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Influence of utilization of maternity waiting homes on the improvement of institutional delivery coverage, in-hospital maternal mortality ratio, and stillbirth rate in Mozambique

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Influence of utilization of maternity waiting homes on the improvement of institutional delivery coverage, in-hospital maternal mortality ratio, and stillbirth rate in Mozambique

Directed by Professor Whiejong M. Han

A Master's Thesis

Submitted to the Department of Global Health Policy and Financing,

Division of Global Health Policy and Financing Program

and the Graduate School of Public Health of Yonsei University

in partial fulfillment of the requirements for the degree of Master of Public Health

Cesarino do Rosário Jaime Tivane

December 2022

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This certifies that the Master's Thesis

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LIST OF ABBREVIATIONS

BD - Birth delivery

BDC - Birth Delivery Coverage

EmONC - Emergency obstetric and new-born care

FBD - Facility-based delivery

ID - Institutional delivery

IDC - Institutional delivery coverage

IMMR - Institutional maternal mortality Ratio

LMICs - low- and middle-income countries

Maternal mortality Ratio - MMR

MD - Mean difference

MoH - Ministry of Health

MWH - Maternity waiting homes

NHS - Nacional Health Systems

NNM - Neonatal mortality

NNMR - Neonatal mortality rate

SBR - Stillbirth rate

SBR+ - Stillbirth rate with a positive focus

SDG -Sustainable Development Goals

TBAs - Traditional birth attendants

WHO - World Health Organization

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ABSTRACT[1]

Many women in low and middle-income countries face the challenges of inaccessibility of obstetric care. Rural women are 3.572 times more likely to die due to complications from pregnancy or delivery than women who came from urban areas. To minimize these problems, developing countries use maternity waiting homes (MWH) as an alternative to increasing the accessibility of obstetric care services.

MWH are homes built in the compound or near health facilities. They provide standard medical and emergency obstetric care. This is the easiest way to decrease the complication related to childbirth. Mozambique set up the MWH strategy with the objective of improving the access of women living in remote areas. It is expected that MWHs will increase institutional delivery (ID), and decrease maternal mortality caused by the delay in obtaining obstetric care.

The study was carried out to evaluate the influence of the utilization of maternity waiting houses in the improvement of institutional delivery coverage, in-hospital maternal mortality rate, and stillbirth rate in Mozambique.

The results of this study revealed that there is a correlation between the utilization of maternity waiting homes and the improvement of institutional delivery coverage, in-hospital maternal mortality ratio, and stillbirth rates in Mozambique. The improvement of institutional delivery coverage, in-hospital maternal mortality ratio, and stillbirth rate was influenced by the utilization of maternity waiting homes in Mozambique. The p-value was less than 0.05.

Keywords: maternity waiting homes; institutional deliveries; stillbirth rate; neonatal mortality; in-hospital maternal mortality; influence; improvement.

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I. INTRODUCTION

1. Background

The Republic of Mozambique is one of the least developed countries in Southern Africa with a large portion of the population living below the poverty line (Chavane et al., 2018; Yaya et al., 2020). Characterized by high fertility rates and plagued by high maternal and child mortality rates, preventative maternity services are underutilized or may be inaccessible (Yaya et al., 2020).

Since the end of the prolonged civil war in 1992 (1977–1992), the country has introduced a series of macroeconomic reforms to revitalize the economy and initiatives to improve the living standards of the population (Yaya et al., 2020).

Despite the noticeable progress made in the areas of poverty reduction, a large proportion of the population continues to live below the poverty line and they face significant challenges in securing basic amenities such as food security and accessible healthcare (Yaya et al., 2020).

Higher fertility rates (5.24 birth per woman as of 2016), a predominantly rural distribution of the population (67.49 as of 2016), a relatively young age structure (45.2% under age 15), low life expectancy (59.31 years as of 2017), and high maternal and child mortality rates characterize the demography of Mozambique (Yaya et al., 2020).

According to the sustainable development goals (SDGs), all countries have to reduce the maternal mortality ratio (MMR) to less than 70 deaths per 100 000 live births by 2030 (Scott et al., 2018). By 2030, the maximum stillbirth rate should be <= 12 per 1000 live births (Dadi et al., 2018).

Globally, low and middle-income countries contributed about 99% of maternal death in 2015. Sub-Saharan Africa accounts for 66% of maternal death which is discriminately high (Dadi et al., 2018). In 2015, the estimated global stillbirth was 18.4 per 1000 births,

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which decreased by 25% from that of 2000. In the same year, in sub-Saharan Africa, it decreased by 19%, which is considered slow progress (Dadi et al., 2018).

Low and middle-income countries contribute to 98% of stillbirths; sub-Saharan Africa and South Asia share about 77%. The majority of losses related to pregnancy and childbirth can be prevented by providing high-quality and evidence-based services (Dadi et al., 2018).

Mozambique's MMR is currently 452 deaths per 100,000 live births, and 27 new-born deaths per 1000 live births, well above the SDG target (Chicumbe & Martins, 2022). Skilled care at every birth to achieve the targets of SDG indicators for MMR is recommended (Scott et al., 2018).

In addition, to achieve these targets, each country has to work towards minimizing barriers to accessing quality maternal and child healthcare services (Dadi et al., 2018). Therefore, planners should analyze their contextualized problems, research available services, and implement a rational framework for prioritizing and scaling up essential services (Dadi et al., 2018).

Many women in low and middle-income countries face the challenges of inaccessibility of obstetric care in rural and urban areas. Even where services are available the facilities are inadequate (Dadi et al., 2018).

Rural women are 3.572 times more likely to die from complications during pregnancy or delivery than women who came from urban areas. This might be because women in rural areas do not utilize maternal health services due to different reasons. As a result, they may face high obstetric complications (Dadi et al., 2018).

What remains unanswered is how best to facilitate access to intrapartum and postpartum care, particularly in rural and remote areas where distance and poor transportation severely restrict access to care (Scott et al., 2018).

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To minimize these problems, developing countries used MWHs as an alternative to increasing the accessibility of obstetric care services (Dadi et al., 2018). MWHs are homes built in the compound or near health facilities that provide standard medical and emergency obstetric care services (Dadi et al., 2018).

This is the easiest way to decrease the complication related to childbirth by avoiding further delay. It decreases barriers, which include distance, geography, transport, cost of transport, and communication between referral points that inhibit access to services (Dadi et al., 2018).

A recent meta-analysis suggests that in low-income countries, MWH users were 80% less likely to die than non-users. Further analysis of these data on over 68,000 births revealed MWH use had a significant effect in reducing perinatal mortality, stillbirths, and neonatal deaths (Lori et al., 2021).

Most Nacional Health Systems (NHS) in developing countries have limited capacity to expand the health services network or to ensure a proper referral system based on an effective transport system; therefore MHWs have been promoted as an alternative solution to improve maternal health (Ruiz, 2010).

Mozambique set up the MWHs strategy with the objective of improving access for women living in remote areas (Ruiz, 2010). It is expected that MWHs will increase institutional deliveries and consequently, decrease maternal mortality caused by the delay in reaching obstetric care. However, no robust evidence for this assumption has been found in the literature (Ruiz, 2010).

Although MWHs may be a promising strategy to improve access to facilities for delivery, evidence is mixed. While some evidence suggests that they are associated with higher rates of facility delivery and improved maternal health outcomes, a Cochrane review found that there are no randomized or quasi-randomized trials assessing the effectiveness of MWHs in low-resource settings (Scott et al., 2018).

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Additionally, it is unclear if MWHs can increase access to facility delivery among women living remotely (Scott et al., 2018). Rigorous evidence on the impact of MWHs on facility deliveries is needed (Scott et al., 2018).

A study showed that the limited number of studies with strong methodological designs and varying operationalized models of MWHs contribute to the lack of robust evidence regarding the effectiveness of MWHs: (Lori et al., 2021).

