



REDUCING MATERNAL MORTALITY IN LUSAKA ZAMBIA

Applied Policy Project
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Honor Statement: On my honor as a UVA student, I have neither given nor received unauthorized aid on this project.

Ian Charles Novak



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Glossary

ANC – Antenatal Care

CCTs – Conditional Cash Transfers

CHW – Community Health Worker

EmONC – Emergency Obstetric and Neonatal Care

HIV/AIDS – Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome

LMICs – Low- and Middle-Income Countries

MMR – Maternal Mortality Ratio

MDG – Millennium Development Goal

MoH – Ministry of Health

mHealth – Mobile Health

NGO – Non-Governmental Organization

SMGL – Saving Mothers, Giving Life

SDG – Sustainable Development Goal

TBAs – Traditional Birth Attendants

UNICEF – United Nations International Children's Emergency Fund

USAID – United States Agency for International Development

USD – United States Dollar

UTH – University Teaching Hospital

ZMW – Zambian Kwacha

Client Overview

As taken from Catholic Relief Services' (CRS) website, their operational goals, or guiding principles, are to advance the following: Sacredness and dignity of the human person, rights and responsibilities, social nature of humanity, the common good, subsidiarity, solidarity, option for the poor, and stewardship. Pursuing a task such as reducing maternal mortality assists in these goals, as it protects the sacredness of the human person through saving the life of the mother, assists the medical system in providing adequate medical care for the people in line with their responsibilities, encourages community solutions in the aspect of social connection, pursues the common good through reducing loss and its negative impacts on a developing nation, supplying the tools to meet successful benchmarks with the ultimate goal of maternal mortality reduced below the SDGs threshold, and providing increased access to medical alternatives for the poor, especially those in unplanned settlements.

CRS has worked in numerous countries across the developing world. In particular, CRS has worked alongside other NGOs and governments in Sub-Saharan Africa for nearly half a century. CRS first began its work within Europe, helping rebuild the continent after the Second World War. This action was guided by the organization's founders, who were bishops of the church. Since, CRS has maintained this religious affiliation while also expanding and doing work in nations that represent a vast number of different religions, as remains true in portions of Africa. These efforts to date have been in large part sponsored by funding from US organizations, as well as private members of the church.

On the issue of maternal mortality, CRS has organized past efforts such as the Mayi na Mwana projects, which saw success in reducing maternal mortality, as well as other projects in Uganda and neighboring nations. Seeing that CRS believes in the power of life in addition to the importance of the family unit. Maternal mortality threatens both of these aspects, and such, CRS has exhausted many efforts into reducing maternal mortality within the nation of Zambia, which has one of the highest maternal mortality ratios in Sub-Saharan Africa. The following report looks to aid these efforts, as well as efforts by other NGOs working to combat the issues that lead to maternal mortality. Through this report, CRS will be provided with additional tools to consider as they move forward towards a Zambia free of maternal mortality.

Executive Summary

Strengthening Maternal Health Infrastructure in Lusaka, Zambia

This report presents a focused, actionable strategy to reduce maternal mortality in Lusaka, Zambia, by addressing one of the most overlooked infrastructure challenges in maternal healthcare: the shortage of hospital beds. Intended for decision-makers in the Zambian Ministry of Health, international donors, and NGOs such as CRS, the report identifies how targeted investments in physical infrastructure, alongside community partnerships and technological tools, can dramatically improve maternal outcomes and support Zambia's national health goals.

Lusaka is in the midst of a maternal healthcare crisis. Zambia's maternal mortality rate stands at 398 deaths per 100,000 live births—among the highest in Sub-Saharan Africa. In certain peri-urban areas of Lusaka, fewer than half of births are attended by skilled health professionals, leaving women vulnerable to life-threatening complications such as hemorrhage, obstructed labor, and infections. These risks are compounded by supply-side failures, including overcrowded health facilities and unsafe birth environments. One particularly urgent issue is the lack of hospital beds, which results in pregnant women being turned away or forced to give birth on clinic floors. The economic toll is also profound—preventable maternal deaths cost the nation an estimated \$487.6 million annually. If NGOs like CRS fail to respond effectively, the crisis will continue to undermine national development and threaten the lives of thousands of Zambian women each year.

To address this issue, the report assesses the feasibility and impact of increasing hospital bed capacity in Lusaka's most underserved health centers. Through analysis of maternal health data and best practices in resource allocation, the report identifies a strategy that combines infrastructure investment with community engagement and real-time monitoring. Mobile health (mHealth) tools can be used to track facility-level needs and maternal outcomes, ensuring that beds are deployed where they are needed most. Priority should be given to unplanned settlements and peri-urban areas where overcrowding and underresourcing are most severe. The findings also highlight opportunities to support Zambia's economy by sourcing beds locally, reducing delivery delays, and fostering national ownership of the healthcare system.

In addition to the analysis of expanding hospital beds within Lusaka, the report also looks at the potential for expanding the number of community health workers within the city. Research shows that throughout the Global South, community health workers have played vital roles in reducing maternal mortality through their ability to expand health networks into areas with lower access. This is especially significant considering the high number of residents within Lusaka living in unplanned settlements that exist outside of the major health infrastructure. While expanding the number of community health workers within Lusaka would yield the highest reduction in maternal mortality, this option is also the most expensive, with a calculated cost of \$27.75 million. Because of this high cost, in addition to funding limitations within CRS and the local government, as well as recent cuts in US aid organizations, achieving the funds necessary to implement such a measure will be very difficult.

The final avenue of approach that was analyzed was the ability for CRS to implement cash transfers in order to encourage facility-based deliveries and care. The research found that through offering just \$22 per visit, there was a significant increase in mothers electing for additional care as well as reductions in maternal mortality. This is important to note as one of the leading causes of maternal mortality within Lusaka is that the majority of livebirths occur outside of medical facilities, often in locations that are unsterile and lacking properly trained medical staff. This alternative counters this effect by directly

providing a way for expecting mothers to gain financial support for making a positive health decision. At a cost of just over \$10 million, this alternative sees great potential in addressing maternal mortality's leading causes. However, because this alternative requires a significant amount of coordination between staff, as well as the cost, it is the opinion that CRS should pursue other options as reductions in aid funding and the suspensions of many aid-based jobs is currently creating a scenario where CRS may not have the resources to sustain such a program.

By analyzing the alternatives through several criteria, including cost, effectiveness, administrative feasibility, sustainability, and accessibility, the author hopes to provide CRS with an accurate tool that will aid their decision-making process. Through examining the cost, the researcher looks to provide CRS with an accurate assessment of the resources required to initiate a program that reduces maternal mortality. With effectiveness, the researcher looked to compare across alternatives how maternal mortality would be reduced. Administrative feasibility and sustainability were both qualitative analyses of whether the program would be able to be supported in line with the goals laid out by the national government of Zambia and the ability for the program to survive after implementation. Through the criteria of accessibility, the researcher looked to demonstrate how the programs would increase the number of women exposed to care. With careful consideration and research of these criteria, the researcher found that one program stood above the rest.

The report recommends that CRS begin with a rapid needs assessment using mHealth systems and local feedback to pinpoint high-need facilities. Following this, CRS should procure and distribute locally manufactured hospital beds, accompanied by staff training to ensure correct usage and maintenance. The initiative should also strengthen emergency referral systems and inter-facility communication to reduce delays in accessing care. Continuous monitoring and community feedback will be essential to evaluate the intervention's success and guide its expansion to other districts. By doing this, CRS can save hundreds of lives at the cost of \$68,640 for 2,160 additional beds.

By acting now, CRS and its partners can help reverse Lusaka's maternal mortality crisis and establish a replicable model for facility-based maternal care improvements.

Introduction

Breakdown of the Report

This report is structured around an analysis of alternatives that look to reduce maternal mortality within Lusaka, Zambia. As such, the report will begin with a background of maternal mortality within Zambia, as well as other countries. The background will be followed by a literature review of evidence of past initiatives that have been utilized in countries with similar backgrounds to Zambia, resulting in decreased maternal mortality. Additionally, it will be this literature review that will guide the selection of the criteria, which is the following section. This section will include the listing of the potential actors for each alternative in addition to how the alternative will operate to reduce maternal mortality. The analysis, or findings, will follow, which will utilize comparisons between different projects of similar nature, with the ultimate goal to produce an alternative that provides the best good while being able to be implemented by CRS. After this option is identified, the recommendation on implementation will be the final section to this report.

Problem Statement

Lusaka faces a maternal healthcare crisis, with Zambia's maternal mortality rate at 398 deaths per 100,000 live births (Musonda et al, 2021)—one of the highest in Sub-Saharan Africa—due to shortages of skilled birth attendants, as less than 50% of births in some areas are attended by trained professionals (Prata et al, 2011). Additionally, with supply-side failures, as well as unsafe birth conditions, mothers in Lusaka are exposed to higher risk, further increasing the probability of maternal mortality. Failure of NGOs, such as Catholic Relief Services (CRS) to address these issues will continue to halt the development of the nation and the life within it, as maternal mortality within the nation costs \$487,626,500.78 annually.

Background

Beyond these direct costs, maternal deaths also affect the whole community. The healthcare system becomes more overwhelmed when preventable deaths take up resources that could be used elsewhere. Children who lose their mothers are at higher risk of malnutrition and disease, which leads to long-term health problems (Reed & Koblinsky, 2000). Socially, maternal deaths make gender inequalities worse because daughters or female relatives often have to step in to care for the family, forcing them to leave school or work (Reed & Koblinsky, 2000). This reduces opportunities for education and better jobs (Reed & Koblinsky, 2000). The loss of a mother also weakens community structures, as women play important roles in families and local economies (Reed & Koblinsky, 2000).

Additionally, a study by Marshall Makate shows that for every level of education not obtained, maternal mortality increases, which means to suggest that for the children of dead mothers who lose out on additional years of education, there is a higher likelihood that they themselves will face a higher likelihood of maternal mortality in the future (Makate, 2016). This in its own right suggests a loop, where one causal event drives the other, which highlights the significant costs maternal mortality poses on society.

The opportunity costs of maternal mortality are the lost benefits that these women could have provided to their families and society. Many women in Lusaka work in small businesses, farming, or the informal

economy, so their deaths mean a loss of income and productivity (Klaveran et al, 2009). Children without mothers often struggle in school, reducing their chances of earning a good living in the future (Reed & Koblinsky 2000). Family members may also have to drop out of school or quit jobs to take care of younger siblings, which keeps them in poverty. Money spent on emergency maternal care or dealing with deaths could have been used for preventing health issues in the first place. Losing mothers weakens communities, slows down economic growth, and holds back progress in gender equality

Despite USAID support enabling programs such as Saving Mothers, Giving Life (SMGL), which has increased deliveries by 30% (USAID, 2014), Zambia's healthcare funding remains ~10% of the national budget, well below the 15% Abuja Declaration target. Because of the lack of additional funding, Lusaka, the capital city of Zambia, faces many health issues. Among them is maternal mortality, which is caused by several factors, including unplanned settlements, lack of information, and inadequate maternal healthcare services. The combination of the three results in Lusaka having a maternal death rate of ~29 per 1,000 live births, a number which is uncharacteristically higher than in rural areas (Jacobs et al, 2024). Additionally, nearly 70% of the city's residents live in what is called an unplanned settlement, which increases concerns with sanitation, education, and quality of life (Jacobs et al, 2024).

The costs and seriousness of maternal mortality, and how it affects the lives of those living in Lusaka, as well as development for the nation as a whole, is clear. The high rate of maternal mortality must be reduced in order to create growth, not just within the family, but the economy as a whole. It is the role of CRS to reduce maternal mortality, as well as the other conditions that cause it and are affected by it. The following section will provide a greater understanding of maternal mortality and what has been done to combat it.

