Factsheet: Millennium development goal 5.* Retrieved from http://www.who.int/mediacentre/factsheets/fs290/en/

World Health Organization.(2012b). *Sierra Leone free healthcare initiative*.Retrieved fromhttp://www.afro.who.int/en/sierra-leone/who-country-office-sierra-leone.html

World Health Organization. (2013a). *Factsheet: Millennium development goal 5.* Retrieved from http://www.who.int/mediacentre/factsheets/fs290/en/

World Health Organization. (2013b). *WHO Disability adjusted life years (DALY) estimates for 2012 by cause for WHO member states*.Retrieved from

http://www.who.int/healthinfo/global_burden_disease/
gbddeathdalycountryestimates2004 xls

World Health Organization. (2014a). *Factsheet: Millennium development goal 5.* Retrieved from http://www.who.int/mediacentre/factsheets/fs290/en/

World Health Organization. (2014b). *The PMNCH 2014 accountability report: Tracking financial commitments to global strategy for women's and children's health.*Retrieved from http://www.who.int/pmnch/knowledge/publications/pmnch_report14.pdf

World Health Organization. (2014c). *Trends in maternal mortality: 1990 to 2013*. Retrieved from http://www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-2013/en/

World Health Organization. (2014d). *Global nutrition targets 2025: Low birth weight policy brief.* Retrieved fromhttp://apps.who.int/iris/bitstream/10665/149020/2/WHO_NMH_NHD_14.5_eng.pdf

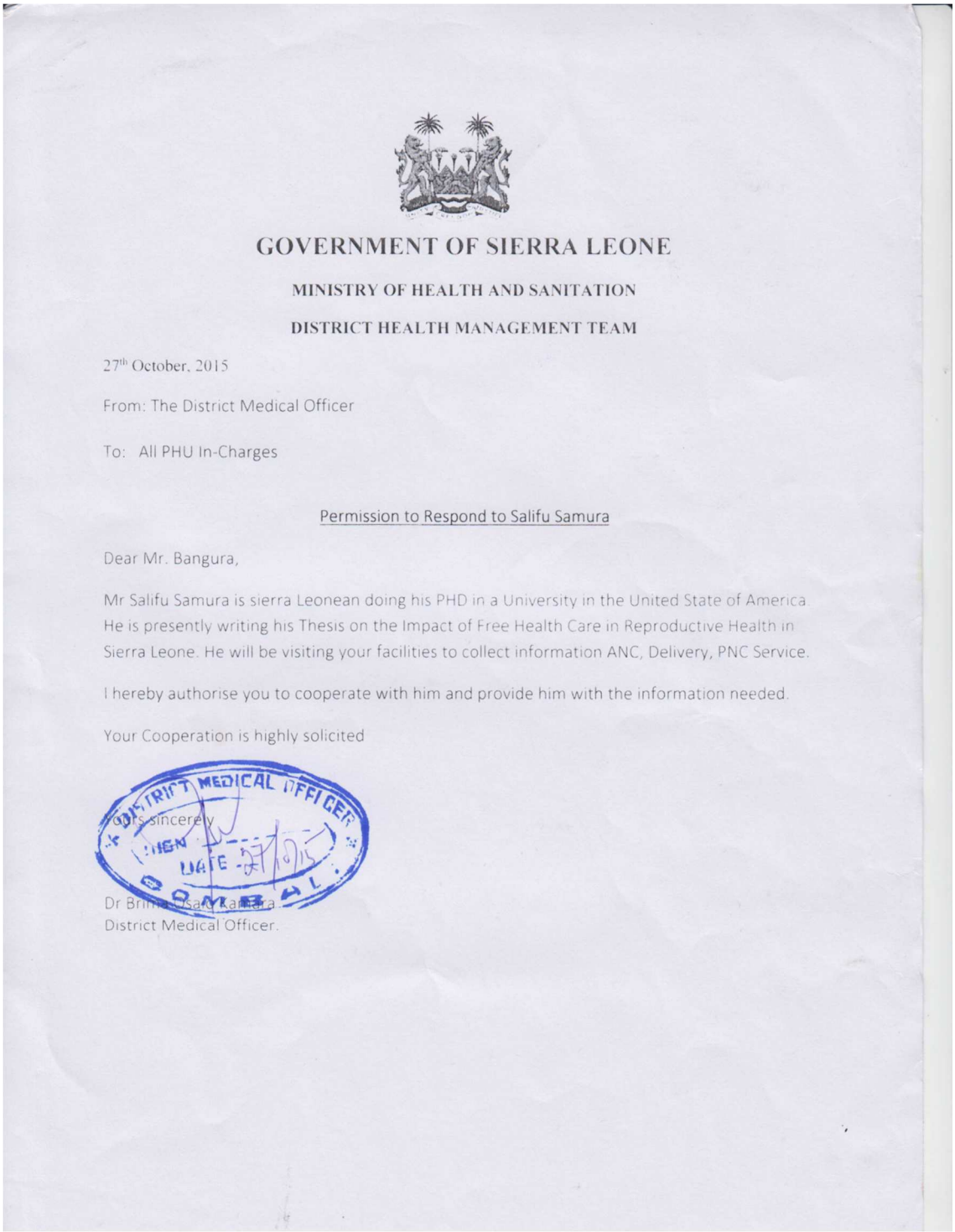
Wurie, H., Samai, M. H., & Witter, S. (2014). Staffing the public health sector in Sierra Leone, 2005-2011: Findings from routine data analysis.*ReBuild Consortium.* Retrieved from http://r4d.dfid.gov.uk/pdf/outputs/ReBuild/Project2Secondarydatareportfinal071114.pdf

