"*ADDRESSING KEY DETERMINANTS FOR MATERNAL MORTALITY IN KENYA*"

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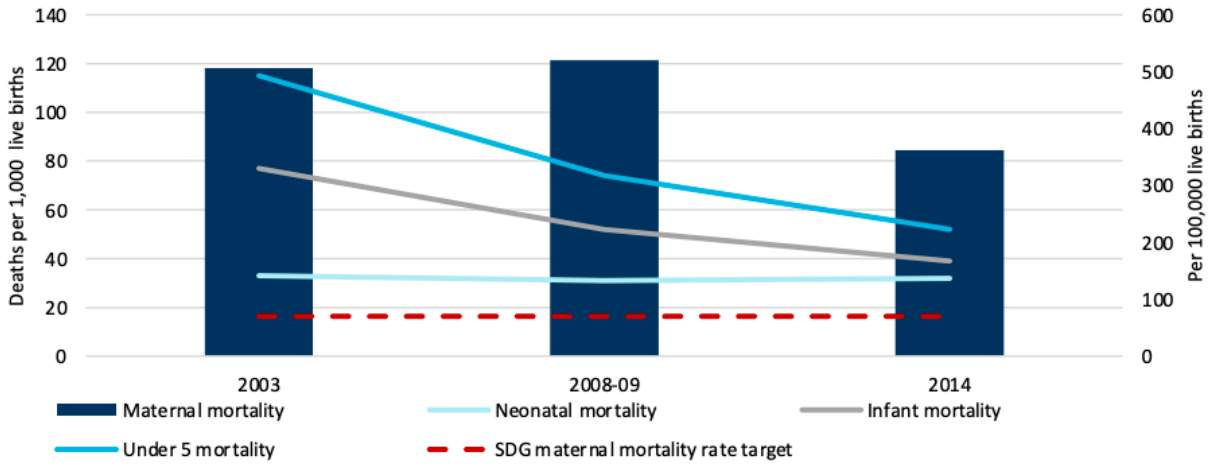
Introduction

In East Africa, Kenya continues to face significant maternal health challenges despite global efforts like the *Safe Motherhood Initiative* launched in 1987 (Santora E., 2020). This initiative aimed at reducing maternal and newborn mortality rates in developing countries has not yet achieved its goals in regions such as Sub-Saharan Africa, where more than half (56%) of all maternal deaths occur. Furthermore, over one million newborns in this region die within their first month of life, underscoring the persistent urgency of these health challenges. Particularly in rural areas, disadvantaged women encounter substantial infrastructural barriers that critically impede their access to healthcare services. Recent *Kenya Demographic and Health Surveys* (KDHS) from 2003 and 2008 (Figure 1), indicate that Kenya's maternal mortality ratio has alarmingly increased from 412 to 488 deaths per 100,000 live births, with rural communities experiencing the highest rates of maternal fatalities (Essendi H, 2015).



[Figure 1: *Trends in MNCH Mortality Rates (2003 - 2014)*. Source: Kenya DHS 2003, 2008-09, 2014]

This backdrop sets the stage for employing the *Socio-Ecological Model (SEM)* in our study, which analyzes how individual, interpersonal, community, and societal factors influence maternal health outcomes in Kenya. At the individual level, factors such as age, parity, and

health knowledge significantly impact maternal outcomes. For instance, high parity and low health literacy are strongly associated with increased risks during childbirth (UNFPA, 2021).Interpersonally, the support from partners and the influence of cultural beliefs plays pivotal roles in shaping health-seeking behaviors among pregnant women (Mochache V. *et al.*, 2020). Community and institutional factors further complicate the landscape. Traditional birth practices and limited healthcare infrastructure hinder effective delivery of maternal health services (Bucher S., 2016). At the societal level, entrenched gender norms and inadequate policy implementation contribute to the persistent disparities in maternal health care access and outcomes (Kenya Ministry of Health, 2022).

This paper seeks to unravel the complex determinants affecting maternal health in Kenya, employing SEM to provide a nuanced analysis of these factors. By comparing Kenya's maternal health indicators with successful interventions in similar contexts, such as Nigeria's Ondo State, Bangladesh, and Morocco, this study will offer strategic insights and policy recommendations aimed at improving maternal health services and reducing mortality rates across Kenya.

Socio-ecological model analysis

In the following section we will use the *Socio-Ecological Model (SEM)* in order to provide a robust framework for analyzing the complex interplay of individual, interpersonal, community, and societal factors that influence health outcomes (Wallerstein *et al*., 2003). This model is particularly suited to our study as it allows for a comprehensive evaluation of the multifaceted determinants of maternal health in Kenya. By utilizing SEM, we will be able to identify targeted intervention points across different levels of influence, thereby proposing holistic solutions to enhance maternal health outcomes effectively.

Individual level

The individual level within the socio-ecological model focuses on factors that directly impact an individual's health behaviors, choices, and experiences. It considers personal characteristics, knowledge, attitudes, and behaviors that influence health outcomes (CDC). Factors such as educational attainment, number of previous births, obstetric history, employment status, socioeconomic level, and the kinds of healthcare behaviors sought during pregnancy all play a role in the maternal health outcomes (Bucher et al., 2016). In the context of maternal mortality in Kenya, understanding individual-level determinants is crucial for designing effective interventions.