Literature Review

I. Introduction

A. Definitions

In order for the literature to be best understood, several definitions must first be defined. Maternal mortality is defined as "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes" (Shrestha, 2022). The leading causes of postpartum deaths include but are not limited to postpartum hemorrhaging, puerperal sepsis, and uterine rupture. Postpartum hemorrhaging is often linked to severe vaginal bleeding, which causes hypovolemic shock. This can occur up to 12 weeks after delivery (Cleveland Clinic, 2024). Puerperal sepsis is defined as the infection of the uterus and surrounding areas. Uterine rupture is defined as the rupture of the uterine lining, which can cause both bleeding and the suffocation of the baby.

B. Significance of the Issue in a Global and Zambian Context

Maternal mortality is a significant cause of death in the developing world. When compared to high-income nations, 99% of maternal deaths occur in low- and middle-income nations (Kabuya et al, 2020). Additionally, Sub-Saharan Africa represents two-thirds of all maternal mortality (Kabuya et al, 2020). Because of this, there have been 2 global initiatives created to address this: The Millennium Development Goals and their successor the United Nations Sustainable Development Goals. Being that Zambia is located in Sub-Saharan Africa and is defined as a low-income nation by the World Bank; it is a prime

nation for addressing maternal mortality in addition to other initiatives laid out by the United Nations Sustainable Development Goals.

C. Research Objectives and Guiding Questions

The purpose of this research is to assess past and current measures within Lusaka, Zambia, and other cities with similar characteristics and challenges. The research will be asking why maternal mortality is so high, why projects have not reduced maternal mortality to an adequate level, and what are the factors that lead to maternal mortality. It is the goal of the researcher to identify causations that can be matched by applicable solutions that have seen success in similar cases.

II. Overview of Maternal Mortality in Zambia

A. Current Maternal Mortality Rates and Trends

The chart below demonstrates the maternal mortality rates over the past 3 decades. What is important to note is that 10 years after the MDG target deadline of 162 deaths per 100,000 live births, Zambia is still at 398 deaths per 100,000 live births (Musonda et al, 2021) despite millions in healthcare spending. Additionally, it is worth noting that while the maternal mortality rate has fallen significantly since 2001, it still has a long way to go to reach the 2015 MDG target.

Figure 1: Maternal Mortality Rates and Trends within Zambia

Indicators	1990	2001/2	2015 MDG Target
MMR Ratio/100,000 Live Births		649	729
Proportion of Births with Skilled Attendant		51%	43%
			80%

Source: ZDHS 2001-2002

B. Causes of Maternal Deaths in Zambia

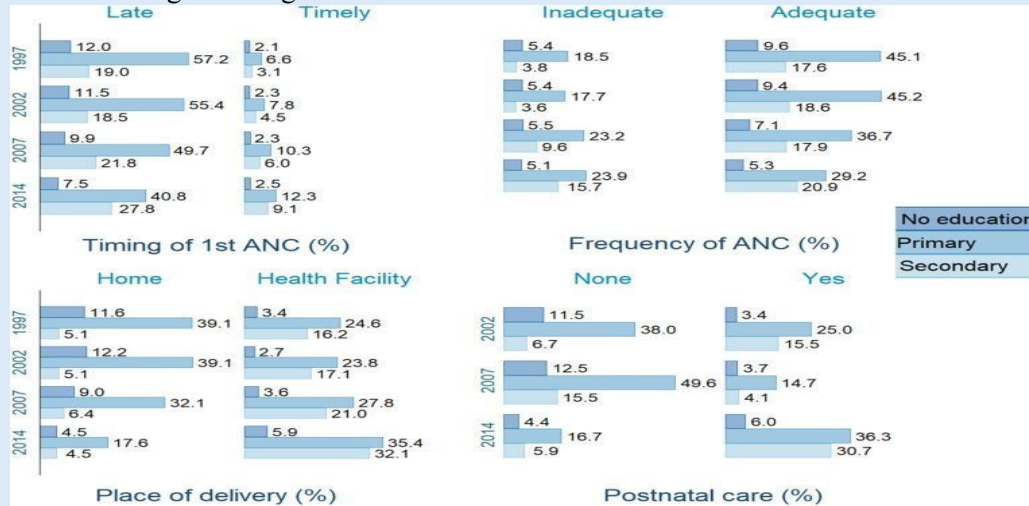
According to a study conducted using data from 1997-2014, the majority of postpartum deaths were related to postpartum hemorrhaging (21%), puerperal sepsis (19%), uterine rupture (16%), and HIV/AIDS-related complications (15%) (Kabuya et al, 2020). The data collected from this study used maternal death reviews (MDRs), which were recorded in sessions with assigned clinicians, attendants, and medical administrators assigned to the mother or health facility (Kabuya et al, 2020). While this study could be interpreted as inaccurate due to the nature of the respondents and their relationship with the mother, these MDRs were conducted in line with guidance from the World Health Organization (WHO), which has significant authority and trust on these matters (Kabuya et al, 2020). It is important to note that these MDRs, under the guidance of the WHO were first introduced by the Zambian Ministry of Health in 2007 with no reported issues (Kabuya et al, 2020).

C. Socioeconomic and demographic factors contributing to high maternal mortality

The study authored by He et al in 2021 used data from the last 4 surveys from the Zambian Demographic and Health Survey (He et al, 2021). These surveys offer a comprehensive view of data from rural and

urban sources. This study highlights that postnatal care was more common for the age group between 20 and 34 years and those above and below. Additionally, the study highlights a trend that those with higher levels of education receive more levels of care. This is demonstrated in the graph below.

Figure 2: Significance of Education within Maternal Healthcare



Source: He et al, 2021

The study by He et al also looked at other socioeconomic factors including the education rate of husbands and religion. The following graphs show that there was a higher likelihood of care for those whose husbands had higher rates of education as well as some religious groups (He et al, 2021). It is important to note that the center column represents urban areas, with the column on the right representing rural areas. The most fascinating aspect of this data is that there is a higher likelihood of rural respondents taking postnatal care, while there is a higher likelihood of those in urban areas using health facility delivery services (He et al, 2021).

Figure 3: Predictors of Taking Postnatal Care in Zambia

Religion (christian)			
Other	.708* [.517,0.970]	1.199 [.549,2.619]	.625* [.436,0.897]
Ethnicity (Bemba)			
Tonga	.801** [.699,0.917]	.705* [.529,0.940]	.839* [.716,0.983]
Chewa	2.090*** [1.747,2.501]	1.911** [1.255,2.911]	2.305*** [1.878,2.829]
Other	1.197*** [1.087,1.317]	.965 [.808,1.151]	1.312*** [1.166,1.476]

Source: He et al, 2021

Figure 4: Predictors of Using Health Facility Delivery Services in Zambia

Husband's education (no education)			
Primary	1.040 [.910,1.188]	1.661 ** [1.153,2.394]	.964 [.837,1.111]
Secondary/higher	1.604 *** [1.394,1.846]	2.759 *** [1.918,3.969]	1.418 *** [1.217,1.652]

Source: He et al, 2021

The primary takeaway from this study is that there is a significant difference in receiving natal care between different socioeconomic classes. Additionally, the authors noted that there was a positive trend in seeking care during the first trimester, which had doubled during the time of the study (He et al, 2021). However, with a decrease in additional visits during the time of the survey, the authors speculate that this is due to poor services/satisfaction with the first care visit (He et al, 2021). There is not data to back this claim, however this is a claim that fits the viewpoint of the researcher that healthcare funding in Zambia is lacking proper resources, which has led the nation to falling behind on its declared healthcare goals.

III. Determinants of Maternal Mortality in Lusaka

A. Healthcare Professionals within Lusaka

One of the strongest barriers to reducing maternal mortality is the lack of trained medical professionals available within Zambia. This is compounded by the factors listed above. The following table depicts the ratio of medical personnel to population within several regions and cities within Zambia. It is important to note that while Lusaka has a lower ratio, meaning there is more available staff within the city when compared to others in Zambia, the city still faces a significant shortfall. Additionally, it is the opinion of the researcher that Lusaka should be the focus due to the factors mentioned above in addition to the likelihood of resources afforded to the city versus rural areas.

Figure 5: Ratio of Trained Medical Human Resources to Population

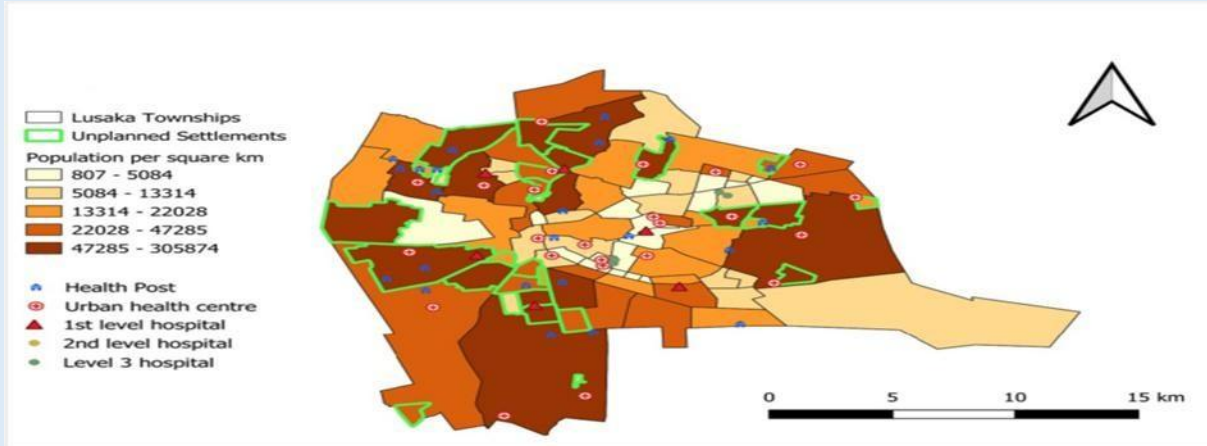
Province	Dr:Pop	CO:Pop	RM:Pop	RN:Pop	ZEM:Pop	ZEN:Pop	Pharm. Staff:Pop	Lab. Staff:Pop	EHT:Pop
Lusaka	6,247	7,544	12,397	3,799	5,243	1,577	319,847	15,527	27,573
Copperbelt	8,998	9,719	14,425	5,091	3,599	1,567	55,076	16,523	23,006
Average Rural Provinces	43,313	10,970	74,713	17,324	11,541	2,863	169,160	49,582	13,099
National	17,589	9,787	27,714	8,822	6,099	2,293	123,509	27,249	15,150
Sources: Ministry of Health 2005 (Verbal Communication)					RM = Registered Midwife RN = Registered Nurse; ZEM = Zambia Enrolled Midwife; ZEN = Zambia Enrolled Nurse; EHT = Environmental Health Technician				
Dr = Medical Doctor; CO = Clinical Officer;									

Source: Anyangwe et al, 2006

B. Challenges within Lusaka

A study conducted in Lusaka highlights the challenges with living conditions and their role in maternal mortality. As noted above, nearly 70% of the population within Zambia lives in “unplanned settlements”, which are associated with poor hygiene practices and a lack of resources (Jacobs et al, 2024). Among these conditions exists lower rates of access to maternal healthcare, which further highlights the issues facing Lusaka (Jacobs et al, 2024). The image below, from the same study, shows the relation between unplanned settlements and higher levels of care facilities.