The lack of formal evaluation of existing maternity waiting homes jeopardizes the future of this alternative solution to the problem of access to emergency obstetric care for high-risk pregnant women (Organization, 1996). Although anecdotal accounts provide a favorable impression, operations research is needed to determine the impact of MWH on maternal mortality (Organization, 1996).

In addition to the above reasons, the World Health Organization's (WHO) endorsement of health promotion interventions for maternal and new-born health suggests that there is a research gap in identifying the efficacy of MWHs. Thus, there is a need for a study on whether the MWH effectively improves birth outcomes or not (Dadi et al., 2018).

MWHs are a solution to a specific problem – geographic inaccessibility to skilled obstetric care (Organization, 1996).

In 2009, the Ministry of Health (MoH) of Mozambique officially launched its strategy of MWHs as part of a greater strategy to improve safe motherhood (Ruiz, 2010).

In Mozambique, MWHs are mainly located near health facilities of primary level (type I and type II). In 2009, 90% of health facilities located in district capitals had MHWs (Ruiz, 2010).

Although Mozambique's Ministry of Health focuses on the promotion of this strategy, a review of the literature shows that information concerning MWH activities, location, and

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characteristics is limited and, in most areas, non-existent. This factor limits the possibility of studying the impact of this strategy (Ruiz, 2010).

Experiences from different countries (Cuba, Honduras, Malawi, Nigeria, Papua New Guinea, Zimbabwe, and Zambia) have been detailed. The review warns that conclusions that arose from these studies should be interpreted with caution as all the available data consist of retrospective cohort studies with significant potential for bias (Ruiz, 2010).

Evaluating the effectiveness of MWHs in reducing MMR could be difficult as several confounders can influence the outcome. For example, an increase in the use of maternities with MHW could increase institutional mortality (Ruiz, 2010).

In any case, as previously stated, one of the assumptions of MHWs is that this service will increase the access of pregnant women that live in remote areas, and consequently, will increase institutional delivery coverage (Ruiz, 2010).

Maternity waiting homes (MWHs) in low- and middle-income countries (LMICs) provide women with accommodation close to a health facility to enable timely access to skilled care at birth (McRae et al., 2021). Currently, there remains a lack of robust evidence supporting the effectiveness of MWHs (McRae et al., 2021).

Furthermore, there is limited information from around the world, and particularly none from Mozambique, that assesses the impact of MHWs in increasing coverage of health facilities (Ruiz, 2010).

This lack of information could promote a strategy that is untested and has no evidence of impact. In addition, it is important to promote research that contributes to knowledge of the impact of the MWHs (Ruiz, 2010).

This research performed a study of 3 main indicators, input (MWH), output (birth delivery), and outcome (in-hospital MMR and SBR). These indicators generated study variables that were analysed and supported the conclusions. The analysis had 3 stages:

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The Trend and evolution of this project focused on three main indicators, input (MWH), output (birth delivery), and outcome (in-hospital MMR and SBR). These indicators generated study variables that were analyzed and they supported the conclusions.

The analysis had three stages:

a. The Trend and evolution analysis was performed in Microsoft Excel;
b. The correlation test was used to identify the influence of HWH on the dependent variables of the study; it was performed in the statistical software Jamovi;
c. The t-test was used to compare the mean difference among the study variables and was performed in the Jamovi statistical software.

This study was carried out to evaluate the influence of the use of maternity waiting houses on the improvement of institutional delivery coverage, in-hospital maternal mortality rates, and stillbirth rates in Mozambique from 2006 to 2021.

The results are expected to generate evidence on the effectiveness of MWHs in improving facility delivery, MMR, and SBR in Mozambique.

Finally, the information is expected to help decision-makers design evidence-based policies that aim to benefit the target population.

Furthermore, the study will contribute with findings which fill the gaps of the lack of information that support the effectiveness of the MWH strategy in increasing institutional coverage and decreasing maternal mortality in the world generally and in Mozambique in particular.

2. Purpose

The purpose of the study was to identify the influence of MWH use on the improvement of IDC, in-hospital MMR, and SBR in Mozambique.

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3. Research question

Does the utilization of maternity waiting homes affect the improvement of institutional delivery coverage, in-hospital maternal mortality ratio, and stillbirth rate in Mozambique?

The conclusions of this study will help decision-makers at the MoH to define strategies that can increase IDC and reduce MMR, and SBR in Mozambique.

4. Definitions

4.1. Maternal death

Mental health is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy from any cause related to or aggravated by the pregnancy or its management (Lancaster et al., 2020).

4.2. Maternal mortality ratio

Maternal mortality ratio is defined as the number of maternal deaths during a given time per 100,000 live births during the same time (Callaghan, 2012).

4.3. Stillbirth

A stillbirth is a baby born with no signs of life after 28 weeks of completed gestation (Hug et al., 2021).

4.4. Stillbirth rate

Stillbirth rate is defined as the number of babies born with no sign of life at 28 weeks or more of gestation, per 1,000 total births (Hug et al., 2021).

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4.5. Neonatal mortality rate

Neonatal mortality rate is the probability of dying during the first 28 days of life, expressed per 1,000 live births (Blencowe et al., 2016).

4.6. Maternity waiting homes

Maternity Waiting Homes are houses built in healthcare settings that lodge pregnant women in their term state of pregnancy to prevent labour and delivery-related complications (Yismaw et al., 2022).

4.7. Institutional deliveries

Institutional deliveries can be defined as any delivery that takes place in a modern health facility and medically trained professionals such as medical doctors, nurses, and midwives/auxiliary midwives provide assistance (Ruiz, 2010).

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II. LITERATURE REVIEW

1. Maternal mortality

Maternal mortality is a major health problem, more than half a million women die every year due to pregnancy complications. Ninety-nine percent of deaths occur in developing countries, and half of them occur in Africa. In these areas, maternal mortality rates are over 100 times higher than those in developed countries (Romagosa et al., 2007).

Maternal mortality in sub-Saharan Africa is among the highest in the world. Many sub-Saharan African countries, including Mozambique, have a maternal death rate of approximately 500 to 1000 per 100 000 births, compared to approximately five to 20 in developed countries (Lancaster et al., 2020). Mortality is especially high in the immediate postpartum period, during which postpartum hemorrhage (PPH) accounts for 30% to 50% of maternal deaths (Lancaster et al., 2020).

According to the WHO, Mozambique has achieved a substantial reduction in maternal mortality over the past 20 years (Lancaster et al., 2020) and continues to be one of the 20 countries with the highest maternal mortality rate estimates (Romagosa et al., 2007). Maternal mortality carries serious socio-economic consequences because women in developing countries are usually the breadwinners of most families (Romagosa et al., 2007).

A study by Kavatkar and Thonneau found that hypertensive disorders associated with pregnancy, hemorrhage, and septicemia are the most frequent causes of maternal mortality in developing countries (Romagosa et al., 2007). Factors that increase maternal death include obstructed labor malnutrition, poverty, fatigue, poor sanitation, inaccessible health care, lack of education, and parasitic disease (Stokoe, 1991). These affect women during pregnancy and childbirth when they are more vulnerable (Stokoe, 1991).

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Over the past decade, substantial efforts have been made in sub-Saharan Africa to implement a variety of preventative measures and treatment protocols have also been instituted to reduce maternal death, resulting in a successful decline in maternal mortality of approximately 40% (Lancaster et al., 2020).

Cultural factors also promote maternal deaths in many areas, such as low status and neglect of girls and women, polygamy, early marriages and childbearing, underfeeding and other harmful dietary practices during pregnancy, and double standards of sexual ethics resulting in clandestine abortion or prepubertal marriage (Stokoe, 1991).

Some approaches to reverse this tragedy include antenatal care with risk referral, small family norm, family planning, adult education, training and supervision of traditional birth attendants, maternity waiting homes, decentralized maternal-child health care, blood banks at delivery units, standardized obstetric care, and compulsory education of girls, late marriage and provision of legal, medical abortion, preferably contra-gestational agents and prostaglandins (Stokoe, 1991).