Yansaneh, A. I., Moulton, L. H., George, A. S., Rao, S. R., Kennedy, N., Bangura, P.,… Diaz, T. (2014). Influence of community health volunteers on care seeking and

treatment coverage for common childhood illnesses in the context of free health care in rural Sierra Leone. *Tropical Medicine and International Health, 19*(12), 1466-1476. doi:10.1111/tmi.12383

Yates, R. (2009). Universal health care and the removal of user fees. *Lancet, 373,* 2078–2081.

Appendix A: Approval Letter to Access Database



GOVERNMENT OF SIERRA LEONE

MINISTRY OF HEALTH AND SANITATION

DISTRICT HEALTH MANAGEMENT TEAM

27th October, 2015

From: The District Medical Officer

To: All PHU In-Charges

Permission to Respond to Salifu Samura

Dear Mr. Bangura,

Mr Salifu Samura is sierra Leonean doing his PHD in a University in the United State of America. He is presently writing his Thesis on the Impact of Free Health Care in Reproductive Health in Sierra Leone. He will be visiting your facilities to collect information ANC, Delivery, PNC Service.

I hereby authorise you to cooperate with him and provide him with the information needed.

Your Cooperation is highly solicited

DISTRICT MEDICAL OFFICER
SIGN
DATE 27/10/15

Yours sincerely

Dr Brima Usaf Kamara
District Medical Officer.

Appendix B: Data Use Agreement

DATA USE AGREEMENT

This Data Use Agreement ("Agreement"), effective as of (Date) is entered into by and between Salifu Salito Samura and Sierra Leone Ministry of Health and Sanitation authority. The purpose of this Agreement is to provide Data Recipient with access to a Limited Data Set ("LDS") for use in research **in accord with laws and regulations of the governing bodies associated with the Data Provider, Data Recipient, and Data Recipient's educational program.** In the case of a discrepancy among laws, the agreement shall follow whichever law is more strict.

1. Definitions. Due to the study's affiliation with Laureate, a USA-based company, unless otherwise specified in this Agreement, all capitalized terms used in this Agreement not otherwise defined have the meaning established for purposes of the USA "HIPAA Regulations" and/or "FERPA Regulations" codified in the United States Code of Federal Regulations, as amended from time to time.