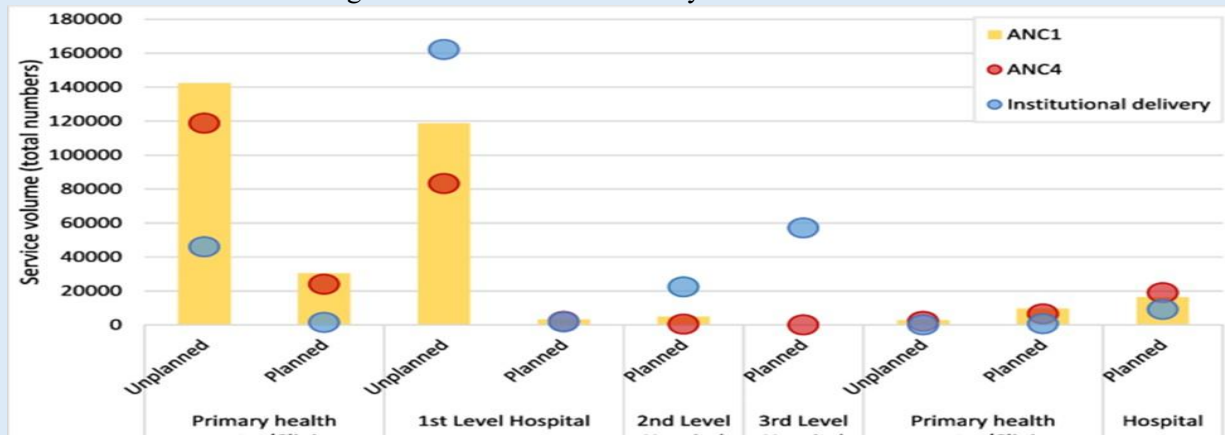
Figure 6: Unplanned Settlements and the Distribution of Hospitals within Lusaka



Source: Jacobs et al, 2024

This study also highlights that despite differences in the ratio of health professionals in Lusaka and rural regions, use of maternal health services in rural areas is about equal to those of urban areas, including Lusaka (Jacobs et al, 2024). However, the study found that neonatal mortality rates within Lusaka are higher than those of rural areas, with ~29 deaths per 1,000 live births compared to 23 deaths per 1,000 live births in rural areas (Jacobs et al, 2024). The authors of this recent study note that there is no data that can make accurate comparisons between maternal mortality rates, but they believe the cause of the difference in neonatal mortality rates (delays in receiving skilled delivery and timely emergency care) are linked to maternal mortality rates (Jacobs et al, 2024). The image below provides a better understanding of the use of facilities and emergency births to this end.

Figure 7: Volume of Services by Area within Lusaka



Source: Jacobs et al, 2024

IV. Successful Model and Best Practices

A. Case Study of a Successful Maternal Health Program in Zambia and Sub-Saharan Africa

Within the literature, there is a consistently referred program for addressing maternal mortality within Zambia and similar nations. This program is the Saving Mothers, Giving Life (SMGL) initiative which is a private-public partnership that was created by USAID and then Secretary of State Hillary Clinton in 2012 with the goal of reducing maternal mortality in developing nations. Since its creation, maternal mortality has been reduced by ~40% in Zambia and Uganda (Conlon et al, 2019). While this was successful, the authors of this study note that only 1 nation, Rwanda, was successful in reducing maternal mortality to the levels required by MDGs (Conlon et al, 2019). The SMGL initiative was implemented in 18 districts in Zambia, however Lusaka was not included. Through this initiative, the proportion of births performed at institutions rose from 63% to 90% within participating districts, the benefit of which can be attributed to the change in mortality rates between rural and urban centers as mentioned above (Conlon et al, 2019). SMGL also addressed issues of transportation by building temporary homes for mothers in the final weeks of their pregnancies near healthcare facilities (Conlon et al, 2019). This effort saw 69% increase of centers reporting available homes for mothers which greatly addressed the issue of transportation throughout participating districts (Conlon et al, 2019). Through this review of SMGL it is clear that their programs must be implemented within Lusaka in order to address the issues of unplanned settlements and socioeconomic factors contributing to maternal mortality.

Another study of SMGL provided a more in-depth review of physical resources within Uganda and Zambia. The table below provides data on resources such as workers, facilities, and equipment that were added within SMGL's first year of practice (Serbanescu et al, 2017).

Figure 7: Resources Added Through SMGL

	Gains during Year 1	
	Uganda	Zambia
Infrastructure developed		
operating theaters built or renovated	8	0
facilities with electricity upgrades	35	22
facilities with uninterrupted water supply added	6	10
mother shelters built or renovated	4	11
Human Resources added		
medical officers	18	0
obstetricians	0	0
clinical officers	15	0
nurses	20	0
midwives	103	19
Health providers who received EmONC training	316	199
Supply-chain system improvements		
facilities that received EmONC equipment	111	122
facilities that received essential commodities and supplies	89	122
facilities with protocols for clinical mgmt. of obstetric complications	57	NA

Source: Serbanescu et al, 2017

It is important to note the distinction between the number of facilities and human resources added between Uganda and Zambia. While the program achieved positive change, Lusaka still faces a human resources challenge which contributes to its maternal mortality. In light of Zambia still failing to reach MDG goals on maternal mortality, this is an area that must be addressed.

B. Lessons from Global Initiatives

It is clear within the literature that there has been relative success in reducing maternal mortality since the 1900s. SMGL is a program that demonstrates the importance of public-private partnerships in aid. The program greatly reduced maternal mortality and factors that contributed to it, but the program failed to instill real change in addressing the unplanned settlements of Lusaka. The cornerstones of the program addressing facilities, transportation, and human resources are all factors that need to be addressed within Lusaka. Looking at their success across 18 districts in Zambia, the researcher believes that these programs can be adapted to better suit the needs of Lusaka and ultimately help the nation of Zambia achieve the MDGs and significantly reduce maternal mortality.

V. Summary of the Literature Review

Zambia is facing a serious maternal health crisis, with a high number of mothers dying during childbirth—398 deaths per 100,000 live births. This is due to a lack of trained medical staff, limited healthcare funding, and financial pressure from paying off debts, especially to Chinese lenders. Although programs like USAID's Saving Mothers, Giving Life (SMGL) have helped increase hospital births in some areas, Lusaka still struggles with poor access to healthcare, economic inequality, and not enough medical resources. Many maternal deaths are caused by severe bleeding, infections, and complications during childbirth, and women with lower education levels often receive less care. These issues can be addressed by increasing access to medical facilities, providing home for late-stage mothers, and increasing the number of facilities within Lusaka, all cornerstones of the success of SMGL. While SMGL has been successful in other parts of Zambia, it has not been implemented in Lusaka, leaving gaps in maternal healthcare. To save more lives, Lusaka needs better-trained healthcare workers, improved facilities, and stronger emergency care services. To conclude, the researcher believes that the successes of SMGL can be used to address the challenges highlighted by this literature review.

The following section will address how lessons learned from SMGL and other initiatives that address maternal mortality can be assessed in order to provide CRS and Lusaka programs that work, expand access, are cost-effective, fit within national goals, and can be sustained over time.

Criteria

Evaluation Criteria

The following criteria have been gathered through a variety of sources and initiatives that looked to address maternal mortality in Zambia and across the world. These criteria, effectiveness, cost, accessibility, administrative feasibility, and sustainability, have been selected as a way to create an alternative that meets the goals of CRS, the Zambian government, WHO, USAID, and other NGOs in the space. Should an alternative receive high marks within the criteria, it will be recommended to CRS as their next step in reducing maternal mortality in Lusaka. Additionally, by providing these criteria to CRS, the researcher allows for CRS to consider other alternatives, should conditions and resources change. The following section will provide both a conceptual definition and what each criteria will measure.

I) Effectiveness

Conceptual Definition: Effectiveness refers to the extent to which each policy alternative reduces maternal mortality and improves maternal health outcomes in Lusaka. The success of each initiative will be determined by its ability to reduce the maternal mortality ratio (MMR) and save mothers' lives.

Measurement: The primary metric for effectiveness will be the reduction in the MMR over time, tracked through health facility records and national health data.

II) Cost

Conceptual Definition: Cost refers to the financial implications of implementing each policy alternative, including direct expenditures on infrastructure, personnel, equipment, and technology, as well as indirect costs related to community outreach and training programs.

Measurement: The total cost of each intervention will be assessed by calculating expenditures per year, per facility, and per program. This will be conducted in both USD and Zambian Kwacha (ZMW).

Additionally, a cost-benefit analysis will be conducted to evaluate potential savings due to reduced maternal complications and improved health outcomes.

III) Accessibility

Conceptual Definition: Accessibility measures the extent to which policy alternatives improve healthcare access for women in Lusaka, particularly those living in unplanned settlements, which account for 70% of the city's population. This criterion evaluates whether services are reaching women who face financial, geographic, or cultural barriers to maternal healthcare.

Measurement: This will be measured through evaluating the number of women who can access the service. This will also include an analysis of other similar projects and how accessibility was measured and increased. This measurement will be quantitative in nature.

IV) Administrative Feasibility

Conceptual Definition: Feasibility refers to the logistical viability of implementing each policy alternative within Lusaka's healthcare system. This approach will consider potential barriers to execution, such as transportation, cultural challenges, and organizational strength in accomplishing the objectives of each alternative.

Measurement: This will be measured through past projects undertaken in the city of Lusaka and other comparable cities. Comparing budgets as well as the supply of labor available to each project, this approach will consider if a project or alternative is feasible in the sense that it can be implemented through the local administration. This measurement will be qualitative in nature.

V) Sustainability

Conceptual Definition: Sustainability evaluates the long-term viability of each intervention beyond the initial implementation phase. It considers financial stability, local capacity-building, and institutional integration to ensure continued service delivery.

Measurement: The availability of recurring funding sources, such as government budgets, grants, and public-private partnerships, will be analyzed. Assessing the alternatives through these criteria will be qualitative in nature and will include speculation in the absence of large U.S. aid structures such as USAID. The capacity of local healthcare systems and personnel to maintain services independently will also be assessed, focusing on workforce retention and knowledge transfer. The ability for the alternatives to hold long-term success, in that both goals and funding can be continued and successful, will also be considered.

With the conclusion of this section, the following will introduce the alternatives for this project. These alternatives, inspired by the above criteria, will cover solutions such as those that address capital supply, labor supply, and demand problems with maternal mortality. It is the goal of the researcher that through providing the criteria before the introduction of alternatives that the alternatives can be understood through their potential impact and cost.

Alternatives

The following alternatives have been generated by looking at past projects of CRS as well as other NGOs and governments across developing nations with high rates of maternal mortality. Although there are many ways to combat maternal mortality, the following three alternatives have been selected through careful consideration of what is within the scope of CRS, as well as the root causes of maternal mortality within Lusaka. These alternatives, from expanding the number of beds within hospitals to expanding the number of community health workers and implementing a cash transfer system all have great potential to allow CRS to reduce maternal mortality within Lusaka. It is the goal of the researcher that by providing a multitude of alternatives, as opposed to just one, that CRS can tailor its approach based on the assessment of each through the criteria provided in the previous section.

I. Strengthening Emergency Obstetric and Neonatal Care (EmONC) Services- Capital Supply Intervention

Overview

The Mayi na Mwana II project recognizes that inadequate emergency obstetric and neonatal care (EmONC) services significantly contribute to preventable maternal deaths in Lusaka. Many pregnant women experiencing complications do not have timely access to life-saving interventions due to poorly equipped facilities, a shortage of trained personnel, and inefficient referral systems. This policy alternative seeks to enhance the availability, accessibility, and quality of emergency obstetric services to ensure that every mother receives the care she needs during childbirth.

Key Components

CRS, in collaboration with the Ministry of Health (MoH), faith-based health institutions, USAID, WHO, and local maternal health organizations, will lead this initiative to upgrade EmONC facilities. These upgrades will include equipping hospitals and health centers with essential medical supplies which directly impact the large numbers of women who give birth either on the floor of hospitals or in a nonmedical setting, such as the home. By increasing the number of beds in each facility, the medical system in Lusaka will be afforded the opportunity to provide more services to more women. Training programs will be implemented for both new and existing healthcare personnel to improve their competency in managing obstetric emergencies.

Implementation of this initiative will occur over a five-year period, following a phased approach that prioritizes high-risk peri-urban and unplanned settlement areas where maternal mortality rates are highest. Immediate efforts will focus on strengthening referral networks, ensuring that beds are available for maternal emergencies, and improving coordination between primary health centers and tertiary hospitals.

Public and mission-run hospitals, as well as health centers in Lusaka, will be the primary locations for implementation, with an emphasis on underserved communities where existing EmONC services are insufficient. The Ministry of Health will work alongside international donors to secure funding for facility

improvements, while CRS will play a crucial role in coordinating public-private partnerships that can expand service delivery capacity.