Age and parity**:** Scientific studies have shown that women's high-risk fertility behaviors (HRFB), including short intervals between births, having many children, and giving birth at a young age, can adversely affect both maternal and child health (Seifu *et al.*, 2023). Young maternal age

(adolescents) and advanced maternal age are associated with increased risks of maternal mortality (Muriithi *et al*., 2022). Additionally, data indicates a higher risk of mortality for women under 18 years of age and those over 35 years old (Yego *et al*., 2014). Adolescent pregnancies pose higher risks due to incomplete physical development, inadequate prenatal care, and social vulnerabilities (Muriithi *et al*., 2022). Teenagers may lack awareness of danger signs and delay seeking care (Muriithi *et al*., 2022). Younger mothers, particularly teenagers, face a higher risk of complications like anemia, eclampsia, preterm birth, and prolonged labor (Muriithi *et al*., 2022). Conversely, older mothers, often over the age of 35, are at increased risk due to the higher likelihood of chronic conditions and complications such as placenta previa and uterine rupture (Yego *et al*., 2014). Women over 35 years of age face increased risks of complications such as hypertension, gestational diabetes, and placental abnormalities and these conditions contribute to maternal mortality (Seifu *et al*., 2023). Similarly high parity (having many previous pregnancies or high birth order as commonly known) can also contribute to complications during childbirth (Muriithi *et al*., 2022). The recent study indicates that 70.86% of women in Kenya engage in high-risk fertility behaviors (Seifu *et al*., 2023). Of these, the most prevalent individual risky behavior is a high birth order, which accounts for 57.15% of the cases (Seifu *et al*., 2023).

Health knowledge, awareness and health seeking behavior**:** A woman's level of education and her understanding of maternal health and pregnancy-related risks directly influence her health-seeking behavior (Seifu *et al.*, 2023). For example, knowledge about the importance of prenatal care and the risks associated with home births without skilled birth attendants can dictate whether or not she seeks medical help during pregnancy and childbirth (Seifu *et al*., 2023). Awareness of danger signs during pregnancy, childbirth, and postpartum is critical. Lack

of knowledge about when to seek care delays timely interventions which often leads to adverse maternal outcomes (Seifu *et al*., 2023). Delay in deciding to seek help due to cultural beliefs, fear, or lack of awareness are some of the major factors to be addressed to help improve the maternal outcomes along with prompt recognition of danger signs and timely care-seeking are essential (Seifu *et al*., 2023).

Education and Income of the mothers/Households: Education significantly impacts maternal health. Educated women generally have a better understanding of health-related information, such as the necessity of prenatal care, nutritional needs during pregnancy, and recognizing complications (DHS Kenya, 2022). Research consistently indicates that women with higher education levels tend to have lower maternal mortality rates because they can make more informed decisions about their and their children's health (Seifu *et al*., 2023). The recent *Demographic and Health Survey* of 2022 reports that employment status also affects maternal health by providing economic independence and resources like healthcare access (DHS Kenya, 2022). Women with employment are typically in a better position to afford healthcare services and benefit from workplace supports like maternity leave and health insurance, enhancing their prenatal and postnatal care (Seifu *et al*., 2023). Additionally, an educated and employed woman has autonomy in decision-making, especially regarding healthcare, profoundly influencing her health outcomes (Seifu *et al*., 2023). Women who have the autonomy to make their own health decisions are more inclined to seek out prenatal care, regular medical check-ups, and emergency services when necessary (Seifu *et al*., 2023). This independence is vital for the timely and effective management of pregnancy-related complications, thus reducing the risk of life-threatening issues.

Nutritional status and anemia: Poor nutrition and anemia increase the risk of maternal complications. Adequate prenatal nutrition and iron supplementation are crucial not only for the healthy infant but also for the fast and proper postpartum recovery of the mother (Muriithi *et al*., 2022). Anemia during pregnancy reduces the oxygen-carrying capacity of blood, leading to fatigue, weakness, and increased susceptibility to infections (Odhiambo & Sartorius, 2020). It also heightens the risk of complications such as preterm birth, low birth weight, and maternal mortality (Odhiambo & Sartorius, 2020). During childbirth, anemic women are less able to tolerate blood loss, increasing the risk of postpartum hemorrhage which if not managed early can lead to maternal mortality (Odhiambo & Sartorius, 2020).

Interpersonal

In the context of the SEM, the interpersonal level refers to the influence of personal and social relationships on an individual's behavior and health choices. This level includes interactions between individuals and their family, friends, colleagues and other significant relationships (Dahlberg & Krug, 2002). Interpersonal dynamics can have a profound impact on health and well-being, influencing decisions, behavior and access to health care resources (Umberson & Montez, 2011). In the context of maternal mortality in Kenya, the interpersonal level plays a crucial role, as cultural norms, partner and family support, and relationships with health care providers can significantly influence pregnancy outcomes. For example, in Kenya, a woman's decision to seek prenatal care, cultural beliefs shared within interpersonal networks may influence pregnancy and childbirth practices which impacts maternal health outcomes.