Maternal deaths in Mozambique are concentrated in rural communities where poverty rates are high. Rural communities have limited access to health services because of distance, lack of transport, and poor roads, contributing to delays for pregnant and postpartum women accessing care (Amosse et al., 2021). Such delays are particularly dangerous in emergencies where every delay increases the risk of stillbirth, neonatal, or maternal death (Amosse et al., 2021).

Despite declining trends maternal mortality remains an important public health issue in Mozambique. The delays in reaching an appropriate health facility and receiving care faced by women with pregnancy-related complications play an important role in the occurrence of these deaths (Chavane et al., 2018).

Skilled antenatal consultation, institutional delivery (ID), and timely post-natal consultation are cost-effective services with a great impact on mothers, unborn babies,

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and neonate survival (Chicumbe & Martins, 2022). High coverage of maternity health care is a longstanding WHO recommendation.

The efforts to increase healthcare coverage need to be sustained if trends in maternal and perinatal deaths are to be improved by 2030, as per the SDGs at global regional, and country levels (Chicumbe & Martins, 2022).

The SDGs pay special attention to low-income African countries. Sub-Saharan Africa remains a priority region for the goals and maternity health care improvements. Indeed, sub-Saharan African countries still share the highest maternal and neonatal death burden, with regional figures in 2017 as high as 533 maternal deaths/100,000 live births and 27 newborn deaths/1000 live births (Chicumbe & Martins, 2022).

Mozambique had shortcomings in delivering the Millennium Development Goals by 2015 and beyond. Indeed, after maternal deaths steadily decreased between the 1990s and 2000s, Mozambique's maternal and neonatal mortality rates had stagnated by 2017, with 452 maternal deaths per 100,000 live births and 27 newborn deaths per 1000 live births, respectively (Chicumbe & Martins, 2022).

Furthermore, it was estimated that interventions offered through maternity health may save an additional 3640 mothers and over 18000 children yearly in Mozambique (Chicumbe & Martins, 2022).

1.1. Maternal death and delays in accessing emergency obstetric care in Mozambique

Delays in access to quality care have been identified as one of the important determinants of preventable maternal death. Thaddeus and Maine's three-delays model that describes the multiple factors that drive maternal mortality has proven to be an effective tool to evaluate the circumstances surrounding access to and appropriateness of emergency obstetric and new-born care (EmONC). The model has helped identify barriers and potential points of intervention along the continuum from home to hospital for over 20 years (Chavane et al., 2018).

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According to this framework, three delays in access to quality emergency care are defined (Chavane et al., 2018):

- The first delay (I) - occurs at the household and community level and reflects the delay in deciding to seek care for pregnancy complications.
- The second delay (delay II) - refers to the delay to reach the facility that provides emergency obstetric care (EmONC) and,
- the third delay (delay III) - refers to the delay that occurs in receiving care after arrival at the health facility.

In Mozambique, estimates based on the 2007 population census indicate that around 46% of maternal deaths occur within health institutions, a substantial proportion considering that these women reached a health facility (Chavane et al., 2018).

Several factors have been identified at the healthcare facility level that interferes with the readiness to deal adequately with obstetric emergencies. Knight described six groups of factors, namely drugs and equipment, policy and guidelines, human resources, facility infrastructure, and patient-related and referral-related aspects (Chavane et al., 2018).

A near miss study—an approach to evaluate the quality of maternal care and learning from women that survived severe maternal complications covered 564 survival women and 71 maternal deaths—conducted in Mozambique's Maputo Province, found delay II in 21.3% and delay III in 69.7% (women could experience multiple delays) of cases. In some cases, these delays followed the woman's path throughout the referral system from admission to a peripheral health facility and then on to the referral facility (Chavane et al., 2018).

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2. Stillbirth and neonatal deaths

The 2030 Agenda for Sustainable Development aims to reduce neonatal mortality to at least 12 per 1000 live births (Dalla Zuanna et al., 2021).

Most of the causes can be prevented or cured, access to quality healthcare during pregnancy and labor is the key to reducing perinatal deaths, and MWHs may have an impact, especially for women who live far from the healthcare system (Dalla Zuanna et al., 2021).

MWHs have been endorsed by the WHO since the 1950s as one component of a comprehensive package to reduce maternal morbidity and mortality (Secka & Handayani, 2021).

A meta-analysis has shown that MWHs significantly reduced perinatal mortality by 82.5% in Africa and MWH users have been reported to be 80% less likely to die than non-users with a 73% reduction in stillbirth among users (Secka & Handayani, 2021).

Although MWHs have been shown to decrease maternal and perinatal mortality, their role in increasing the utilization of institutional delivery, however, is inconclusive (Secka & Handayani, 2021).

In Zambia, the introduction of six MWHs in three rural districts led to improvements in the proportion of health facility deliveries in the intervention facilities versus the comparison facilities whilst in Timor-Leste, the implementation of MWHs in two remote districts did not improve facility-based delivery (FBD) uptake by women living in the study districts (Secka & Handayani, 2021).

Thus, planners should analyze their contextualized problems, research available services, and implement rational frameworks for prioritizing and scaling up essential services (Dadi et al., 2018).

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Public health programs need to further intensify the delivery of effective interventions to reduce perinatal deaths since most causes are potentially preventable or treatable (Dalla Zuanna et al., 2021). Obstetric hemorrhage, non-obstetric complications, hypertension in pregnancy, and pregnancy-related infections account for more than three-quarters of stillbirths (Dalla Zuanna et al., 2021).

The most common causes of neonatal deaths are perinatal asphyxia and severe neonatal infections, followed by complications of preterm birth (Dalla Zuanna et al., 2021).

To make pregnancy and birth safer, every woman should have access to appropriate obstetric care during pregnancy, delivery, and puerperium (Tayebwa et al., 2021). One of the strategies for increasing access and reducing maternal morbidity and mortality is the implementation of MWHs (Tayebwa et al., 2021).

Maternity waiting homes are dedicated places where high-risk pregnant women are provided with accommodation during their final weeks of pregnancy, allowing them easy access to emergency obstetric care when labor starts (Tayebwa et al., 2021). Upon admission, pregnant women are provided with health education about safe pregnancy, labor, and newborn care (Tayebwa et al., 2021).

The WHO recommends the establishment of MWHs close to a health facility where essential care for childbirth is provided, especially targeting women living in remote areas (Tayebwa et al., 2021). Over the last few decades, developing countries have been scaling up MWHs to bridge geographical barriers between health facilities and communities, with promising results in reducing maternal and neonatal morbidity and mortality (Tayebwa et al., 2021).

A Cochrane review in 2012 found insufficient evidence of the potential benefit of MWHs (Tayebwa et al., 2021). However, several recent studies seem to underline that MWHs improve maternal and neonatal mortality, though their use, services offered, and management standards differ greatly between countries (Tayebwa et al., 2021).

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In Mozambique, women experience multiple delays, and distance to health facilities has been reported as the second most important barrier for women to access obstetric care (Chavane et al., 2018).

Thus, this study aimed to evaluate the influence of the utilization of maternity waiting homes in improving institutional delivery coverage, in-hospital maternal mortality ratio, and stillbirth rate in Mozambique.

3. Institutional delivery

Every day, globally, approximately 830 women die from pregnancy and childbirth-related complications. These deaths, almost all of which take place in low-income countries, could have been averted through the use of quality obstetric services (Yaya et al., 2020).

Annually, approximately 18 million women in Africa give birth at home without medical assistance. If complications arise, transport to a health facility is often unavailable or of poor quality (Amosse et al., 2021).

Approximately 30% of births in sub-Saharan Africa are unattended or only attended by family members while about 23–40% are attended by traditional birth attendants (TBAs) (Yaya et al., 2020).