Who: CRS will lead the initiative in collaboration with international donors such as USAID, WHO, and the World Bank. Healthcare providers at public and private hospitals, as well as non-governmental organizations specializing in maternal health, will be key implementers.

What: This alternative involves the construction and upgrading of EmONC facilities, equipping them with essential maternal health supplies such as maternity beds.

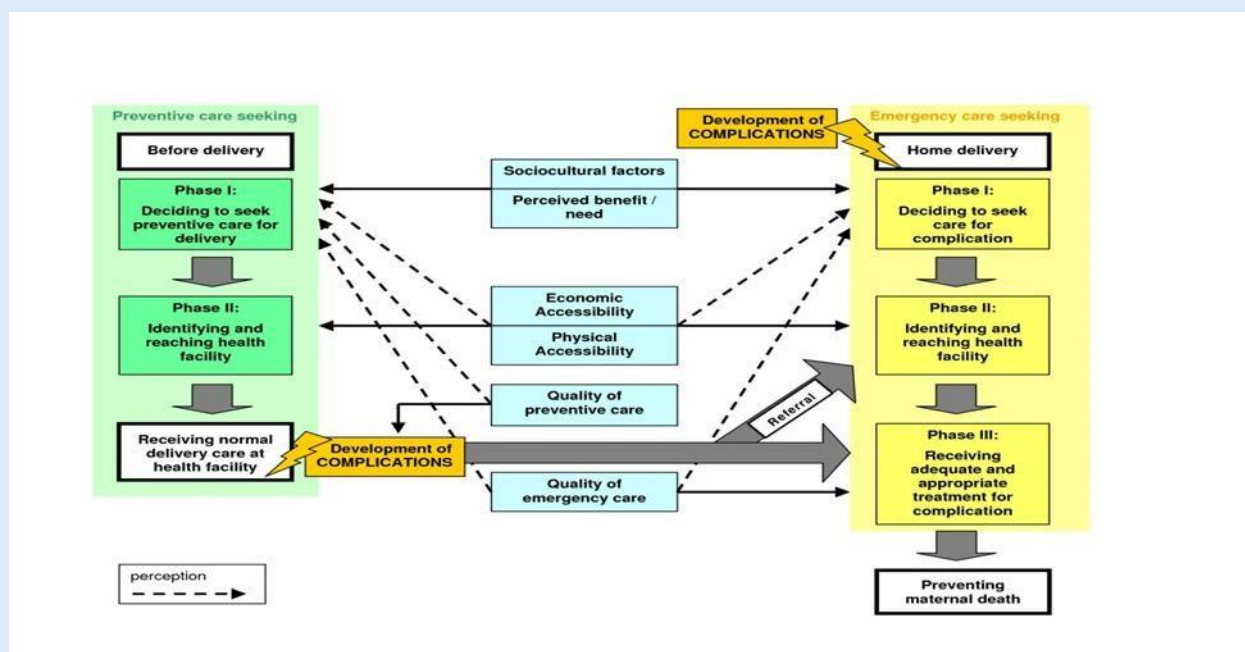
When: Implementation will be carried out over a five-year period, with a phased rollout targeting the most underserved areas first. Immediate efforts will focus on improving lower-tier facilities near unplanned settlements, with later efforts increasing the number of beds in higher-tier facilities such as the University Teaching Hospital.

Where: The program will be implemented in Lusaka's public hospitals, health centers, and select private facilities. Priority will be given to peri-urban and unplanned settlement areas where maternal mortality rates are highest due to inadequate emergency care.

How: CRS will work with international health agencies to secure funding for facility improvements and training initiatives. The program will also leverage public-private partnerships to increase service delivery capacity. A centralized emergency response system will be strengthened to improve coordination among health facilities and ensure that high-risk pregnancies receive timely interventions.

Inspiration: Inspiration for this alternative came from a variety of academic and new sources on challenges within the medical infrastructure within developing countries. Specifically, the following graphic produced within a study by Gabrysch & Campbell, 2013, provided a higher level of understanding of what needs to be done in Zambia in order to reduce the MMR.

Figure 8: Analysis of Identifying Steps to Decrease MMR



Source: Gabrysch & Campbell, 2013

A study by Koblinsky et al, 2016, also notes specific ways to address maternal mortality in Zambia. As Zambia is in the Stage III of implementations recommended by the authors (MMR between 70 and 420), the following from the study inspires the increase in services/capital:

Improve service quality through appropriate integration, especially for infections, malnutrition, and mental health, as well as triage and referral
Employ quality of care improvement methods (including clinical practice guidelines), timely data collection, and use for decision making and programme improvements
Increase demand for services, with specific focus on the vulnerable, through respectful satisfactory care provision based on women's needs and perspectives, address transport or location needs, and effective use of financial initiatives (Koblinsky et al, 2016).

II. Deploying Community-Based Maternal Health Workers (CHWs)- Labor Supply Intervention

Overview

Many women in Lusaka face financial, logistical, and cultural barriers that prevent them from accessing formal healthcare facilities. Community-based maternal health workers (CHWs) serve as a bridge between expectant mothers and the healthcare system, offering essential services such as prenatal care, maternal health education, and early detection of complications. This policy alternative seeks to recruit, train, and deploy CHWs to expand access to maternal healthcare services and strengthen linkages between communities and health facilities.

Key Components

CRS, the MoH, and local maternal health NGOs will collaborate to implement this initiative, integrating traditional birth attendants (TBAs) into the program to build community trust and ensure continuity of care. CHWs will undergo rigorous training in maternal health best practices, including conducting basic antenatal checkups, identifying danger signs during pregnancy, providing nutritional counseling, and offering postpartum follow-ups. They will also be responsible for distributing essential maternal health supplies such as iron supplements, folic acid, and misoprostol to prevent postpartum hemorrhage. Additionally, CHWs will educate families on the importance of facility-based births and safe delivery practices, helping to shift cultural perceptions that favor home births.

The program will be implemented over three years, beginning with a pilot phase in high-risk urban areas where maternal health indicators are poorest. The first year will focus on selecting and training CHWs, establishing robust monitoring systems, and forming partnerships with health facilities to ensure effective referrals. In subsequent years, coverage will be expanded to additional communities, with efforts to refine the referral system and integrate CHWs into the formal health system to enhance sustainability.

CHWs will be deployed in densely populated, low-income areas of Lusaka, particularly in unplanned settlements where access to health facilities is limited. Each CHW will be assigned a specific community and will maintain continuous engagement with expectant mothers in their designated areas. The MoH will develop a standardized training curriculum in partnership with medical institutions and maternal health NGOs. To ensure retention and motivation, CHWs will receive stipends and performance-based incentives. Additionally, mobile health (mHealth) tools will be leveraged to track patient data, facilitate communication between CHWs and facility-based health workers, and improve overall service coordination.

Who: CRS will oversee program implementation in collaboration with local NGOs, donor agencies such as USAID and UNICEF, and community leaders. Existing networks of traditional birth attendants (TBAs) will be integrated into the program to ensure continuity of care and community trust.

What: CHWs will be trained in essential maternal health practices, including basic antenatal checkups, identifying danger signs during pregnancy, counseling on nutrition and family planning, and postpartum follow-ups. They will also distribute essential supplies such as iron supplements, folic acid, and misoprostol (to prevent postpartum hemorrhage). Additionally, CHWs will be responsible for educating families on safe delivery practices and the importance of facility-based births.

When: The program will roll out over three years, beginning with a pilot phase in high-risk urban areas. The first year will focus on training CHWs, establishing monitoring systems, and forming partnerships with health facilities. Subsequent years will involve scaling up coverage, refining the referral system, and integrating CHWs into the formal health system.

Where: The initiative will be implemented in densely populated, low-income areas of Lusaka, particularly in unplanned settlements where access to health facilities is limited. CHWs will be assigned to specific communities, ensuring continuous engagement with expectant mothers in their catchment areas.

How: CRS will develop a standardized training curriculum in partnership with medical institutions and maternal health NGOs. CHWs will receive stipends and performance-based incentives to ensure motivation and retention. The program will leverage mobile health (mHealth) tools to track patient data, improve communication between CHWs and facility-based health workers, and enhance service coordination. Community meetings and outreach activities will be used to build trust and encourage participation.

Inspiration: The inspiration for this alternative came from a study conducted by Ahmed et al that looked at the role of CHWs in giving care/medical advice to underserved populations (Ahmed et al, 2022). This study looked at the gaps in underserved communities, as well as gaps within groups of CHWs, noting that in order for healthcare gaps to be addressed, the quality of quantity of CHWs must not just be improved, but supported by community and government efforts (Ahmed et al, 2022). Additionally, this study also noted the success of offering incentives to women to increase medical service uptake (Ahmed et al, 2022).

III. Conditional Cash Transfers (CCTs) for Facility-Based Deliveries- Demand/Incentive

Intervention

Overview

Financial constraints often prevent women in Lusaka from seeking maternal healthcare, leading to increased risks associated with home births and unskilled birth attendants. Conditional Cash Transfers (CCTs) can provide a powerful incentive for expectant mothers to attend prenatal visits and deliver in accredited health facilities, ultimately improving maternal and neonatal outcomes. This policy alternative aims to increase maternal healthcare utilization by providing direct monetary incentives to pregnant women who comply with recommended maternal health practices.

Key Components

The Zambian government, CRS, and international partners such as UNICEF and the World Bank will collaborate to fund and oversee this initiative. Healthcare providers at government and accredited private health facilities will verify patient compliance with maternal healthcare milestones and facilitate necessary medical interventions.

Under this program, pregnant women will receive financial incentives for completing key maternal healthcare milestones. The structure will include small cash transfers for each completed prenatal visit (up to four), a larger payment upon verified facility-based delivery, and an additional postnatal incentive for attending a check-up within six weeks of birth. To enhance accessibility and security, funds will be disbursed via mobile money where possible, or cash disbursements will be provided at designated health facilities. A verification system using electronic medical records will be implemented to prevent fraud and ensure that the benefits reach eligible participants.

The initiative will begin as a two-year pilot program in high-risk urban areas of Lusaka, with semi-annual impact assessments to measure effectiveness and inform potential scaling. Targeting will focus on low-income households in Lusaka's unplanned settlements, where maternal mortality rates are highest and access to healthcare services is most constrained. Community health workers will play a critical role in enrolling eligible women in the program and educating them on the benefits and requirements of CCT participation.

Who: CRS, in collaboration with international organizations such as the World Bank, USAID, and UNICEF, will fund and oversee the program. Mobile money providers will facilitate disbursements if access to mobile funds is available. If not, cash can be given at the conclusion of visits, and can follow a similar program to Progresá. Healthcare providers at government and accredited private health facilities will verify patient compliance and provide necessary maternal health services.

What: Pregnant women will receive financial incentives for completing key maternal healthcare milestones. The structure will include a small cash transfer for each completed prenatal visit (up to four), a larger payment upon verified facility-based delivery, and an additional postnatal incentive for attending a check-up within six weeks of birth. The funds will be disbursed via mobile money to reduce logistical constraints and ensure security. The program will also implement a verification system using electronic medical records to prevent fraud.

When: The initiative will start as a two-year pilot program in high-risk urban areas of Lusaka, with impact assessments conducted semi-annually. If successful, the program will be expanded to other regions with high maternal mortality rates.

Where: Targeting low-income households in Lusaka's unplanned settlements, where maternal mortality rates are highest and access to healthcare is most limited. Health facilities participating in the program will be equipped to handle safe deliveries and basic emergency obstetric care.

How: CRS, in coordination with donor agencies, will provide funding for the cash transfers. Clinics and hospitals will track patient attendance and report compliance using digital health records. Payments will be disbursed via mobile money to minimize administrative costs and increase accessibility for women who may not have traditional bank accounts. Community health workers will assist in enrolling eligible women in the program and ensuring they understand the benefits and requirements.