Partner and family support: Studies have shown that partner support is crucial in encouraging pregnant women to seek prenatal care and delivery assistance in health facilities (Atif *et al.*, 2023). Lack of support from partner and family which may be due to religious belief and cultural norms limit women in making autonomous decisions regarding their health or the perception that pregnancy and childbirth are exclusively female matters, and relationships with health care providers can significantly influence pregnancy outcomes (Idris *et al.*, 2023). In Kenya, a woman's decision to seek prenatal care, the type of delivery care she chooses, and access to postnatal care are strongly influenced by the support and expectations of her partner and family and, in fact, more support from partners is proved to a more likely use of maternal health services (Kagia, 2011). Similarly, cultural beliefs shared within interpersonal networks may influence pregnancy and childbirth practices, including preferences for traditional birthing methods or home care, which may lead to increased risks of complications or maternal mortality (Kagia, 2011).

Cultural knowledge and beliefs and stigma: Unwanted pregnancies out of wedlock or various other factors are often considered stigma due to cultural beliefs and that leads to unsafe abortion practices. One way of stigmatization is the result of other people's abortion attitudes and cultural expectations regarding how a woman should respond to news about her pregnancy (Mohamed *et al*., 2018). Unsafe abortion in Kenya is one of the leading causes of maternal mortality in Kenya (Mohamed *et al*., 2018). A national survey indicated that in 2012, around 465,000 abortions were performed in Kenya, which corresponds to a rate of 48 abortions per 1,000 women of reproductive age (Ziraba *et al*., 2015). Research on the sociocultural aspects of abortion in Kenya shows that unintended pregnancies are common, with about one in four women who have given birth reporting that their most recent pregnancy was not planned (Ziraba *et al*., 2015). Unwanted

pregnancies are particularly prevalent among single women (Ziraba *et al.*, 2015). Due to cultural beliefs and norms and in an effort to avoid the repercussions of unplanned or poorly timed pregnancies, many women in these circumstances may choose to have an unsafe abortions which leads to maternal mortalities due to infections, severe bleeding as major causes (Ziraba *et al*., 2015).

In several communities in Kenya, like the Digo in Kwale County, traditional beliefs link poor health to supernatural forces, often leading people to prefer traditional healers over modern medical services (Mochache *et al.*, 2020). This belief system can delay the seeking of essential healthcare, particularly during pregnancy and childbirth which may lead to adverse maternal outcomes (Mochache *et al*., 2020). Women in Kenya have responded to studies elaborating how the stigma has caused women seeking to terminate an unintended pregnancy to enjoy no respect, sympathy, or support. (Izugbara *et al*., 2015).

Community and institutional

The community level of the *Socio-Ecological Model (SEM)* examines how individual behaviors and attitudes are influenced by broader social networks, community norms, and social associations (CDCP, 2024). Community norms, beliefs, and resources influence maternal health behaviors and access to care, which could also shape the policies, practices, and resources of healthcare organizations and institutions, while institutional policies and practices can also influence community norms and behaviors related to maternal health (Adu *et al.,* 2018). Kenya, like many other countries, faces challenges related to external factors such as political instability, conflict, and humanitarian emergencies that can disrupt health care delivery systems and exacerbate maternal health disparities (Namasivayam *et al.*, 2012). Gender norms and

inequalities perpetuate inequalities in access to maternal health services in Kenya (Namasivayam *et al.,* 2012). Patriarchal attitudes, cultural practices, and discriminatory social norms may limit women's autonomy, decision-making power, and access to resources, including health care (Olwanda *et al.*, 2024).

Toxic Gender Norms: Toxic gender norms persist in Kenya, significantly impacting women's rights, opportunities, and health. What cannot be ignored the most is the high incidence of gender-based violence in Kenya, including domestic violence, sexual assault, female genital mutilation (FGM), child marriage, and so on. Besides, sociocultural norms and gender stereotypes can influence the utilization of maternal health services (Sumankuuro *et al.*, 2018). In many Sub-Saharan African communities, which are largely patriarchal in nature, men hold primary decision-making authority, directly or indirectly shaping women's ability to access and utilize healthcare services. Conversely, women contend with societal attitudes and expectations that unfairly disadvantage their health outcomes (Mochache *et al.*, 2020). Although various religious groups are increasingly used to spread sexual and reproductive health messages, historically these groups have been more inclined to spread prevention messages about abstinence before marriage, complicating women's reproductive decisions (Juma *et al.*, 2014). Research indicates that women's autonomy, defined as their ability to make independent decisions based on their own judgment and interests, impacts reproductive, maternal, and child health outcomes positively (Olwanda et al., 2024). Conversely, when women lack autonomy in decision-making, there are delays and reduced use of maternal health services, leading to higher rates of maternal morbidity and mortality (Olwanda et al., 2024).

Healthcare Infrastructure and Access to healthcare facilities: Many health facilities in Kenya have dedicated maternity wards or units specifically designed to provide care to pregnant women and mothers. However, whether it is effective in terms of reducing MMR is ambiguous. Data from a survey of health facilities in five countries in sub-Saharan Africa, including Kenya, shows that nearly 90% of healthcare facilities providing obstetric care do not have the capacity to perform cesarean sections, and that these primary care facilities account for 44% of all facility births (Kruk *et al.*, 2016). Moreover, the study also found that the quality of delivery care was very low across the study facilities, particularly in primary care settings with low delivery volumes (Kruk *et al.*, 2016). Another study in Kenya also shows a similar result that quality of maternal care there is generally low, with poor people receiving significantly worse care than wealthier people (Sharma *et al*., 2017). In a study conducted in the Mchinji District of Malawi region of Kenya, it was found that there was inadequate utilization of maternal healthcare care along the continuum of care by women (Stewart & Hall, 2022). Many women participants living at a distance more than 5 kms from the healthcare facility shared that due to poor road infrastructure and commute they prefer not to go to the healthcare facility (Stewart & Hall, 2022). Home birth practices due to above reasons often leads to medical complications which causes maternal mortalities (Stewart & Hall, 2022). In the above study, the key determinants associated with the no utilization or restricted use of the continuum of maternal healthcare were distance to healthcare facility, SES, number of live children, pregnancy intention, previous miscarriage, control over decisions and experience of abuse (Stewart & Hall, 2022).