The literature shows that, in countries where maternal health is successfully improved, maternal mortality decreased when institutional deliveries increased significantly (Ruiz, 2010).

The long distances women must travel, often in labor, to reach health facilities, present one of the biggest barriers to facility delivery (Lori et al., 2021). MWHs located near a health facility where women can stay during pregnancy and/or after birth to enable timely access to maternal and newborn healthcare have been identified as an intervention to bridge this inequity in access caused by distance (Lori et al., 2021).

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MWH, as a strategy to increase deliveries at health facilities with basic emergency obstetric and new-born care (BEmONC) capacity, has been embraced as one approach to reach women who must travel long distances to deliver in health facilities (Lori et al., 2021).

About thirty years ago, following the initiation of the Safe Motherhood Initiative, maternal and neonatal health leaders began advocating for improved access to skilled medical professionals during labor and delivery. Timely access to quality facility delivery by skilled health providers remains the best available strategy to reduce maternal mortality (Secka & Handayani, 2021).

Facility-based delivery (FBD) has been shown to improve maternal survival rates in low and middle/income countries (LMICs). Notwithstanding global recognition of these benefits, however, ensuring universal access to safe facility delivery services continues to be a challenge in many LMICs particularly in rural areas of South Asia and Sub-Saharan Africa (Secka & Handayani, 2021).

To attain the sustainable development goal (SDG) 3.1 of reducing the global maternal mortality ratio to less than 70 per 100,000 live births by 2030, considerable efforts are required to improve maternal health and reduce maternal mortality (Secka & Handayani, 2021).

Despite the significant progress made in reducing maternal mortality between 2000 and 2017, global maternal mortality remains unacceptably high (Secka & Handayani, 2021). Decreasing maternal deaths has been a top global health agenda for the past 20 years, and the majority of maternal deaths are preventable even in the case of developing countries (Secka & Handayani, 2021).

In 2017, 810 women died each day as a result of preventable causes related to pregnancy and delivery (Secka & Handayani, 2021). Inadequately managed pregnancies and

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deliveries contribute to nearly four million newborn deaths and millions of disabilities among children every year (Secka & Handayani, 2021).

An estimated 74% of maternal deaths could be prevented if all women had access to skilled delivery and emergency obstetric care services (Secka & Handayani, 2021).

Several studies have identified factors such as long-distance, poor road networks, lack of vehicles, and transportation costs, as barriers to emergency obstetric care for pregnant women (Secka & Handayani, 2021).

Increased distance to maternity care has an inverse relationship with maternal healthcare utilization, especially among rural women. These barriers necessitate the design of interventions to expedite the swift movement of women from home to health facilities. Among such interventions are MWH (Secka & Handayani, 2021).

Local ambulances with life-support equipment, and maternity waiting houses are examples of ways of dealing with transport problems ("Improving maternal care reduces mortality," 1987).

MWHs have been endorsed by the WHO since the 1950s as one component of a comprehensive package to reduce maternal morbidity and mortality (Secka & Handayani, 2021).

Although MWHs have been shown to decrease maternal and perinatal mortality, their role in increasing the utilization of institutional delivery, however, is inconclusive (Secka & Handayani, 2021).

In Zambia, the introduction of six MWHs in three rural districts led to improvements in the proportion of health facility deliveries in the intervention facilities versus the comparison facilities, whilst in Timor-Leste, the implementation of MWHs in two remote districts did not improve FBD uptake among women living within the study districts (Secka & Handayani, 2021).

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3.1. Impact of MWHs on FBD utilization

The effectiveness of MWHs in increasing the utilization of FBD showed contradictory results. Three out of five studies showed a positive association between MWHs and the utilization of FBD (Secka & Handayani, 2021).

In Liberia, a mid-program evaluation found an 84.4% increase in the proportion of institutional births assisted by traditional midwives together with SBAs (team births) ($p<0.001$) in 10 rural communities with an MWH compared to 10 communities without MWHs (Secka & Handayani, 2021).

Similarly, in Zambia, Jody et al. (2020) found a significant increase in the percentage of deliveries following the introduction of a core MWH model for all women living > 10km away from the intervention facilities (Secka & Handayani, 2021).

However, in Timor-Leste, Wild et al. (2013) found no significant increase in the number of FBDs among rural women following the implementation of two MWHs in two districts; distance had no impact on utilization (Secka & Handayani, 2021).

The prevalence of health facility delivery was 70.7 % approximately 30% of the women in Mozambique were not using health facility delivery services, with the prevalence being noticeably lower in the rural areas (Yaya et al., 2020).

Access to skilled birth assistance and health facility delivery services requires financial resources and many women in Mozambique cannot afford necessary expensive procedures and services (Yaya et al., 2020).

Currently, little is known about the use of childbirth services in Mozambique (Yaya et al., 2020).

The present study aims to evaluate the influence of the utilization of MWHs on the improvement of institutional delivery coverage, in-hospital maternal mortality rates, and stillbirth rates in Mozambique between 2006 and 2021.

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4. Maternity waiting homes

On average, globally, a woman dies from pregnancy and delivery complications every minute of every day. Of the more than 580 000 maternal deaths which occur each year, 99% occur in the developing world (Organization, 1996).

Currently, globally, approximately 830 women die from pregnancy and childbirth-related complications every day. These deaths, almost all of which take place in low-income countries, could have been averted through the use of quality obstetric services (Yaya et al., 2020).

The technical means to prevent the overwhelming majority of maternal deaths from these causes have been known for many decades. What is lacking, in many parts of the world, is the ability to bring the necessary technical skills - economic, geographic, and operational to the women in need of help. In much of the developing world, barriers to healthcare are so great that many women do not benefit at all from the healthcare system (Organization, 1996).

Studies of maternal mortality in developing countries have shown that making pregnancy and childbirth safer means ensuring that women have access to a continuum of care, including appropriate management of pregnancy, delivery, and the postpartum period together with access to life-saving obstetric care when complications arise. Access to such care is a crucial component of the Safe Motherhood Initiative (Organization, 1996).

There are currently three possible ways to improve access to obstetrical services when complications arise (Organization, 1996):

1) Bringing medical services to women in need – “flying squads.”

2) Bringing women who need them to medical services - emergency transport.

3) Decentralization of care so that women have easy access to skilled obstetric care.

This would require the provision of obstetric facilities close to every community.

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The third solution, which is available in much of the developed world, is not a viable option in the foreseeable future for most of the developing world. Some countries have developed maternity waiting homes as an alternative to the decentralization of essential obstetric services (Organization, 1996).

Many consider maternity waiting homes to be a key element of the strategy to "bridge the geographical gap" in obstetric care between rural areas with poor access to equipped facilities and urban areas where the services are available. As one component of a comprehensive package of essential obstetric services, maternity waiting homes may offer a low-cost way to bring women closer to the required obstetric care (Organization, 1996).

While anecdotal evidence indicates that maternity waiting homes are successful in reducing maternal mortality, little quantitative research has been conducted to prove their efficacy. Utilization rates and user satisfaction are also insufficiently documented (Organization, 1996).

Most national health systems in developing countries have limited capacity to expand the health services network or to ensure a proper referral system based on an effective transport system; therefore MWHs have been promoted as an alternative to improve maternal health (Ruiz, 2010).

MWHs aim to improve the access of pregnant women to quality and in-time maternal healthcare services, especially for high-risk pregnancies or women that live in remote areas (Ruiz, 2010). It is assumed that MWHs contribute to increasing the proportion of institutional deliveries, and by this increase, to reducing maternal mortality (Ruiz, 2010).

4.1. History of maternity waiting homes

The idea of homes for pregnant women with obstetric and social problems is not new. For many centuries, voluntary organizations in Europe have provided shelters for single mothers to reduce abortion and infanticide. Since the beginning of the 20th century,

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waiting homes have existed in Northern Europe, Canada, and the United States to serve women in remote geographic areas with few obstetric facilities (Organization, 1996). For example, in Finland where there are remote communities with access difficulties and few obstetric services, nurses'facilities serve as "patient hotels" with the same aim (Ruiz, 2010).