Inspiration: The CCT alternative was inspired by the success of Progress in increasing uptake in education. Expanding further on CCTs within the medical space, a review by Bastagli et al in 2016 looked at the success of CCTs in increased medical uptake in developing countries. Through 15 studies, the authors noted a significant increase in the use of medical facilities and services in 9 studies (Bastagli et al, 2016). Additionally, this study found that total savings within the household were increased in 34 out of 35 studies (Bastagli et al, 2016).

These alternatives provide real promise to CRS and the people of Lusaka in reducing maternal mortality. Through providing the above solutions, as well as the inspirations behind them, the author hopes to provide CRS with tangible projects to create within the coming years as Zambia looks to reduce its maternal mortality. The following section will now assess these alternatives through the criteria listed in the previous section.

Assessment of Alternatives

This section is dedicated towards assessing the provided alternatives through the criteria of effectiveness, cost, accessibility, administrative feasibility, and sustainability. The researcher looks to make quantitative comparisons across the evidence collected. In the absence of tangible evidence, the author selects a qualitative approach, discussing differences between Lusaka and the nation where evidence was collected in order to maintain accuracy. With the shutting down of USAID, there was data that was lost, which created the need for more qualitative analysis. The following applies the criteria to each alternative, presenting CRS with a greater understanding of the inputs required for each alternative.

Evaluation of Strengthening Emergency Obstetric and Neonatal Care (EmONC) Services- Capital Supply Intervention

1. Effectiveness

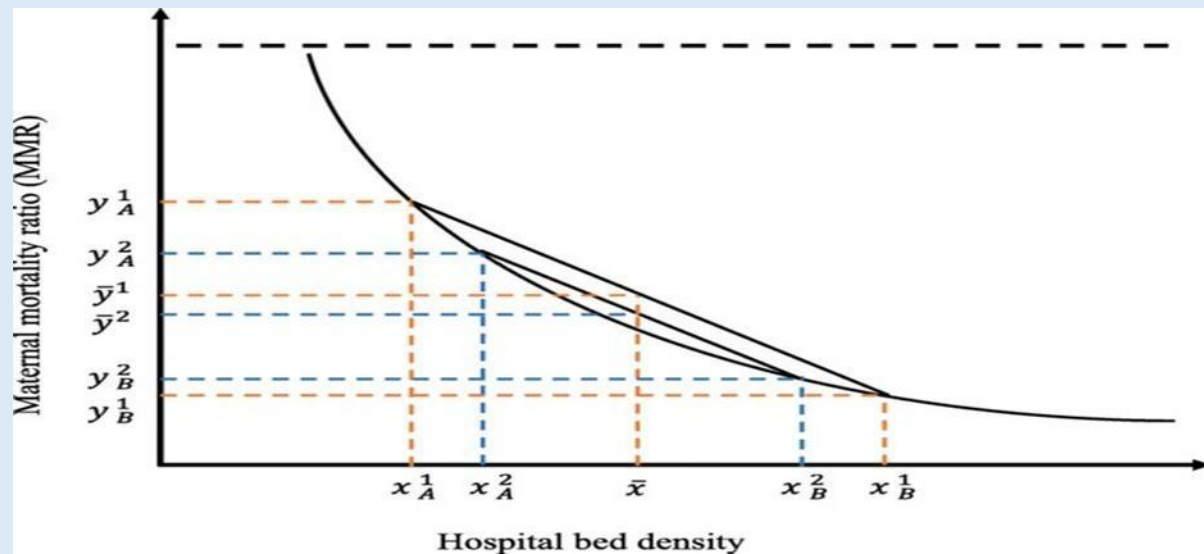
Strengths: This intervention directly addresses major causes of maternal mortality (e.g., hemorrhage, sepsis, hypertensive disorders) by improving facility readiness and emergency response capacity through establishing more beds for women within facilities in Lusaka. Enhancing this directly addresses the common occurrence that is limited access to beds within Lusaka for expecting mothers. In total, more than 20 women give birth on hospital floors every year in Lusaka, which greatly increases risk for both the mother and child (Kabanshi, 2014).

Challenges: Upgrading facilities does not directly address barriers such as transportation costs, cultural preferences for home births, and delays in seeking care. The success of this intervention depends on ensuring trained personnel remain in underserved areas and that facilities remain well-stocked.

Measurement: One study in Tanzania looked to implement higher access to EmONC training in order to decrease MMR. According to this study, MMR decreased 80% from 933 to 186/100,000 live births over a 6 year period (Nyamtema et Al, 2022). Being that Tanzania not only borders Zambia, but shares a similar, if not higher MMR, due to the same similar factors, it is likely that should EmONC services be strengthened to specifically address the major causes of maternal mortality, Zambia would see similar success in Lusaka.

One study in China looked to quantify the impact of bed density on MMR. The below graph demonstrated the found effects of increasing beds on MMR.

Figure 9: Hospital Bed Density on MMR



Source: Tian, Fan & Pan, Jay, 2021

Further within the research paper, the researchers identified with an increase of hospital bed density from 2.28 hospital beds per 1000 people to 4.54 hospital beds per 1000 people, there was a reduction in MMR from 49.3 per 100,000 births to 19.9 deaths per 100,000 births over a 12 year period (Tian & Pan, 2021). This survey looked at both rural and urban population centers (Tian & Pan, 2021). Because of this, if beds are increased to a similar ratio, similar results can be expected in Lusaka. Data on the bed density within Lusaka is limited, with only the University Teaching Hospital (UTH) listing a capacity of 2,000 beds. However, with a catchment of 2 million people, according to an article posted to Medium by 50 Things that Define Zambia, this would mean 2,000 beds per 2 million people, or 1 bed per 1,000 people. Because Lusaka has 89 medical facilities, the ratio of beds to people is assumed to be higher. However, given the limited data, in addition to UTH being the largest hospital in the city, the ratio will not be much higher. The author expected the total ratio to be around 4-10 beds per 1,000 people, given the similarities in population density from the Tian and Pan study. Using the above graph, if beds within Lusaka's medical infrastructure increase, thus increasing hospital bed density, MMR will be reduced. Given that by doubling the hospital bed density which created a reduction in MMR by 59.6%, MMR could be reduced by similar numbers within Lusaka.

2. Cost

Strengths: While capital-intensive, investing in EmONC facilities has long-term benefits in reducing maternal deaths and preventing expensive complications that require prolonged hospital stays. Leveraging public-private partnerships and donor funding can reduce financial burden.

Challenges: High upfront costs for infrastructure, equipment, and staff recruitment. Ongoing costs for maintenance, training, and emergency response systems must be sustained beyond initial donor support.

Measurement: According to a cost-effectiveness study conducted by Grimes et al, 2017, which looked to compare costs between several hospitals in Sub-Saharan Africa, the average cost of a hospital bed was \$33. Expanding the number beds by 20 across Lusaka's Level I and II hospitals (ones lacking in EmONC services), the total cost of this alternative is \$68,640 (20*33*108).

3. Accessibility

Strengths: This intervention ensures high-quality emergency care is available in Lusaka's hospitals and health centers, particularly in peri-urban and unplanned settlements where facilities are currently inadequate. Women experiencing complications will have a better chance of receiving timely care.

Challenges: Distance to EmONC facilities and lack of transportation for rural and low-income women could limit accessibility, particularly if ambulance networks are not well-maintained or if referral systems are inefficient.

Measurement: The increase in the number of pregnancies within Lusaka's Hospitals will be used to determine if this alternative increases accessibility. According to a study by Falchetta et al, 2020, increasing the number of beds addresses decreasing MMR, but it is not the strongest way to increase accessibility. This study denotes that for those who live within 1 hour of a facility (like those who live in some unplanned settlements), accessibility is increased, but for those who live outside of this range, accessibility does not change (Falchetta et al, 2020). Within Lusaka, 70% of the population lives in unplanned settlements. With this high proportion, in addition to just 10% of the population having access to a private car (Walkability, 2024), this corresponds to just 700,000 women increasing access, assuming that there is 1 car available to the women in the 10%, as this data does not discuss accessibility by gender. Public infrastructure is lacking for other sources of transportation. Assuming that with the increase of 660 total beds, with the average length of hospital stay being 13.4 days for Zambia (Vian et al, 2022), the total number of women that would see increased access to care would be 17,977. This means that this alternative moderately increases the number of women who can opt into additional treatment.

4. Administrative Feasibility

Strengths: Large-scale EmONC improvements are logistically feasible with strong government and donor backing. The phased approach (prioritizing underserved areas first) increases the likelihood of effective implementation. Existing healthcare facilities provide a foundation for expansion.

Challenges: Recruiting and retaining skilled personnel (e.g., obstetricians, anesthetists, midwives) in high-risk areas can be difficult. Infrastructure upgrades require long-term commitment from the Ministry of Health, and procurement delays could slow rollout.

Measurement: Because there have been numerous examples of NGOs donating beds to hospitals within Zambia, this alternative is feasible for CRS to implement, as it can model the donation of beds to the Minister's Spouses Association action that gave 20 beds to the Ndola Teaching Hospital Relatives Shelter (ZANIS, 2025). For this reason, this alternative has a high amount of government/NGO support.

5. Sustainability

Strengths: EmONC facility upgrades create lasting improvements in maternal healthcare infrastructure. If well-integrated into Zambia's national health strategy, this intervention could have long-term benefits beyond the project's initial funding cycle. Public-private partnerships can help sustain operational costs.

Challenges: High operating costs and reliance on external funding pose risks to long-term sustainability. Equipment and facilities require continuous maintenance, and ensuring a steady supply of emergency medicines and surgical tools is critical.

Measurement: This will be measured by the ability of the alternative to be supported by the government, as well as other NGOs and crucial players within the space. According to the Zambian Ministry of Health

(MoH), expanding EmONC services and capacity is one of the primary goals of the 2022-2026 National Health Strategic Plan. Because expanding EmONC services is a primary goal, this alternative can be sustained because it is and will continue to be supported by the Governments and other stakeholders for at least the next 2 years, until a new Strategic Plan is implemented. This alternative assumes that the total number of beds mentioned above will be installed within 2 years. Unless there is a severe change in the number of staff within the health system of Lusaka, the beds themselves can last for 10-15 depending on the manufacturer used.

Evaluation of Deploying Community-Based Maternal Health Workers (CHWs)- Labor Supply Intervention

1. Effectiveness

Strengths: CHWs expand healthcare access by providing continuous maternal care, education, and early detection of complications. Evidence from other Low- and Middle-Income Countries (LMICs) shows that CHWs significantly reduce maternal mortality by improving care-seeking behavior. Integrating Traditional Birth Attendants (TBAs) enhances cultural acceptance and trust, increasing service utilization.

Challenges: The impact of CHWs depends on training quality, supervision, and referral efficiency. If CHWs are not well-integrated into the formal health system, their ability to manage complications may be limited. Ensuring that CHWs follow best practices consistently will be critical.

Measurement: Reduction in Maternal Mortality Ratio (MMR). A study looking at the role of community programs and CHWs on maternal and prenatal mortality found that women who received increased knowledge, training, and support from CHWs during pregnancy and delivery found that MMR decreased by 23% compared to those that did not receive the same resources (Prost et al, 2013). As this study was conducted in low resource nations such as Nepal, Bangladesh, and India, similar results can be expected for those within Lusaka's unplanned settlements. Additionally, seeing that both Bangladesh and India have highly congested areas, with similar infrastructure/accessibility challenges, similar results can be further supported. Specifically, a study in Bangladesh found that additional exposure to CHWs led to a MMR reduction of 400 deaths per 100,000 births, with a control group seeing 3-8 deaths per 1,000 births and the treatment group seeing 1-4 deaths per 1,000 live births (Fauveau et al, 1991). With the population of Bangladesh being over 160 million people, this reduction is much higher than it would be within Lusaka, which has a population just shy of 3 million people. The total population of Lusaka represents just 1.7% of the population of Bangladesh. In order to account for this change, the reduction of 23% will be used. With an MMR of 398, reducing this by 23% yields a reduction in MMR by 92 deaths per 100,000 births.