Societal, policy and environment level

The societal and government policy levels represent the broader structures and systems within which people live, including laws, policies, social norms, and health and economic infrastructure that influence the health and well-being of individuals. Policies adopted by governments directly influence the availability, accessibility and quality of maternal health care, such as the promotion of free or low-cost health care for pregnant women, which is key to reducing maternal mortality (Orangi, 2021). In Kenya, initiatives such as the launch of the 'Linda Mama' programme, which offers free health services to pregnant women and new mothers, aim to improve access to care and reduce maternal mortality (Orangi *et al.*, 2021).

Health policies: Kenya's health policies have seen significant changes in recent years with the introduction of strategies aimed at reducing maternal mortality. The Kenyan government has made purposeful efforts geared towards improving the lives of women over the years and more recently, in June of 2013, Kenya declared maternity services free of charge ("*Free Maternity Services*"), in all public health institutions across the country, a move that makes access to quality maternal health care possible for all women in the country. Since the adoption of Kenya's 2010 Constitution, which recognizes health as a fundamental right including abortion care, there has been significant legal progress despite ongoing challenges. These decisions highlight the constitutional protections for dignity, autonomy, equality, and bodily integrity, and continue the fight for accessible and safe abortion services across the country. However, the sustainability and quality of these services remain major challenges. Issues include delayed government reimbursements leading to out-of-pocket charges for patients, and inadequate infrastructure in rural areas. Many such areas lack sufficient qualified personnel, essential medicines, and

transport for emergency care. Poor road conditions further hinder pregnant women's access to facilities (Moturi *et al.*, 2022).

Political Instability: Political instability in Kenya exacerbates existing challenges related to gender inequality and maternal health disparities. During times of political instability, health care delivery systems are often disrupted, resulting in limited access to essential maternal health services. In addition, increased gender-based violence due to political instability further endangers the health and safety of women and girls.

Socioeconomic Inequalities: Economic barriers, such as the hidden costs associated with supposedly free maternity services, prevent many women, especially those from poorer backgrounds, from accessing necessary care (Jeong, 2020). Additionally, educational disparities limit women's awareness and utilization of maternal health services, further exacerbating health outcomes (Moturi *et al.*, 2022). Moreover, gender inequality and cultural practices also contribute to the higher risks associated with pregnancy and childbirth in these communities (Chirowa, 2013)

Unproportional Effect of Climate Change on Women: Climate change disproportionately affects women, particularly in regions like Kenya where agricultural livelihoods are prevalent and natural disasters are increasingly frequent. In regions like Marsabit, Kenya, where water scarcity is already a pressing concern, climate change-induced droughts and erratic rainfall patterns further strain water availability, leading to heightened tensions and conflicts over water access and use. Women are often responsible for household food security and water provision, making them more vulnerable to the impacts of climate change-induced droughts, floods, and crop

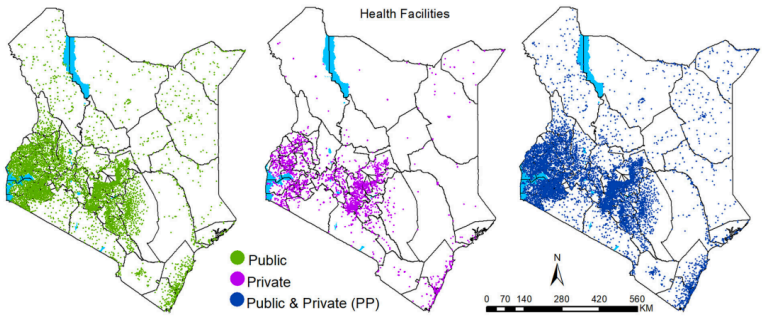
failures (Yerian et al., 2010). These environmental stressors can exacerbate existing socioeconomic inequalities and further limit women's access to maternal health care.