Cuba built its first maternity waiting home in 1962. By 1984, there were 85 such homes in the country, and 99% of babies were delivered in a hospital. Maternal mortality fell from 118 to 31 per 100 000 live births (Organization, 1996).

In Africa, Nigeria, in the 1950s, had one of the early experiments with maternity waiting homes (known as "Maternity Villages"). Such homes helped to reduce maternal mortality in hospitals from ten to less than one per 1000 deliveries and the stillbirth rate from 116 to 20 per 1000 (Organization, 1996).

Uganda, where similar houses were instituted in the 1960s recorded that maternal deaths in one remote area fell by half once a maternity waiting area was established (Organization, 1996).

In Ethiopia, a maternity waiting home or "tukul" was opened in 1976 for pregnant women identified as being at high risk. In 1987, 151 pregnant women were admitted to the "tukul." There were 13 maternal deaths among women admitted directly to the hospital, but none among women who first entered the tukul (Organization, 1996).

Today, various forms of maternity waiting homes have been documented in several countries (Organization, 1996). Recent evidence about the establishment of MWHs showed that it contributed more than 80% to the reduction of maternal death among users in developing countries and more than 70% of stillbirth was reduced among the users of MWHs (Dadi et al., 2018).

In Ethiopia, MWHs contribute more than 80% to the reduction of maternal death among users and have reduced more than two-thirds of stillbirths (Dadi et al., 2018).

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4.1. Purpose of maternity waiting homes

The purpose of maternity waiting homes is to provide a setting where high-risk women can be accommodated during the final weeks of their pregnancy near a hospital with essential obstetric facilities. Some maternity waiting homes have expanded their purpose to include not only decreased maternal mortality but also improved maternal and neonatal health. In these homes, additional emphasis is put on education and counseling regarding pregnancy, delivery, and care of the newborn infant and family (Organization, 1996).

Gradually, the concept has been expanded to include "high-risk" women, including those expecting their first delivery, women with many previous births, very young women, older women, and those identified as having problems such as high blood pressure during pregnancy (Organization, 1996).

4.2. Crucial elements of a maternity waiting home

A MWH is not a stand-alone intervention but rather serves to link communities with the health system in a continuum of care. The level of success in reducing maternal and infant mortality will depend on the following factors:

1) The definition of risk factors and selection of women;

2) viable community health service necessary for referral to occur and women's compliance with the referral;

3) skilled obstetric services (including capacity level to handle obstetric emergencies); and

4) community and cultural support.

During the second half of the 20th Century, MWHs have been promoted in several developing countries to bring women near health facilities, increase institutional deliveries, and as a result, decrease maternal mortality (Ruiz, 2010). However, as

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Talamanca noted, unfortunately, most of the experiences have not been documented properly, making it difficult to assess the effectiveness of this service (Ruiz, 2010).

Nevertheless, in the last two decades, several retrospective population cohort studies and qualitative studies have been done to assess the effectiveness of MHWs in decreasing maternal deaths and stillbirths (Ruiz, 2010).

Lonkhuijzen et al. (2009) have systematized a comprehensive review of research aimed at assessing MWHs for improving maternal and neonatal outcomes in low-resource countries (Ruiz, 2010).

Thus, taking into account the lack of information about MWHs in improving the birth deliveries and maternal mortality ratio, a study was conducted on the identification of the relationship between the utilization of MWHs and the improvement of institutional delivery coverage, maternal mortality ratio, and stillbirth rate in Mozambique, 2006-2021.

The findings will contribute to reducing the information gaps and enable decision-makers to plan and design policies based on evidence for the target population.

5. Impact of the COVID-19 pandemic on access to maternal and child health services in Mozambique.

The Covid-19 pandemic has so far infected millions of people in the world, having a major impact on global health with collateral damage (das Neves Martins Pires et al., 2021).

The COVID-19 pandemic has disrupted the provision of essential reproductive, maternal, newborn, and child health (RMNCH) services in sub-Saharan Africa to varying degrees (Plotkin et al., 2022).

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To reduce potential impacts on populations related to RMNCH service delivery, national governments in Kenya, Mozambique, Uganda, and Zimbabwe swiftly issued policy guidelines related to essential RMNCH services during COVID-19 (Plotkin et al., 2022).

The WHO issued recommendations to guide countries in preserving essential health services by June 2020 (Plotkin et al., 2022). The national policy guidelines to preserve essential RMNCH services in these four countries reflected WHO recommendations (Plotkin et al., 2022).

In Mozambique, a public state of emergency was declared at the end of March 2020. This limited people's movement and reduced public services, leading to a decrease in the number of people accessing healthcare facilities (das Neves Martins Pires et al., 2021).

Many women and children in Mozambique faced barriers as they tried to access health services, even before the COVID-19 pandemic began. Maternal and child health (MCH) is one of the Mozambican government's priorities (das Neves Martins Pires et al., 2021).

Interventions have included: implementing family planning (FP), ante-natal assistance, in-hospital deliveries, and childhood monitoring and vaccination programs. These target groups have high morbidity and mortality rates, far below the SDGs and now are at higher risk of worse outcomes given the national response to COVID-19 (das Neves Martins Pires et al., 2021).

A study conducted in Mozambique demonstrated the negative collateral effects of the Covid-19 pandemic on access to maternal and child healthcare services (das Neves Martins Pires et al., 2021).

The study compared 2019 quantitative maternal health services access indicators with those from 2020 and found a decrease in most important indicators: family planning visits and elective C-sections dropped by 28%; first antenatal visit occurring in the first trimester dropped by 26%; hospital deliveries dropped a statistically significant 4% (p =

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0.046), while home deliveries rose by 74%; children vaccinated experienced a 20% reduction (das Neves Martins Pires et al., 2021).

However, there is limited evidence on the realized effects of the pandemic and associated emergency orders on access to services in low-income country contexts (Leight et al., 2021)

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III. METHODS

1. Main objective

To evaluate the influence of the utilization of maternity waiting houses on the improvement of institutional delivery coverage, in-hospital maternal mortality rates, and stillbirth rates in Mozambique.

1.1. Specific objectives

1.1.1. To identify the influence of utilization of MWHs in improving institutional delivery coverage, in-hospital maternal mortality rates, and stillbirth rates in Mozambique, 2021;

1.1.2. To identify the improvement in institutional delivery coverage, in-hospital maternal mortality rates, and stillbirth rates, before the baseline year (2009) and after the baseline year of the implementation of the MWH strategy in Mozambique.

2. Hypothesis

2.1. H0: The improvement in coverage of institutional delivery, in-hospital maternal mortality rates, and stillbirth rates is not influenced by the utilization of MWHs in Mozambique;

Ha: The improvement in coverage of institutional delivery, in-hospital maternal mortality rate, and stillbirth rate is not influenced by the utilization of MWHs in Mozambique.

2.2. H0: The coverage of institutional delivery, in-hospital maternal mortality rate, and stillbirth rate was improved before the baseline year (2009) of the implementation of the maternity waiting homes in Mozambique;

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Ha: The coverage of institutional delivery, in-hospital maternal mortality rates, and stillbirth rates were improved after the baseline year (2009) of the implementation of the maternity waiting homes in Mozambique.

3. Study Design

An analytical, quantitative, observational study was used to identify the influence of the use of maternity waiting homes in improving institutional delivery coverage, in-hospital maternal mortality rates, and stillbirth rates in Mozambique.

4. Sampling

This study used the total population, which included all health units with a birth facility in Mozambique. The list was extracted from the MoH database.

4.1. Participants

All health units of 10 provinces of Mozambique that have birth facilities.

4.2. Data collection method

Available secondary data were used.

For data collection, a data collection form developed in Microsoft Excel was used. See appendix 1 and 2.