2. Cost

Strengths: CHWs are more cost-effective than large-scale facility expansion and reduce the burden on hospitals by managing lower-risk cases at the community level. Stipends and performance-based incentives can ensure retention while keeping costs manageable.

Challenges: Initial training, supervision, and incentive payments require sustained investment. If funding is inconsistent, CHW motivation and retention could decline.

Measurement: Total program cost (USD/ZMW), cost per CHW. Data on the financing of CHWs in LMICs is limited. However, a study by Masis et al (2021) outlines and evaluates the limited data. It is worth noting that the authors of this study find that investments in CHWs yield a 10:1 return on investment as it

pertains to health measures (Masis et al, 2021). Using 10 African countries, the authors find that the median annual cost of a CHW(including training) is \$2574. According to the National Health Strategic Plan, only 3,400 of a total 5,312 CHWs have been trained thus far. In order to reach the 5,312 figure a present value of \$4,921,488 will have to be paid for the first year of training and salary. With an annual interest rate of 6.00% compounded annually, the future value of \$4,921,488 after 5 years would be approximately \$27,750,237.

3. Accessibility

Strengths: CHWs bring healthcare directly to women in unplanned settlements, addressing financial, cultural, and logistical barriers. They also improve continuity of care by offering follow-ups, nutritional support, and emergency referrals.

Challenges: Some women may still hesitate to transition from home births to facility deliveries, even with CHW counseling. Limited health facility capacity may also reduce the effectiveness of CHWs' referral efforts.

Measurement: The increase in the number of women using CHWs will be used to measure the accessibility of this alternative. Throughout the literature, the use of CHWs significantly increases accessibility to medical services and increases the number of women using CHWs when provided with a higher number of the same. One study that looked to quantify the impact of CHWs on uptake of ANC visits found that in 1,652 mothers in rural/remote areas in Zambia, the increase of those who received some form of CHW exposure resulted in double the probability that mothers received higher levels of successful care in pregnancy (Jacobs et al, 2018). Data on just how many CHWs currently operate in Lusaka is limited. However, by almost doubling the amount of CHWs available, the amount of women reached would be almost double, if not higher assuming that CHWs see multiple families in 1 year. Because of this, this alternative highly increases the number of women who can opt into additional treatment.

4. Administrative Feasibility

Strengths: CHW programs have been successfully implemented in multiple LMICs, making them logistically viable. The use of mobile health tools enhances tracking and coordination. Partnerships with existing TBAs increase local support and credibility.

Challenges: Recruiting, training, and supervising CHWs requires strong institutional coordination. If government and donor support is weak, implementation could face delays. Monitoring CHW performance in remote or underserved areas may also be difficult.

Measurement: Because of the high cost, which is larger than the average annual budget of NGOs in Lusaka, the feasibility of increasing CHWs by this number is low. If CRS were to leverage training instead, using funding from organizations such as USAID to provide grants for salaries, the feasibility of this alternative would be higher. However, as the funding of USAID is mostly halted, this alternative would have low levels of government/NGO support.

5. Sustainability

Strengths: CHWs can be integrated into the national health system, ensuring long-term sustainability if supported by government policies and donor funding. If CHWs are properly trained and incentivized, they can become permanent community healthcare providers.

Challenges: Funding continuity is a major risk. If donor support decreases, stipends and incentives may become unsustainable. Ensuring CHWs are consistently trained and resupplied will require long-term institutional commitment.

Measurement: CHWs are high in the list of priorities for the MoH in Zambia. However, Zambia has failed to maintain the level of CHWs required. Because there is support for more CHWs, but the financial incentives for maintaining CHWs is lacking, this alternative can be sustained after implementation with moderate additional resources.

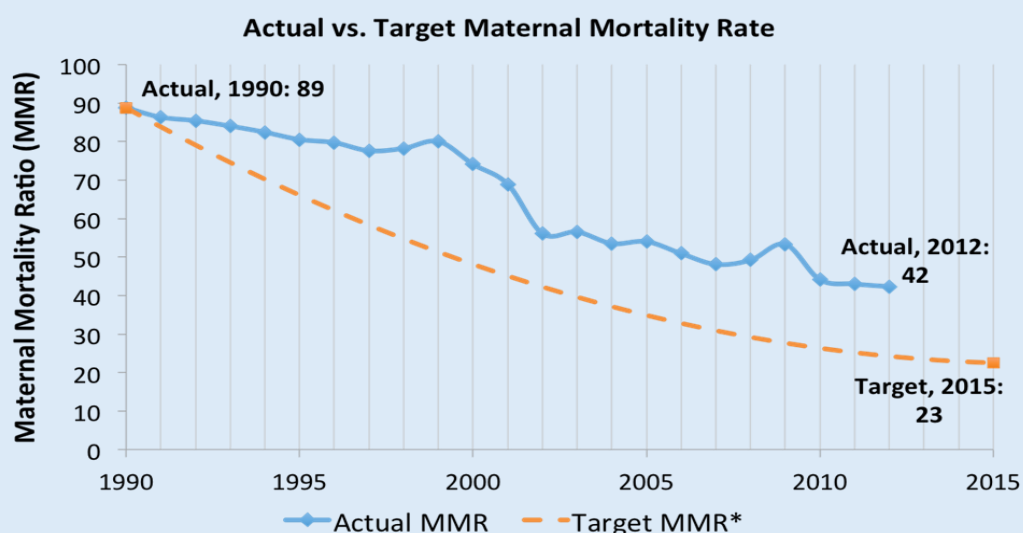
Evaluation of Conditional Cash Transfers (CCTs) for Facility-Based Deliveries- Demand/Incentive Intervention

1. Effectiveness

Strengths: CCTs have been proven to increase healthcare utilization, as seen in other LMICs. By incentivizing antenatal visits and facility-based deliveries, this policy can reduce maternal mortality risks associated with home births. Additionally, financial relief could indirectly improve maternal and child nutrition, which contributes to better health outcomes.

Challenges: The success of this intervention depends on the adequacy of cash incentives, healthcare facility capacity, and women's ability to access participating clinics. If health facilities are overcrowded or under-equipped, increased demand may strain resources, limiting improvements in health outcomes.

Measurement: A meta-analysis that focused on the impacts of CCTs found that CCTs greatly increased the use of medical services, especially in receiving prenatal visits, which can be used to identify problems that could result in higher maternal mortality (Glassman et al, 2013). However, data on how these visits affect MMR is limited. Within this study, the Oportunidades Program in Mexico was determined to have an 11% decrease in MMR for regions that had at least 1 facility that had opted into the program (Glassman et al, 2013). The following graph demonstrates Mexico's reduction in MMR because of this program. It is worth noting that this understates that true value of these measures, as MMR was widely underreported in Mexico during the 1990s (Glassman et al, 2013).



Source: Adebayo et al, 2015

This study shows that within Mexico, MMR was reduced by 45 deaths per 100,000 births (Adebayo et al, 2015). Because of the issues of underreporting, as well as differences between Mexico's regions, of which this data is an average, it should be expected that there should be a higher level of reduction within Lusaka.

2. Cost

Strengths: While CCTs require substantial financial investment, they may reduce long-term healthcare costs by preventing maternal complications that would otherwise require expensive emergency care. The use of mobile money minimizes administrative expenses.

Challenges: The high cost of cash transfers requires sustained funding, which may be difficult without long-term government or donor commitment. Costs will include cash disbursements, administration, monitoring, and potential fraud prevention systems.

Measurement: According to a study on India's Janani Suraksha Yojana, a CCT to improve prenatal visits for mothers, the average cost payout of the program for a visit was \$22 in urban areas (Powell-Jackson et al, 2015). For women in Lusaka, this amounts to 618.20 Zambian Kwacha, or 6.88% of total salary, assuming the average salary in Lusaka is \$320, as is reported by Bdeez. Using the 2021 figure for pregnant women in Lusaka, 22,000 women get pregnant every year (LusakaTimes, 2021), Knowing that 4 prenatal visits produce the best outcome for mothers, the total cost of this alternative for 1 year is 1,936,000. Using the same interest rate as above, the total future value for this alternative is \$10,913,491, assuming the number of pregnant women stays the same.

3. Accessibility

Strengths: CCTs directly target low-income women who face financial barriers to maternal healthcare. Mobile money reduces logistical challenges, making disbursements more accessible and secure. The program also aligns with cultural preferences, as it provides direct financial benefit to families.

Challenges: Not all women in unplanned settlements have mobile phones or mobile banking access. Some may face transportation barriers to reach health facilities, even with financial incentives. Additionally, socio-cultural norms might influence whether women have autonomy over how the cash is used.

Measurement: This is measured in the increase in the number of women who received care through opting into the program. As noted in the Oportunidades Program study, the number of women reached was 5,800,000, assuming that of the 5,800,000 families reached, each family had 1 mother (Julio Frenk, 2012). This represented 19% of the households in Mexico (Alvarrez, 2020). With 687,923 households in Lusaka, 19% would be 130,705, assuming the same take-up rate on account of the amount offered, which has a similar proportion of average income to that of Mexico, as well as social factors including the limited access to proper health services. Because of the accessibility of similar programs, this alternative is highly increases the number of women who can opt into additional treatment

4. Administrative Feasibility

Strengths: CCTs have been successfully implemented in other LMICs, and Zambia has prior experience with cash transfer programs. Collaboration with international donors (World Bank, UNICEF, USAID) makes funding feasible in the short term. Integration with electronic health records enhances verification.

Challenges: Effective implementation requires robust monitoring, fraud prevention, and coordination between healthcare providers and financial institutions. If funding lapses, beneficiaries may lose trust in the program.

Measurement: CRS does not have the resources to run a program as large as the Oportunidades Program. However, if the program were scaled down to a more manageable level, the political feasibility would increase. If not scaled down, this alternative would have low levels of government/NGO support. If scaled down, this alternative would have moderate levels of government/NGO support.

5. Sustainability

Strengths: If government funding or international donor support continues, the program could be sustainable. Successful pilot results could encourage long-term adoption by integrating CCTs into Zambia's national health strategy.

Challenges: Donor dependency is a major risk, as the program requires consistent funding. If external support declines, the government may be unable to sustain cash transfers at scale. Additionally, inflation and economic instability could reduce the real value of incentives.

Measurement: Within the MoH budget, there is no allocation for CCTs. Additionally, CRS does not have the funds to sustain this project without international assistance. Seeing that most aid comes from the US, and foreign aid is mostly suspended, this alternative is unlikely to be sustained.

Figure 11: Comparison of the Alternatives

Criteria	Strengthening EmONC Services	Expanding Community Health Workers	Conditional Cash Transfers
Efficiency	59% Decrease in MMR	23% Decrease in MMR	11% Decrease in MMR
Cost	\$68,640	\$27,750,237	\$10,913,491
Accessibility	Moderate Increase	High Increase	High Increase
Administrative Feasibility	High Support	Low Support	Moderate Support
Sustainability	Needs Little Additional Resources	Needs Moderate Additional Resources	Cannot Be Sustained Without Additional Resources

Having the alternatives now assessed, the next section will discuss the recommendation based on the findings above. It is the goal of the author that the above findings can be used by other organizations or through other funding routes, should resources or conditions change. By analyzing each alternative and laying out how each of the criteria is used for each alternative, the author hopes that CRS and other organizations can take lessons learned and apply them to other scenarios. This is important because funding to reduce maternal mortality predates the world of CRS and represents a complex issue facing developing nations around the world. The next section dives into the author's recommendation, which is followed by steps to implement the project successfully within Lusaka.

Recommendation

The recommended alternative is the expansion of beds available to medical facilities within Lusaka. This supply-side alternative, when compared to the others, directly addresses one of the leading causes of high levels of MMR within Lusaka. Additionally, given the current shutdown of USAID and other aid agencies, the ratio of cost to MMR reduction of one (2,288) for the first alternative is much lower than the other alternatives (69,375.59 and 242,522.02, respectively). While having the lowest ratio, this alternative also has the highest likelihood of political feasibility and sustainability.