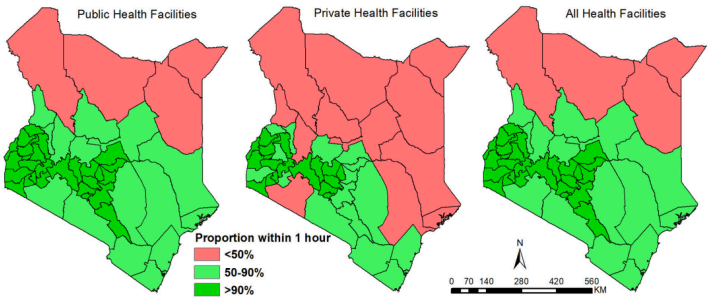
Policy proposals

Access to care - Nigeria's case

Despite evident efforts and commitments to accelerate progress towards the Millennium Development Goals for maternal and newborn health (MDGs 4 and 5), in most rural communities in sub-Saharan, access to these services is still limited and, even where services are available, they often lack the infrastructural prerequisites to function at the very basic level in providing essential routine health care services, let alone emergency care. Insufficient infrastructure, such as reliable water and electricity, has been linked to substandard healthcare services in rural Kenya (Magadi, 2001). Just 58% of hospitals nationwide maintain a consistent yearly water supply, and only a quarter have a continuous electricity supply (KNBS, 2011). The situation is particularly hard in the Eastern province, where 40% of facilities lack either a stable electricity supply or a fueled generator. Consequently, only 42.8% of women in this region have access to a skilled attendant during childbirth, with many citing the long distance to healthcare facilities as a significant barrier (Joseph, 2020). Therefore, poor infrastructural development in sub-Saharan Africa, particularly in its rural areas has been cited as the main contributor to the poor progress made in the achievement of MDGs 4 and 5 (Adam, 2005). In Kenya, despite

initiatives to improve access to maternal healthcare, such as the *Linda Mama* program which provides free antenatal, neonatal, and postnatal services, significant challenges remain (Orangi, 2021). These include inadequate, delayed, and inconsistent reimbursements to health facilities from the government, leading some facilities to charge patients out-of-pocket. The infrastructure in rural regions further complicates access to quality care. Many areas face a severe shortage of qualified health personnel and basic healthcare facilities. For instance, some rural communities are served by facilities that are understaffed and poorly equipped, lacking essential medicines and adequate transport for emergency care. These issues are exacerbated by poor road conditions, making it difficult for pregnant women to reach healthcare facilities in time (Moturi *et al.*, 2022). An understanding of spatial distribution of health facilities has implications on the service provision, quality of care and economic considerations at the household level in accessing care. Approximately 2.7 million people (6%) are marginalized (living outside 2 h) from routine care offered by both the public and private sector (Appendix 1). The counties with the majority of the marginalized population are in northern parts of Kenya and include Garissa, Isiolo, Lamu, Mandera, Marsabit, Turkana and Wajir (Joseph, 2020).





[Health facilities' spatial distribution in 2021 by sector: Public (n = 7,418), Private (n = 5,550) and total (both public and private) health facilities (n = 12,968)]

[Travel time to the nearest public, private and combined health facilities binned based on travel time and population density in Kenya in 2021

Abiye initiative in Nigeria and adaptability in Kenya

The *Abiye initiative* was crafted in response to maternal health statistics in Ondo State, Nigeria, highlighted by the *Nigeria Demographic and Health Survey (NDHS)* of 2008, which reported the worst maternal outcomes in the Southwestern region. This initiative encompasses several integral components aimed at addressing the multi-layered barriers to accessing maternal health services, better clarified in Appendix 2. In particular, one of the main focuses is addressing infrastructural and financial barriers, specifically tailored to enhance maternal and child health services. By constructing and refurbishing health centers in remote areas, the initiative addressed the healthcare accessibility issue ending in reducing travel time for pregnant women. These centers were fully equipped with medical tools, drugs, and supplies for comprehensive prenatal, childbirth, and postnatal care (Ajayi, 2020). Additionally, the initiative established specialized mother and child hospitals for complex maternal and pediatric emergencies. Moreover, the *Abiye initiative* effectively tackled financial barriers to healthcare in low-resource areas through several strategies, like abolishing user fees for pregnant women at government facilities, ensuring cost was not a deterrent to seeking medical care. Additionally, it implemented a conditional cash transfer program to encourage referrals from traditional and faith-based practitioners to professional medical facilities, thus integrating informal healthcare providers into the formal system. The initiative also offered subsidies and incentives to attract and retain skilled health

workers in rural and underserved areas, ensuring adequate service delivery as demand increased (Mimiko, 2017). Overall, post-implementation data showed a jump in antenatal care from 80% to 98% and in facility-based deliveries from 56.5% to 85.6%, indicating a significant reduction in home births and unskilled deliveries (Ajayi, 2020).

The implementation of *Abiye* in Nigeria, specifically in Ondo State, offers a framework that can potentially be adapted for Kenya. The situation in Nigeria pre-Abiye was critical regarding the healthcare system infrastructure, with lacking well-equipped medical facilities. The creation of new health facilities and refurbishment of existing ones under *Abiye* improved physical access significantly. In 2013, Kenya devolved health and other services from the central government to 47 new sub-national governments (known as counties). Even though disparities in facility quality and availability are present, this decentralization of health governance could be leveraged to implement localized versions of the *Abiye* initiative. Such delegation of control could bring even better effects, leading to a greater community participation, improve efficiency and reduce inequities (Oladimeji & Fatusi, 2022). In Nigeria the role of state-led initiatives with strong leadership were crucial for the rollout and success of *Abiye*. With the Kenyan decentralized healthcare management, strong coordination between national and county governments is required in order to ensure uniformity in service quality and access to any *Abiye*-like initiatives. Finally, for what concerns funding and resource allocation, initial funding was predominantly state provided in Nigeria, supplemented by international donors like Bill and Melinda Gates, Department of International Development (DFID), Society for Family Health (SFH), World Health Organisation (WHO) and Ford Foundation (Cooke & Tahir, 2013). After careful research, we were able to establish how each of these financial contributors possesses a rich scheme of funding specifically for Kenya, the majority of which is employed in the country's United

Nations Sustainable Development Goals, which include primary health care and gender equality. For this reason, we estimate a rich participation of international supporters, at least on the same scale as in Nigeria.