Data were extracted from different sources (Reports and databases from MoH, Ministry of Economy and Finance, National Statistic Institute, UNICEF, and World Bank)

4.3. Source of data

a. Ministry of health:

- Annual reports:
    - Anuários Estatísticos of Ministry of Health – Mozambique. Available on Website: https://www.misau.gov.mz/

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- Database:
    - SIS-MA Sistema de Informação de Saúde para Monitoria e Avaliação. Available o Website: https://www.misau.gov.mz/

b. Ministry of Economy and Finance:

- Annual reports:
    - Balanços do Plano Económico e Social e Orçamento do Estado. Available in Website: https://www.mef.gov.mz

c. National Statistic Institute

- Annual reports:
    - Statistical Yearbook of National Statistic Institute – Mozambique. Available on Website: www.ine.gov.mz

d. UNICEF

- Database:
    - UNICEF Data: Monitoring the situation of children and women. Neonatal mortality rate (Deaths per 1,000 live births). Available on the Website: Data Warehouse - UNICEF DATA

e. World bank

- Database:
    - World Bank data. Maternal mortality ratio (modeled estimate, per 100,000 live births). Available on Website: Mozambique | Data (worldbank.org)

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5. Variables

Variable	Value	Meaning
Period of: Birth delivery, maternal death, stillbirth, neonatal death, MWH implementation	2006 -2021 2006 -2017	Study interval: Analysis of study variables performed from 2006 to 2021, and 2006–2017 where recent data are not available.
Place of: Birth delivery, maternal death, stillbirth, neonatal death, MWH implementation, women who visited health units coming from HWM	10 provinces and national	Place of study: Study variables were analysed by province and national levels. The national level is the total and corresponds to the whole country (Mozambique)
Percentage of health units with maternity facilities that have waiting houses for pregnant women (HWM)	Percentage	Analysis of percentage distribution of HWMs by province and by year
Birth delivery (BD) coverage	Percentage	Analysis of percentage distribution of BD by province and by year
In-hospital maternal mortality Ratio (MMR)	Ratio	Analysis of ratio distribution of MM by province and by year
Stillbirth rate (SBR) with a positive focus	Rate	Analysis of rate distribution of SB by province and by year
Neonatal mortality rate (NNMR)	Rate	Analysis of rate distribution of SB by province and by year
Percentage of women who visited health units coming from HWM	Percentage	Analysis of rate distribution of SB by province

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6. Data analysis and processing method

- For data analysis, two tests were performed: correlation test and paired t-test.
- Microsoft Excel was used.

6.1. The Microsoft Excel tool was used to carry out an analysis of trends and evolutions between percentage of health units with maternity facilities that have a waiting house for pregnant women and compared with trends of improvement of institutional coverage of childbirth, institutional maternal mortality rates, rates of stillbirth, and neonatal mortality rates in Mozambique, 2006 to 2021;

6.2. A correlation test was carried out in the statistical software Jamovi, to identify the influence of the utilization of maternity waiting houses on the improvement of institutional delivery coverage, in-hospital maternal mortality rate, and stillbirth rate in Mozambique, 2021. Pearson's correlation coefficient and p-value were calculated.

Pearson's correlation coefficient (Pearson's r) describes the linear relationship between two quantitative variables (Bevans, 2022).

Correlation tests check whether variables are related without hypothesizing a cause-and-effect relationship (Bevans, 2022). A correlation analysis test was conducted to determine if the correlation coefficient between two variables is significantly different from 0 (Bevans, 2022).

A correlation coefficient (Pearson's correlation coefficient) which is traditionally denoted as *r*. is a number between -1 and 1 that tells us the strength and direction of a relationship between variables, it reflects how similar the measurements of two or more variables are across a dataset (Bevans, 2022).

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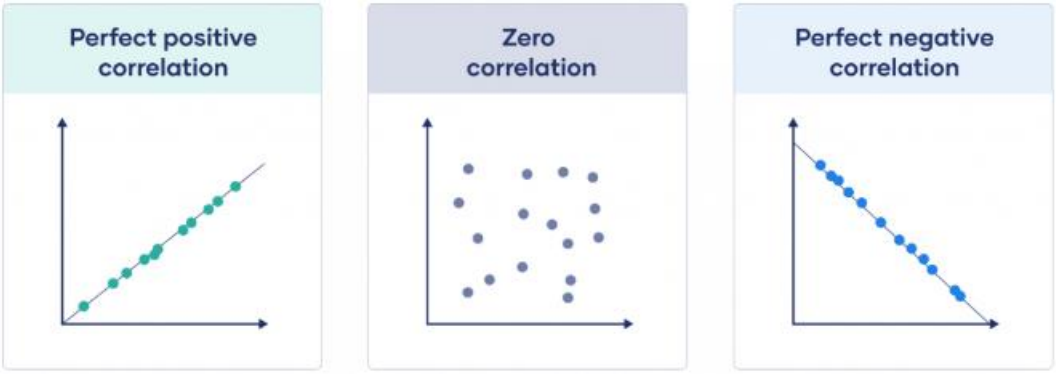
The *sign* of the coefficient reflects whether the variables change in the same or opposite directions: a positive value means the variables change together in the same direction, while a *negative value* means they change together in opposite directions (Bevans, 2022).

According to Bevans, R. (2022):

Correlation coefficient value "*r*"	Correlation type	Meaning
1	Perfect positive correlation	When one variable changes, the other variables change in the same direction.
0	Zero correlation	There is no relationship between the variables.
-1	Perfect negative correlation	When one variable changes, the other variables change in the opposite direction.

Visualizing linear correlations, the correlation coefficient shows how closely the data fits on a line. The closer the points are to this line, the higher the absolute value of the correlation coefficient and the stronger the linear correlation (Bevans, 2022).



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This study used the p-value and the guideline proposed by Bevans, R. (2022) below to interpret the correlation strength from the correlation coefficient value.

Correlation coefficient	Correlation strength	Correlation type
-.7 to -1	Very strong	Negative
-.5 to -.7	Strong	Negative
-.3 to -.5	Moderate	Negative
0 to -.3	Weak	Negative
0	None	Zero
0 to .3	Weak	Positive
.3 to .5	Moderate	Positive
.5 to .7	Strong	Positive
.7 to 1	Very strong	Positive

6.3. A paired t-test was also performed in the Jamovi statistical software to identify the improvement in institutional delivery coverage, in-hospital maternal mortality rate, and stillbirth rate before the base year (2009) and after the base year of the implementation of the MWHs strategy in Mozambique.

The t-test is a statistical test that is used to compare the means of two groups. It is used in hypothesis tests to determine whether two groups are different (Bevans, 2022).

If the groups come from a single population such as the measuring before and after, an experimental treatment is performed by a paired t-test. And if the objective is to know

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whether one population mean is greater than or less than the other, a one-tailed t-test is performed (Bevans, 2022).

The t-test estimates the true difference between two group means using the ratio of the difference in group means over the pooled standard error of both groups (Bevans, 2022).

Jamovi statistical software includes a t-test function. This built-in function takes the raw data and calculates the t-value, then compares it to the critical value and calculates the p-value to illustrate whether or not the groups are statistically different.

In cases where the p-value is less than 0.05, the null hypothesis was rejected and the alternative hypothesis was accepted.

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IV. RESULTS

Table 1 shows the result of the correlation test of the influence of the utilization of MWHs on the improvement of institutional delivery coverage, in-hospital maternal mortality rates, and stillbirth rates in Mozambique.

Table 1. Correlation test of the influence of utilization of maternity waiting homes on the improvement of institutional delivery coverage, in-hospital maternal mortality rate, and stillbirth rate in Mozambique, 2021.