Additionally, while this alternative reaches the fewest women of the three, it is worth noting that the high support that the implementation is to receive, as well as the likelihood of sustainability with little additional resources, means that this alternative can be scaled up in order to reach more women should it be successful. Additionally, with the cost per life saved, this alternative is more feasible for an NGO such as CRS to implement, which is demonstrated in past projects within Lusaka. It is worth noting, however, that while past projects that increased beds have been successful, with an MMR reduction of 9-14, perhaps more should be done in order to reduce MMR within Lusaka to below 70, as determined by SDG #3.

While the CHW alternative could have the highest potential impact out of the 3 options, it is the most expensive. Should CRS receive grants from sources other than USAID that could match this cost, it is the opinion of the author that this should be implemented, as increasing beds only works for mothers who can access them, which is demonstrated in the small number of women reached through the first alternative. While a specific number could not be calculated for the total women reached, being able to directly address pregnancies within the 70% of the population within unplanned settlements, in addition to the 90% of individuals without access to a private car could be a crucial step forward for the city and nation in reducing MMR.

CCTs have been proven to work well across the world. However, with CCTs comes high administrative fees, as well as a high level of support needed to sustain the program, which was demonstrated in the closure of many CCTs after large changes in government priorities or resources, as demonstrated in the Progres example from Mexico. It is the opinion of the author that the CCT could be implemented in addition to other alternatives should CRS receive adequate funding and support.

Implementation Plan

The next step after identifying the best alternative is to provide how CRS can implement the alternative within Lusaka in order to reduce maternal mortality. This implementation plan considers past works by CRS in addition to characteristics within the above analysis that will provide for the best outcome for Lusaka and CRS. The following details how CRS can acquire additional beds, strengthen hospital systems, and create a system that allows for continued use as well as refinement.

How CRS Can Help Improve Maternal Health in Lusaka

Catholic Relief Services (CRS) can help reduce maternal deaths in Lusaka, Zambia by buying and donating hospital beds to health facilities that need them the most. This effort supports Zambia's goals in the National Health Strategic Plan (2022–2026), which aims to improve emergency care for pregnant women, especially in areas with fewer resources.

Finding Out Which Places Need Help First

The first step for CRS is to find out which hospitals and clinics are most in need of more beds. Many poor communities have health centers where pregnant women are turned away or end up giving birth on the floor. CRS should work closely with local health leaders and government officials to get the most accurate information.

To help with this, CRS can use a mobile health (mHealth) system that uses mobile phones to track health information in real time. A good example is the HealthyHoos system, which tracks patient data instantly. This system, utilized by the University of Virginia, in coordination with the University of Virginia health system, has been successful in this venture, helping thousands of students for years. With a similar system, CRS can see which facilities have the highest number of untreated women or unsafe births. This will help CRS decide where to send help first. It's likely that Tier I and Tier II medical facilities, especially those in unplanned settlements, will need urgent attention.

Buying Quality Beds and Supporting the Local Economy

After identifying the health centers most in need, CRS can buy hospital beds from trusted suppliers to make sure they are both high quality and reasonably priced. CRS can also work with programs like the Minister's Spouses Association, which donated locally made beds to a hospital in Ndola. Buying local beds not only supports the economy but also makes the process faster and more sustainable, especially important now that USAID and other U.S. funding sources have shut down their programs in Zambia.

Delivering Beds with Help from the Community

To move the beds to the right locations, CRS can partner with local charities, community health workers, and volunteers. CRS already has staff and volunteers who know the area well and can help avoid delays. These volunteers live in the same communities they serve, so they can also help spread the word about the new resources. This will likely lead to more pregnant women coming to the facilities to receive care.

Training Staff to Use the Beds Correctly

Once the beds are delivered, CRS should also train healthcare workers on how to use and maintain them. This isn't a difficult task—CRS already has experience training nurses and other staff. Proper training will help the beds last longer and make sure they improve care. It's also important because, with better equipment, these clinics and hospitals will likely start seeing more patients, so staff need to be ready.

Keeping the Program Going Over Time

To make sure the project continues successfully, CRS can work with businesses, donors, and the Ministry of Health to keep funding the program. The Ministry of Health is already focused on reducing maternal deaths, so they're likely to support this effort. The mHealth system can also be used to track how well the beds are working—such as whether fewer women are dying during childbirth and whether the new beds are being used properly. CRS should also share success stories from the project. This can help gain more support and possibly expand the program to other cities or regions in Zambia.

Conclusion

Conclusion: Tackling the Root Causes and Strengthening Maternal Health in Lusaka

Maternal deaths in Lusaka, Zambia, are caused by a mix of serious challenges: overcrowded hospitals, too few medical supplies and staff, poor roads and facilities in informal settlements, and not enough trained health workers. Many women face long delays—first in deciding to seek help, then in getting to a health center, and finally in receiving proper treatment when they arrive. These delays can be deadly, especially during emergencies like bleeding, high blood pressure, or difficult labor. One major reason for these delays is the shortage of hospital beds. Without enough beds, women are sometimes turned away or forced to give birth on the floor, putting both mothers and babies at risk.

Catholic Relief Services (CRS) is in a strong position to help fix this problem. By buying and donating hospital beds to the places that need them most, CRS can help improve maternal care where it matters most. This work supports Zambia's National Health Plan (2022–2026), which focuses on better emergency care for mothers and newborns, especially in underserved areas. By providing beds at a lower cost than the other alternatives, CRS has the ability to directly combat one of the leading causes of maternal mortality. Through this effort, CRS demonstrates its commitment to its founding values and operational mission.

Still, donating beds is just one part of the solution. CRS also plans to gather detailed information on which hospitals are struggling the most. Using mobile health tools—like apps that track real-time patient data—and working closely with community leaders, CRS can make sure help goes exactly where it's needed.

Another important part of the plan is to buy beds from local suppliers. This helps deliver beds faster, supports local jobs, and makes the program more sustainable. Training hospital staff on how to use and take care of the beds is also key. As noted within the above research, maternal mortality affects not just the family but the economy as well. But committing to the development of the economy through not just reducing maternal mortality, but in strengthening partnerships with local businesses, CRS can create a ripple effect that sees other issues such as poverty addressed. Together with strong community involvement, this approach helps ensure that the improvements last well into the future.

Finally, by tracking results and sharing stories of success, CRS can build wider support for the program and encourage more funding. Over time, this effort could expand beyond Lusaka, helping to lower maternal deaths across Zambia and even serving as a model for other countries. Because medical data lacks in quality throughout Zambia and other developing nations, it is imperative that this project be used as a springboard for the deployment of mHealth systems in Lusaka.

Limitations

The lack of accurate data, as it pertains to hospital wait times, strength of hospital staff, logistics of CHWs within unplanned settlements, and lack of patient information as it pertains to discharges and treatments given within the hospital network of Lusaka, still yields unanswered questions within the research. Because of these gaps, the author had to make assumptions based on other countries, as opposed to scoping the research to just the projects that have occurred within Lusaka.

Additionally, another limitation is the effect of the beds on the hospital system. Through the research component of this project, the author could not find viable data or information on the capacity of the hospital systems within Lusaka. In greater detail, this means that if the root cause of maternal mortality, and the prevalence of women who give birth outside of health networks was in fact that there was not enough hospital staff available, the purchasing of more beds only increases sterile conditions, as opposed to strengthening the mother's access to medical care, which is a different characteristic. While these limitations inhibited some of the analysis, the author hopes that by leveraging a qualitative analysis between Lusaka and other cities that the work produced is accurate and can create tangible change within the city and nation.

Final Thoughts

Ultimately, this project is about far more than hospital beds. It is about saving lives, restoring dignity to childbirth, and strengthening the health system from the ground up. With strategic investment, local partnerships, and a commitment to long-term impact, CRS can help ensure that every mother in Lusaka has the chance to deliver her child safely and watch that child grow into a future full of promise.

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Appendices

Appendix A: Cost Calculations

Direct Costs Calculations:

Driving equation (Needs to be updated the deeper this process goes):

Average cost of funeral (\$140-\$300)+ average cost of funeral services (\$50-\$5,6000) Taken from Why is death a booming business in Zambia? - Ongolo -funeral costs vary from different cities/districts, will need to get average for Lusaka. Correction, this article is from Lusaka.

+ Average female income lost (Average household income in Lusaka is \$197.01)Average Household income by Province, Zambia, 2022 Living Conditions Monitoring Survey – Zambia Statistics Agency 28.4% of females are in the workforce. It is unclear the proportion of income within the family unit. Findings from the 2022 Living Conditions Monitoring Survey – Zambia Statistics Agency +

Loss of education in children

Orphans make up 455,018 out of a total 5,538,681 of students enrolled (2022-Education-StatisticsBulletin). Data on impact of years of education, as well as proportion of orphans due to maternal mortality unavailable (USAID Site down). Further, a study by Ozawa et al shows the impact of education on wages, stating that “an improvement in cognition by one standard deviation is associated with a 4.5% annual increase in earnings in LMICS (Ozawa et al, 2022). Data in this space is limited, but seeing that LMICS see similar characteristics, I am making the assumption that this increase is similar in Zambia. According to WHO, the average life expectancy in Zambia is 60 years. Assuming that children receive what is considered to be a full education, or around 10 years, the ability to improve cognition is considerable. Additionally, with this improvement, assuming that the child enters the workforce at 15, the 4.5 annual increase in earnings could amount to the following equation:

$$1.045^{45}=7.248248$$

7.25 x (\$197.01(avg monthly income in Lusaka) x 12) equals an increase of \$17,139.87. For every child that does not achieve this figure, several annual incomes worth of increased wages is missed, further slowing down development and attributing further to increased maternal mortality as it relates to poverty.

+

Loss of production due to the father/household roles changing. Data on loss of income due to maternal mortality in this proportion not well tracked/behind a paywall. Working with UVA library to find additional data.

+

Cost of transportation, care, medical bills

“Spontaneous vaginal delivery cost patients and health systems between USD 6–52 and USD 8–73, but cesarean section costs between USD 56–377 and USD 80–562, respectively. Patient and health system costs of abortion range between USD 11–66 and USD 40–298, while post-abortion care costs between USD 21–158 and USD 46–151, respectively. The patient and health system costs for managing a case of eclampsia range between USD 52–231 and USD 123–186, while for maternal hemorrhage they range

between USD 65–196 and USD 30–127, respectively. Patient cost for caring low-birth weight babies ranges between USD 38–489 while the health system cost was estimated to be USD 514 (Mori et al, 2020).

Direct expected to be in the thousands (several annual incomes) when related to the current value costs of funeral/services. For future costs of education loss, I would predict that this number to be greatly increased, assuming all children go off to create their own family unit, which can have a compounding impact on education and income for generations.