Policy recommendation - Kenya Maternal Health Enhancement Initiative

Several studies have been developed to improve the general understanding of the healthcare infrastructure problem (Luna *et al*., 2022). In particular, a recent joint research paper from the World Bank Infrastructure and Human Development Chief Economist Offices studies how the lack of access to essential infrastructure such as roads, electricity, and information and communications technology may hinder the provision of many critical services such as health care in Kenya (Luna *et al*., 2022). For this reason, we propose a comprehensive national program designed to improve maternal and newborn health outcomes in Kenya through infrastructure development, financial accessibility, and enhanced healthcare services. The initiative will focus on reducing maternal and newborn mortality by addressing barriers to accessing quality healthcare, particularly in underserved and rural areas.

- Primary target population: Pregnant women and newborns in rural and underserved regions of Kenya, with a particular focus on areas with the least access to healthcare facilities and the highest rates of maternal and neonatal morbidity and mortality.
- Secondary target population: Healthcare providers including doctors, nurses, midwives, and traditional birth attendants in these areas, who will receive training and support to improve the quality of maternal and newborn care.

Implementation guidelines: Government and international donors fundings should be used in order to (1) improve infrastructure and (2) build and upgrade healthcare facilities in high-need areas, ensuring they are equipped with essential resources like water, electricity, and medical supplies. Financial barriers are addressed through (1) fee waivers for all maternal and newborn health services and (2) conditional cash transfers to encourage healthcare utilization. We emphasize the creation of programs for capacity building through regular training for healthcare workers and competitive incentive schemes to attract and retain staff in underserved areas.

Health Literacy - Morocco & Bangladesh

Improved educational attainment among women in Kenya plays a crucial role in reducing maternal mortality by enhancing health literacy (Kagia, 2013), appendix 3 shows estimates using a quadratic in years of education, the functional form suggested by a non-parametric plot of this relationship. As of 2022, 90% of adult women in Kenya are literate, and 54% of women aged 25 and older have completed at least lower secondary education. These advancements in education equip women with better health knowledge and the ability to comprehend critical information regarding pregnancy and childbirth. This understanding is vital for recognizing health risks and seeking timely medical care, thereby preventing many potentially preventable maternal deaths (Filmer, 1999). Additionally, education contributes to greater economic empowerment; research indicates that each additional year of schooling can increase a woman's earnings by 10-20%. Higher income levels improve access to quality healthcare, further supporting the reduction of maternal mortality. This data underscores the interconnectedness of education, economic empowerment, and improved maternal health outcomes. To address health literacy effectively, it is essential to examine the relationship between education and health literacy. Research by

Bayati et al. (2018) in Kazeroon demonstrates a direct correlation between education level and health literacy. Additionally, a study in the Netherlands by Van der Heide (2013) identifies low education as a significant predictor of poor health outcomes, disproportionately affecting those with lower educational levels. Understanding this linkage highlights the potential of education to reduce MMR by enhancing health literacy, suggesting a strategic focus on educational improvements as a means to improve health outcomes.

Morocco has prioritized women's education, resulting in a fourfold increase in the net enrollment rate for girls aged 6 to 11 in rural areas from 1990 to 2008 (Ministry of Health, 2011). Concurrently, the percentage of births attended by skilled health workers rose from 36% to 71% during the same period. Similarly, Bangladesh's introduction of the *Female Secondary Stipend and Assistance Program (FSSAP)* in 1994 aimed to boost secondary school enrollment and completion among girls, thereby reducing early marriage and enhancing rural women's education. Research by Wu (2022) demonstrates that each additional year of education for mothers is associated with a 21.54% decrease in under-five mortality and a 22.24% decrease in infant mortality, underscoring the profound impact of educational advancements on health outcomes. Beyond enhancing health literacy, education significantly promotes women's empowerment and challenges harmful social norms, both of which are inversely related to maternal mortality rates (MMR). Data from 193 countries reveal a clear correlation: as gender equality improves, reflected by metrics such as educational attainment at all levels, employment rates, and leadership representation among women, MMR correspondingly declines (Bagade et al., 2022).

Countries comparison

The *Gender Inequality Index (GII)* reveals variations in gender disparity among Kenya, Morocco, and Bangladesh (Appendix 4). Kenya's GII is 0.56, indicating significant gender inequality, compared to Morocco's lower rate of 0.5. Bangladesh shares a moderate gender inequality level with Kenya, also at 0.5 (IMF, 2024). These disparities likely affect women's health status and access to education and healthcare, influencing maternal mortality rates (IMF, 2024). According to GDP per capita data (Appendix 5), Kenya's stands at approximately $6.98K, compared to Morocco's $10.95K and Bangladesh's $9.42K. Generally, a higher GDP per capita is associated with superior healthcare infrastructure and resources, which can lead to improved maternal health outcomes (IMF, 2024). *Corruption Perception Index (CPI)* scores indicate varying levels of perceived corruption in the three countries (Appendix 6). Morocco, with a score of 38, exhibits the lowest perceived corruption, followed by Kenya at 31, and Bangladesh at 24, indicating the highest perceived corruption. Such discrepancies can significantly influence the effective implementation of healthcare policies and the allocation of resources, potentially impacting maternal health initiatives and health literacy programs (Transparency International, 2023).