	95% Confidence Interval	
Variables	Utilization of maternity waiting homes (MWH)	
Birth delivery coverage (BDC)	Pearson's r	0.936
	p-value	< .001
Institutional maternal mortality ratio (IMMR)	Pearson's r	0.948
	p-value	< .001
Stillbirth rate (SBR) with a positive focus	Pearson's r	0.942
	p-value	< .001

The result of the above correlation test shows that there is a correlation between the use of maternity waiting homes and the improvement of institutional delivery coverage, in-hospital maternal mortality ratio, and stillbirth rates in Mozambique.

All dependent variables analyzed showed a statistically significant correlation with the use of maternity waiting homes.

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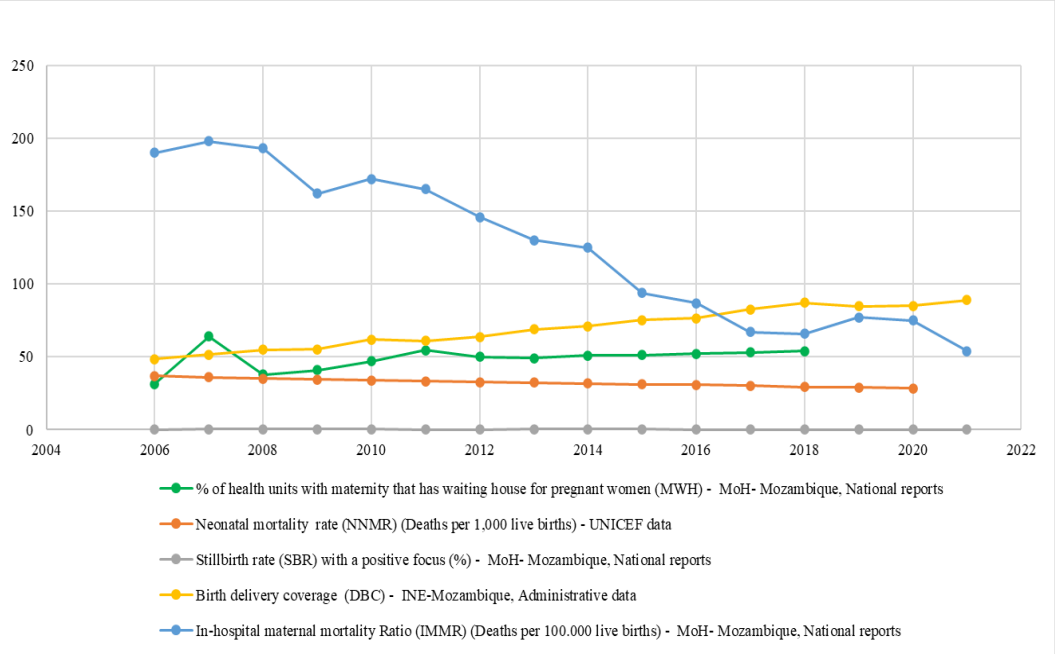
- BDC is correlated with MWH utilization (p = < .001; r = 0.936).
- IMMR is correlated with MWH utilization (p = <0.001; r = 0.948).
- SBR is correlated with the use of MWH (p = < .001; r = 0.942).

Chart 1, shows the relationship between health units with MWH and BDC, NNMR, SBR+, and IMMR in Mozambique.

Chart 1. Relationship between the percentage of health units with MWH and BDC, NNMR, SBR+, and IMMR in Mozambique, 2006-2021.



Over the period under analysis, the percentage of MWH shows a slight increase, but the remaining variables show significant changes, except SBR, which did not reduce substantially.

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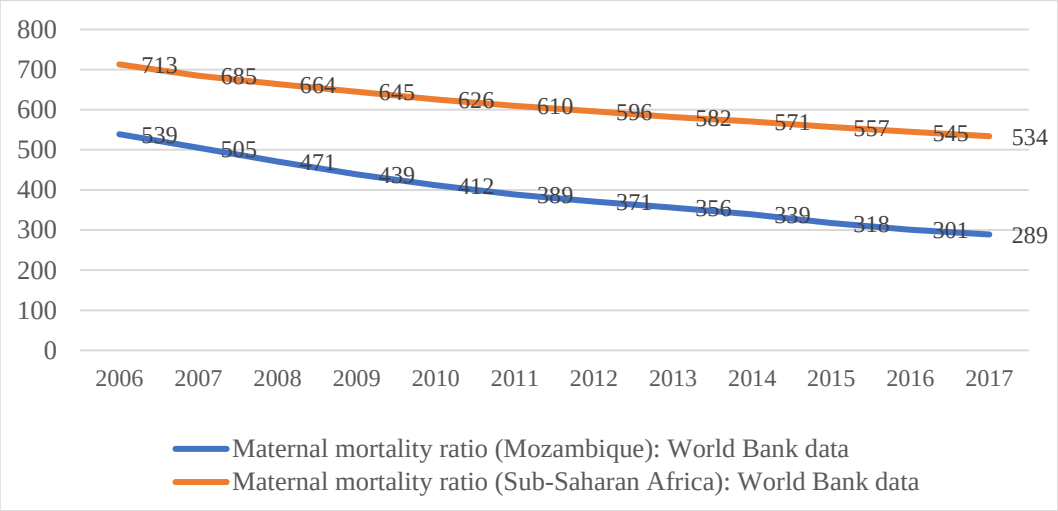
This may indicate that the significant change in other variables is not only influenced by the HWM. There may be other variables that are not the subject of this study that are reinforcing HWH strategies in improving maternal and child indicators.

Chart 2 compares the trend of MMR in Mozambique and Sub-Saharan Africa from 2006 to 2017.

Chart 2. The trend of MMR in Mozambique compared to MMR in Sub-Saharan Africa, 2006-2017



There is evidence of decreasing MMR in Mozambique and Sub-Saharan Africa. Nevertheless, Mozambique shows a sharper decrease, having reduced by 86.5%, and Sub-Saharan Africa by 33.5%, between the two periods under analysis.

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Table 2 shows the result of the paired t-test analysis of the improvement in maternal and child indicators before and after the implementation of the MWH strategy in Mozambique.

Table 2. The result of paired t-test study on the improvement of maternal and child indicators before and after the implementation of the MWH strategy in Mozambique.

	95% Confidence Interval	
After the existence of the MWH strategy	**Before the existence of MWH strategy (2006 - 2008)**	
	Mean difference (MD)	P – value
Birth delivery coverage (BDC)		
2010 – 2012	10.6	0.009
2013 – 2015	20.1	< .001
2016 – 2018	30.4	< .001
2019 – 2021	34.6	< .001
In-hospital maternal mortality ratio (IMMR)		
2010 – 2012	- 32.7	0.03
2013 – 2015	- 77.3	0.011
2016 – 2018	- 120	0.003
2019 – 2021	- 125	0.002
Stillbirth rate with positive focus (SBR+)		
2010 – 2012	- 0.06	0.143
2013 – 2015	-0.157	0.941
2016 – 2018	- 0.137	0.092
2019 – 2021	- 0.22	0.038

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In 2009, the MoH of Mozambique officially launched its strategy of MWH as part of a greater strategy to improve safe motherhood to increase coverage of institutional deliveries and reduce the maternal mortality ratio and stillbirth rate.

Thus, the objective of this analysis is to measure the impact of the MWH strategy by comparing data on the improvement in institutional delivery coverage, in-hospital maternal mortality ratio, and stillbirth rate before the base year (2009) and after the base year of implementation of the MWH strategy in Mozambique.

The result of the analysis shows the contribution of the strategy to the improvement of the maternal and child indicators studied.

The analysis of the performance of maternal and child indicators illustrated in table two makes a comparison of the improvement in the three years (2006–2008) before the implementation of the MWH strategy against a set of three years after the implementation of the strategy until 2021.

Thus, it can be concluded that, in general, the birth delivery coverage and In-hospital maternal mortality ratio, in all periods of the study, showed statistically significant improvements after the existence and implementation of the strategy, with $p = < 0.05$, respectively.