2. Preparation of the LDS. Data Provider shall prepare and furnish to Data Recipient a LDS in accord with any applicable laws and regulations of the governing bodies associated with the Data Provider, Data Recipient, and Data Recipient's educational program.

3. Data Fields in the LDS. **No direct identifiers such as names may be included in the Limited Data Set (LDS).** In preparing the LDS, Data Provider shall include the **data fields specified as follows,** which are the minimum necessary to accomplish the research: Utilization data from the four major government hospitals (Freetown, Bo, Kenema and Makeni government hospitals) to include number of prenatal visits, number of hospital deliveries, number of low birth weight babies delivered, number of very low birth weight babies delivered, number of preterm babies delivered, also the mothers educational level, geographic location, marital status, age, smoking status and alcohol usage for the year 2007, 2008, 2009, 2011, 2012 and 2013.

4. Responsibilities of Data Recipient. Data Recipient agrees to:

   a. Use or disclose the LDS only as permitted by this Agreement or as required by law;

   b. Use appropriate safeguards to prevent use or disclosure of the LDS other than as permitted by this Agreement or required by law;

   c. Report to Data Provider any use or disclosure of the LDS of which it becomes aware that is not permitted by this Agreement or required by law;

   d. Require any of its subcontractors or agents that receive or have access to the LDS to agree to the same restrictions and conditions on the use and/or

disclosure of the LDS that apply to Data Recipient under this Agreement; and

e. Not use the information in the LDS to identify or contact the individuals who are data subjects.

5. Permitted Uses and Disclosures of the LDS. Data Recipient may use and/or disclose the LDS **for its Research activities only.**

6. Term and Termination.

a. Term. The term of this Agreement shall commence as of the Effective Date and shall continue for so long as Data Recipient retains the LDS, unless sooner terminated as set forth in this Agreement.

b. Termination by Data Recipient. Data Recipient may terminate this agreement at any time by notifying the Data Provider and returning or destroying the LDS.

c. Termination by Data Provider. Data Provider may terminate this agreement at any time by providing thirty (30) days prior written notice to Data Recipient.

d. For Breach. Data Provider shall provide written notice to Data Recipient within ten (10) days of any determination that Data Recipient has breached a material term of this Agreement. Data Provider shall afford Data Recipient an opportunity to cure said alleged material breach upon mutually agreeable terms. Failure to agree on mutually agreeable terms for cure within thirty (30) days shall be grounds for the immediate termination of this Agreement by Data Provider.

e. Effect of Termination. Sections 1, 4, 5, 6(e) and 7 of this Agreement shall survive any termination of this Agreement under subsections c or d.

7. Miscellaneous.

a. Change in Law. The parties agree to negotiate in good faith to amend this Agreement to comport with changes in federal law that materially alter either or both parties' obligations under this Agreement. Provided however, that if the parties are unable to agree to mutually acceptable amendment(s) by the compliance date of the change in applicable law or regulations, either Party may terminate this Agreement as provided in section 6.

b. Construction of Terms. The terms of this Agreement shall be construed to give effect to applicable federal interpretative guidance regarding the HIPAA Regulations.

c. No Third Party Beneficiaries. Nothing in this Agreement shall confer upon any person other than the parties and their respective successors or assigns, any rights, remedies, obligations, or liabilities whatsoever.

d. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

e. Headings. The headings and other captions in this Agreement are for convenience and reference only and shall not be used in interpreting, construing or enforcing any of the provisions of this Agreement.

IN WITNESS WHEREOF, each of the undersigned has caused this Agreement to be duly executed in its name and on its behalf.

DATA PROVIDER

Signed: _____

Print Name: _____

Print Title: _____

DATA RECIPIENT

Signed: S.S.Samura

Print Name: Salifu S Samura

Print Title: Researcher