Policy recommendation

Challenges in implementing health policies in Kenya are exacerbated by its higher *Gender Inequality Index (GII)* and moderate corruption levels compared to Morocco and Bangladesh. These issues may hinder progress in women's health and education. Corruption particularly

affects healthcare quality and resource allocation, leading to shortages in essential medical supplies. This often forces pregnant women to seek alternatives to hospital births, increasing maternal mortality risks. Research indicates that without addressing corruption, efforts to improve gender equality and skilled birth attendance are unlikely to reduce maternal mortality significantly in Africa (Lan & Tavrow, 2017). Advancing health literacy in Kenya through education requires addressing gender inequality, corruption, and sociocultural norms. Learning from Morocco and Bangladesh, tailored strategies can significantly improve maternal health policy outcomes in the country.

Conclusion

Maternal health challenges in Kenya transcend medical solutions, deeply embedded within the social and cultural framework of the nation. Utilizing the *Socio-Ecological Model (SEM)*, this paper demonstrates that advancing maternal health goes beyond improving healthcare services. It involves addressing the complex interplay of individual behavior, interpersonal and community support, and national policies. This paper reveals that addressing these multifaceted factors is crucial and calls for a holistic approach that moves beyond traditional healthcare strategies.

At the *individual level*, age, parity, and health literacy are key factors influencing maternal health outcomes. The findings align with prior research indicating that high-risk fertility behaviors, such as short birth intervals and high parity, significantly elevate the risk of adverse maternal and neonatal outcomes (Seifu *et al.*, 2023). This highlights the urgent need for targeted educational programs to raise women's awareness of safe pregnancy and childbirth practices. *Interpersonally*, the support from partners and family, coupled with the influence of cultural beliefs, plays an

instrumental role in determining health-seeking behaviors. The evidence suggests that enhancing partner and family support could alleviate some barriers to accessing healthcare services, thereby potentially reducing maternal mortality rates (Atif *et al*., 2023). At the *community and institutional levels*, our analysis underscores the significant impact of healthcare infrastructure and care quality. Alarming disparities in access, especially in rural areas, demand urgent upgrades to ensure facilities are well-equipped and staffed for effective maternal health management (Kruk *et al*., 2016). Additionally, *societal norms* and weak *policy frameworks* significantly impede progress, with entrenched gender norms and insufficient health policies exacerbating maternal health disparities. The analysis of successful interventions in comparable settings highlights substantial opportunities for maternal health interventions in Kenya through strategic policy and structural reforms. Enhancing healthcare accessibility and quality, particularly in remote and underserved regions, is crucial for reducing maternal mortality. This requires more than infrastructural improvements; it calls for a thorough reassessment of funding and service delivery models. Implementing policies that provide equitable healthcare access can greatly improve maternal care standards and safeguard the health of mothers nationwide. This approach not only boosts health outcomes but also strengthens the healthcare system's resilience against future challenges.

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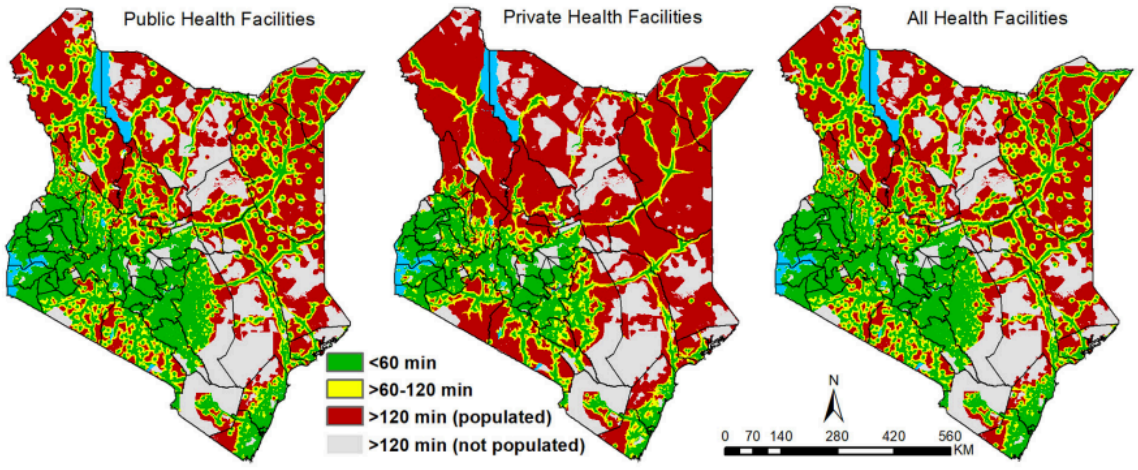
Appendix

Appendix 1: Travel time to the nearest public, private and combined (public and private) health facilities binned based on travel time and population density in Kenya in 2021.