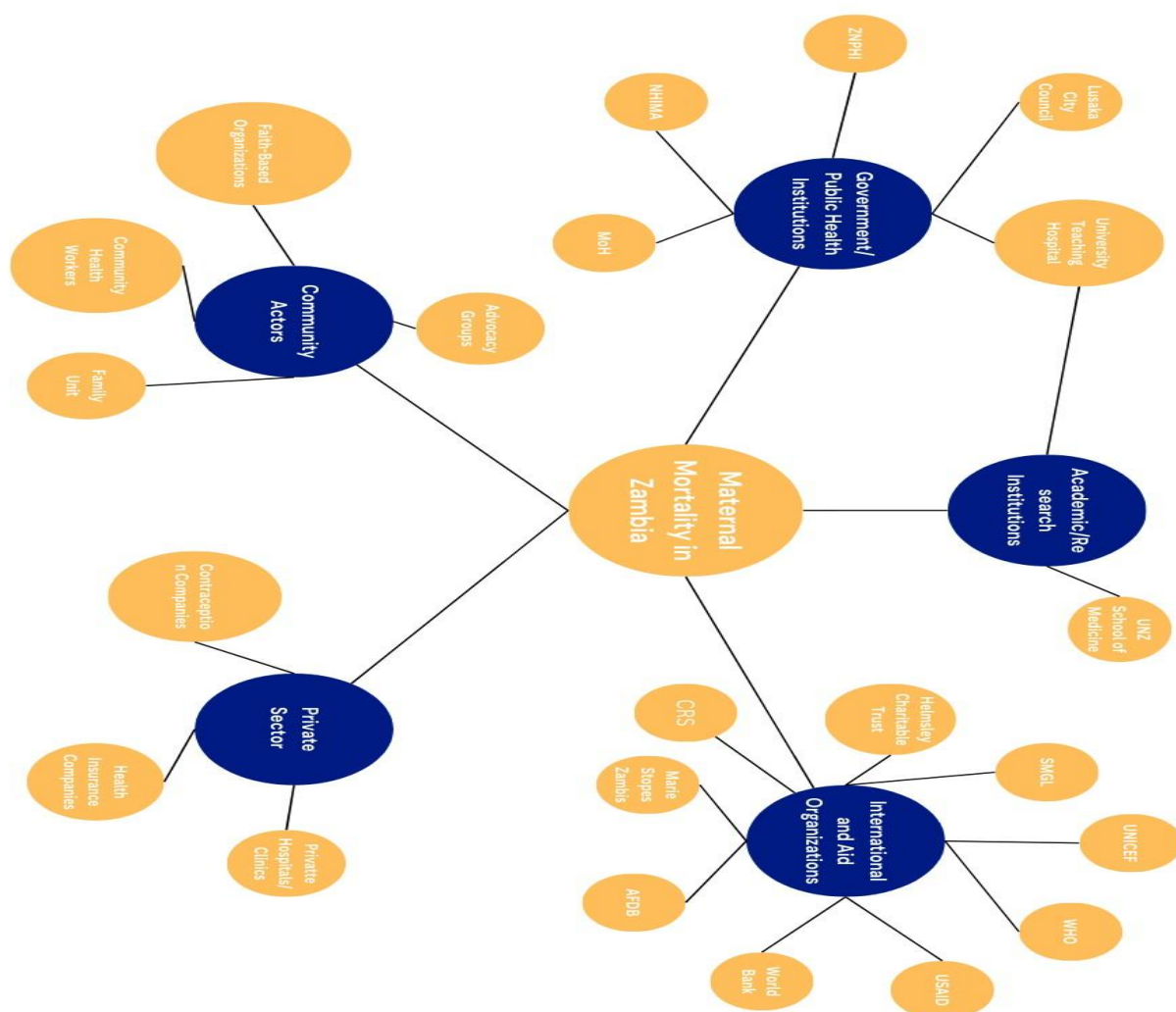
The rough calculated estimate included the above for 1 mother, assuming the mother has 1 child and 1 husband is \$20,569.87, assuming the mother died from massive hemorrhage. Additionally, assuming the mother contributes to the household income, this figure could rise by an additional \$47,282.4, assuming that the mother could have worked another 20 years. This equation could be significantly higher of course, if the mother is single, has more potential years of earning, has more than 1 child, or contributed a larger share to the household income. Considering that the average annual income is \$2,364.12, it is important to note that even at the lower end of potential outcomes, maternal mortality has significant economic costs, as this loss represents ~28 years in income lost, holding my assumptions true.

Appendix B: Logic Model

The logic model below demonstrates the causes of maternal mortality as addressed within the literature review and how implementing alternatives will work with local systems to reduce the same.



Ecosystem Map



Appendix C: Ecosystem Map

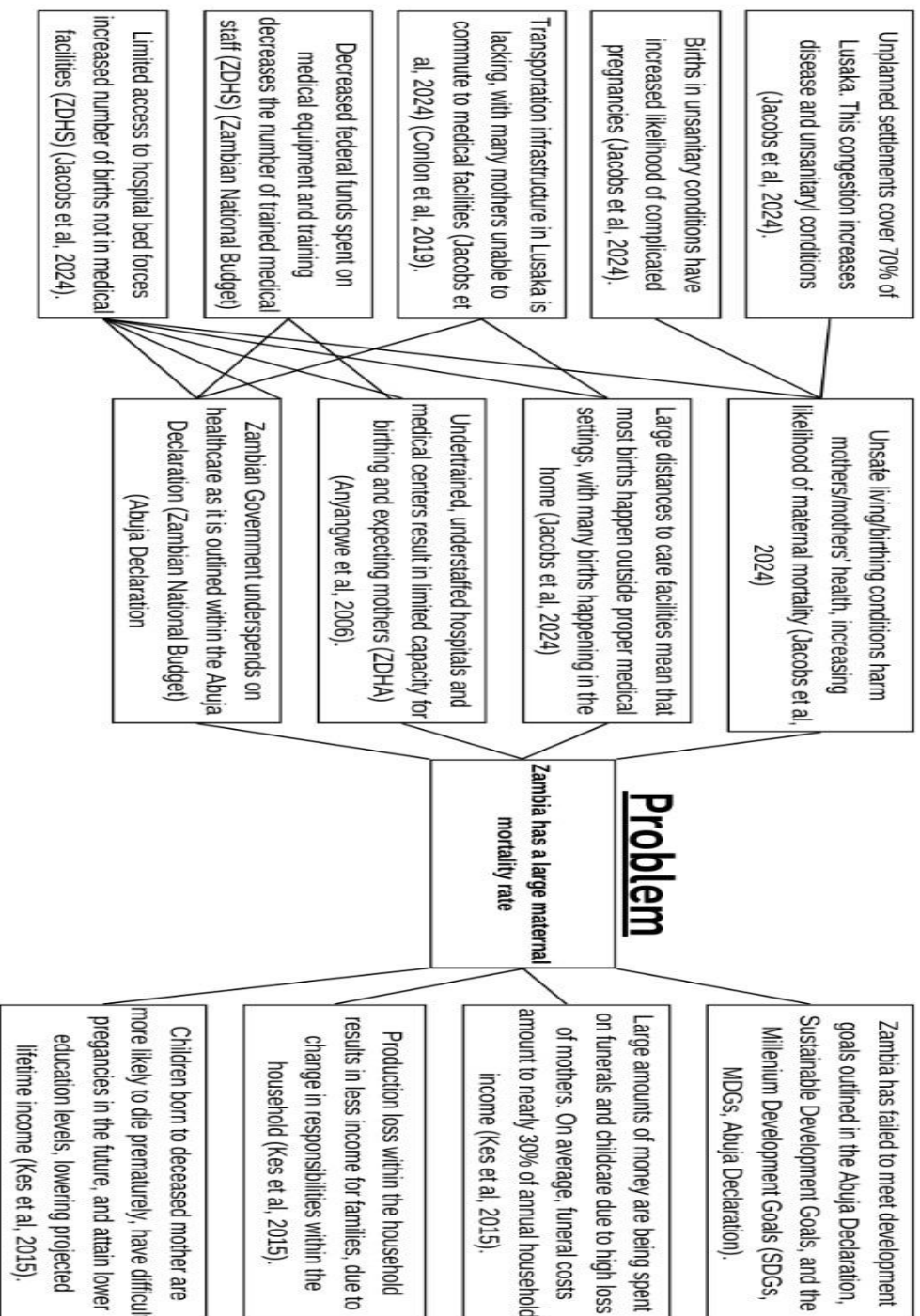
The ecosystem map below demonstrates the large number of actors within Lusaka that can work together to reduce maternal mortality. This map also shows organizations that CRS has not worked with before, which as the research demonstrates, CRS must work with the all groups as maternal mortality is a complex issue.

RCA

Secondary Causes

Primary Root Causes

Symptoms

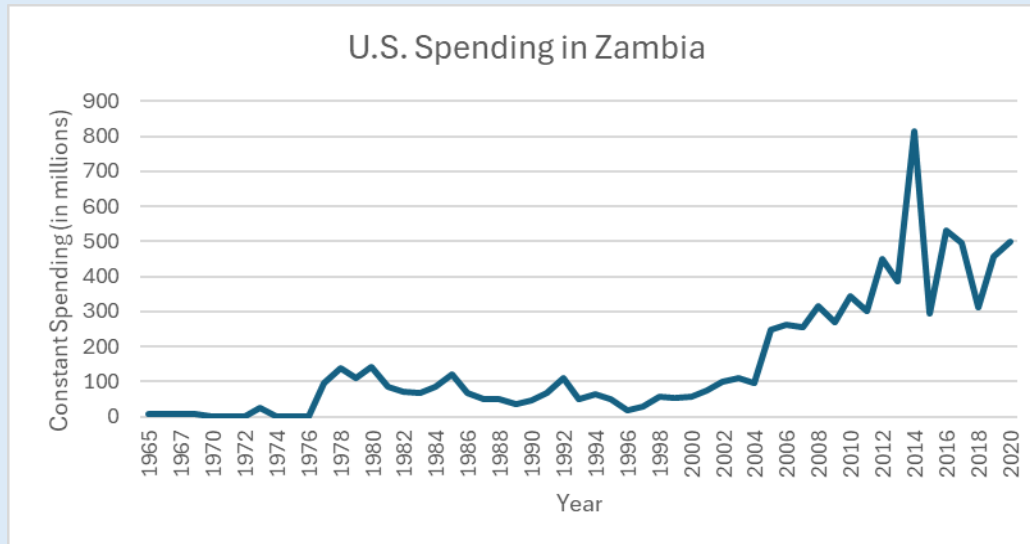


Appendix D: Root Cause Analysis

The root-cause analysis below demonstrates the complexities of maternal mortality within Lusaka. In order for maternal mortality to be truly reduced, both primary and secondary causes must be addressed.

[Appendix E: US Spending in Zambia](#)

This chart demonstrates the large amount of aid that Zambia receives each year from the US. With the cutting of USAID, it is important to not that following a drastic reduction of spending, it can be expected that maternal mortality and other negative health indicators are increased as NGOs lose access to much needed aid.



[Appendix F: US Spending by Sector, Zambia](#)

The chart below lists sector spending for US aid within Zambia. It is important to note the large proportion of aid spent on health and population, which includes measures to reduce maternal mortality, improve hospital systems, provide training, and advancing other efforts that advance public health. This chart demonstrates that health is an important indicator for development, and other sectors will not improve without addressing health.

Sector Aid (2023)	Amount
Health and Population	\$460 million
Administrative Costs	\$20 million
Agriculture	\$16 million
Other	\$13 million
Governance	\$11 million



REDUCING MMR IN ZAMBIA



Useful Statistics

- Over 20 women give birth on hospital floors every day(Lusaka Times)
- Zambia underspends its healthcare budget by ~5%

Indicator	1990	2001/2	2015 MDG target
Maternal mortality ratio/100,000 live births	649	729	162
Proportion of births attended by skilled health personnel	51%	43%	80%

Source ZDHS 2001-2002

Background on CRS

Catholic Relief Services (CRS) is a nonprofit that focuses on improving the lives of those in developing nations around the world. CRS has a large foothold in Sub-Saharan Africa, where they work to fund and train projects within the healthcare sector.

One specific project in Zambia was the Mayi na Mwana II Project, which looked to reduced maternal mortality across 3 districts in Lusaka. This project, which increased training of CHWs(Community health workers) and education of expecting mothers and families saw a 50% reduction in MMR.

Working Alternatives

Supply Side Intervention: This intervention looks to increase the number of beds within hospitals. This will cost \$68,640 and is expected to reduce MMR by 30.

Demand Side Intervention: This intervention looks to increase the number of CHWs in Lusaka. This will cost \$27,750,237 and is expected to reduce MMR by ~400
CCT: This intervention looks to provide cash transfers to increase facility care and deliveries. This intervention will cost \$10,913,491 and is expected to reduce MMR by 45.

Terms to Understand

. Maternal mortality is defined as "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes"(Shrestha, 2022).

. Postpartum hemorrhaging is often linked to severe vaginal bleeding, which causes hypovolemic shock. This can occur up to 12 weeks after delivery(Cleveland Clinic, 2024). Puerperal sepsis is defined as the infection of the uterus and surrounding areas. Uterine rupture is defined as the rupture of the uterine lining, which can cause both bleeding and the suffocation of the baby.