Source: Moturi, A.K., Suiyanka, L., Mumo, E., Snow, R.W., Okiro, E.A., & Macharia, P.M. (2022). "*Geographic accessibility to public and private health facilities in Kenya in 2021: An updated geocoded inventory and spatial analysis*". Front Public Health, 10, 1002975. https://doi.org/10.3389/fpubh.2022.1002975



Appendix 2: The logic model of the "Abiye" safe motherhood program

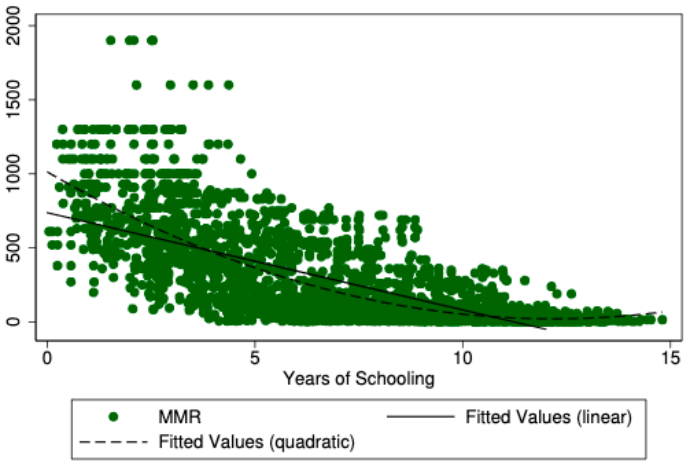
Source: Oladimeji OJ, Fatusi AO. (2022) "*Realist Evaluation of the "Abiye" Safe Motherhood Initiative in Nigeria: Unveiling the Black-Box of Program Implementation and Health System Strengthening"*. Front Health Serv.;2:779130. doi: 10.3389/frhs.2022.779130. PMID: 36925893; PMCID: PMC10012745.

INPUTS	PROCESSES	OUTPUTS	OUTCOMES	IMPACT
Recruitment of Health rangers	• Training and assigning specific pregnant women to health rangers	• Health rangers use skills in other to manage effectively the assigned women	• Higher number of skilled birth attendant at delivery	• Improved maternal health services
Drugs and life saving materials	• Working supplies system	• Health facilities are more effective and efficient		
Renovation and building new facilities with infrastructure	• Provision of MCH services at more health facilities	• Improved utilization of MCH services by the women	Reduced maternal and child morbidity and mortality	Maternal mortality ratio decrease
Ambulance service Strengthening of the referral system	• Effective referrals	• Third level of delay is eliminated and pregnant women able to access definitive life saving interventions whenever they need it		

Appendix 3: Maternal mortality and education: functional form

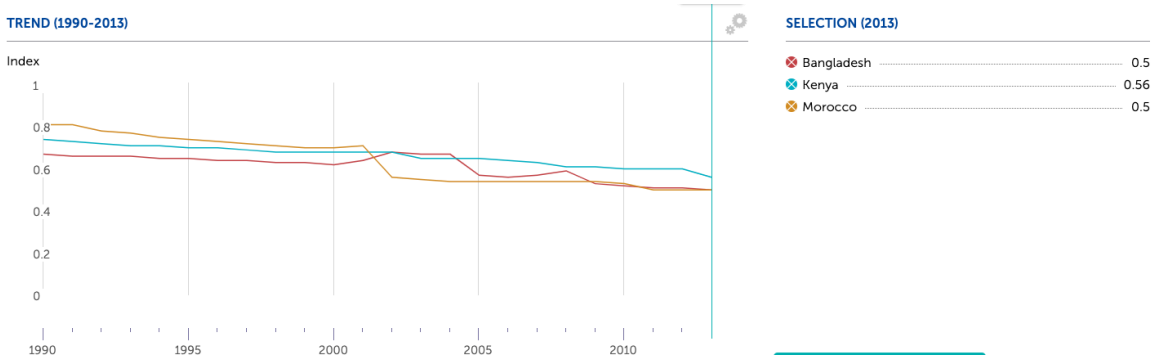
Note to the figure: each point represents a country average of maternal death per 100,000 births. Education data is for women aged 15-39.

Source: Bhalotra S. & Clarke D. (2013) "Educational attainment and maternal mortality" :2014/ED/EFA/MRT/PI/14



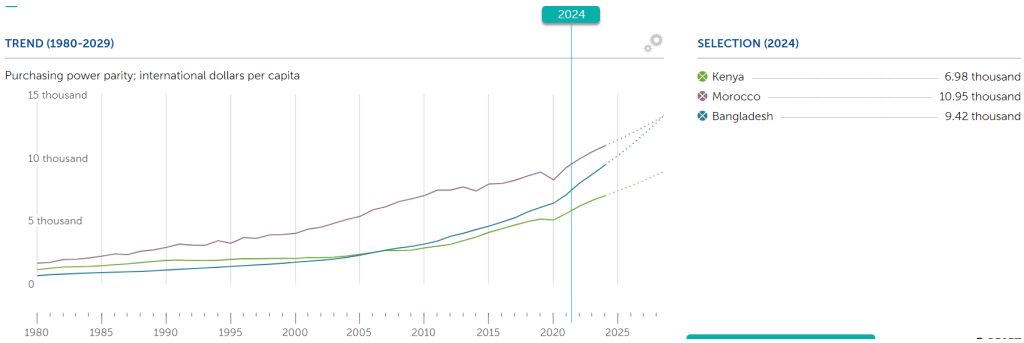
Appendix 4: Gender Inequality Index (GII) - (Bangladesh, Kenya, Morocco)

Source: IMF



Appendix 5: *GDP per capita, current prices (Kenya, Morocco, Bangladesh)*

Source: IMF



Appendix 6: *2023 corruption perceptions index* - The Corruption Perceptions Index (CPI) is the most widely used global corruption ranking in the world. It measures how corrupt each country's public sector is perceived to be, according to experts and businesspeople.

Source: Transparency International (accessible at: https://www.transparency.org/en/cpi/2023/)