Conversely, the same analysis showed that the stillbirth rate with a positive focus did not improve significantly in the first three years after the existence and implementation of the strategy ($p>0.05$). However, the last set of years (2018 to 2021) showed a statistically significant improvement in the indicators, with $p = 0.038$.

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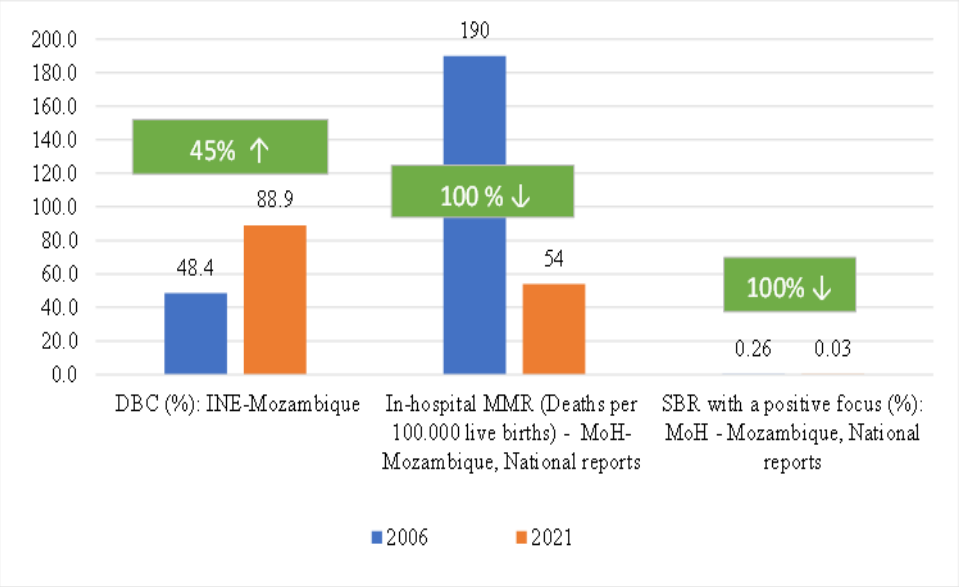
Chart 3 illustrates coverage performance and evolution of institutional coverage of deliveries, in-hospital maternal mortality rates, and stillbirth rates in Mozambique from 2006 to 2021. All study indicators show improvements between the two periods of analysis.

Chart 3. Coverages and evolution of institutional delivery coverage, in-hospital maternal mortality ratio, and stillbirth rate in Mozambique, 2006/2021.



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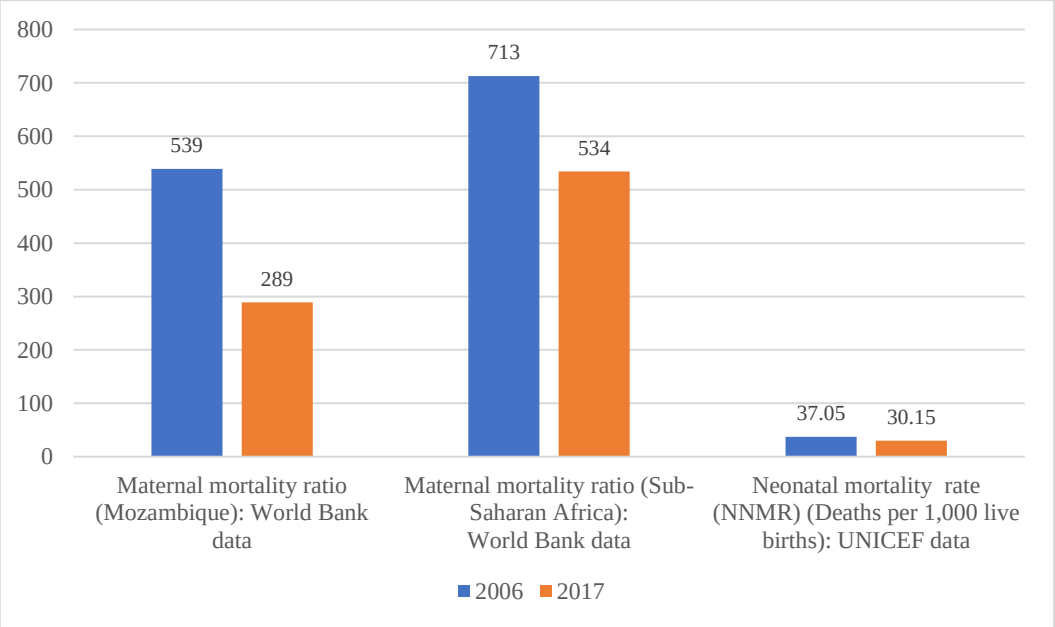
Graph 4 illustrates the coverage and evolution of the maternal mortality rate in Mozambique, the maternal mortality ratio in sub-Saharan Africa, and the neonatal mortality rate in Mozambique, 2006/2017.

The results show an improvement in the indicators between the two periods under study.

Chart 4. Coverages and evolution of maternal mortality ratio in Mozambique, maternal mortality ratio in Sub-Saharan Africa, and the neonatal mortality rate in Mozambique, 2006/2017



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V. DISCUSSION

a. Correlation test of the influence of utilization of maternity waiting homes on the improvement of institutional delivery coverage, in-hospital maternal mortality rate, and stillbirth rate in Mozambique.

The results of this study showed that the improvement in institutional delivery coverage, in-hospital maternal mortality ratio, and stillbirth rate in Mozambique was influenced by the use of MWHs, with p-value = < .001, respectively.

The findings reported in the present study were similar to other studies:

The study of the distribution of maternity waiting homes and their correlation with perinatal mortality and direct obstetric complication rates in Ethiopia (Tiruneh et al., 2019) found that perinatal mortality was 47% lower in hospitals with maternity waiting homes than in those without. MWHs were a significant predictor to decrease perinatal deaths in hospitals (Coef. − 0.473; $P < 0.01$).

The study by Braata et al. (2018) also exposed that the number of stillbirths was significantly lower among MWH users 38 (1.4%) than among non-MWH users 393 (7.2%) and women in Butajira Hospital 717 (7.6%).

A recent meta-analysis suggests that in low-income countries, MWH users were 80% less likely to die than non-users. Further analysis of these data on over 68,000 births revealed that MWHs use had a significant effect in reducing perinatal mortality, on other hand, reducing stillbirths, and early and neonatal deaths (Lori et al., 2021).

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Similar results were achieved in a retrospective cohort study on the comparison of pregnancy outcomes between MWH users and non-users at hospitals with and without an MWH (Braata et al., 2018) The study showed that in total, 17 679 births were attended to in Attat and Butajira Hospitals. No maternal deaths occurred in the MWH group in Attat Hospital, compared with 20 (0.4%) in the non-MWH group in Attat Hospital (p=0.001) and 31 (0.3%) in Butajira Hospital (p=0.003).

b. The result of paired t-test study on the improvement of maternal and child indicators before and after the implementation of the MWH strategy in Mozambique.

The present study found that delivery coverage and in-hospital maternal mortality rate improved statistically significantly after the existence and implementation of the maternity waiting home strategy, with p = < 0.05, respectively.

While the stillbirth rate with a positive focus showed statistically significant improvement in the last set of years (2018 - 2021), with p = 0.038.

The result of this study corroborated the conclusions of other studies:

McRae et al. (2021) found that the presence vs. absence of an MWH was associated with a 19% increase in facility birth (aOR 1.19, 95% CI: 1.10, 1.29). The presence vs. absence of a hospital-affiliated MWH predicted a 47% lower perinatal mortality rate ($P < 0.01$).

Another study that corroborates with the present findings is the role of a maternity waiting area (MWA) in reducing maternal mortality and stillbirths among high-risk women in rural Ethiopia (Kelly et al., 2010). Results of this study showed that maternal mortality was 89.9 per 100.000 live births (95% CI, 41.1–195.2) for MWA women and 1333.1 per 100.000 live births (95% CI, 1156.2–1536.7) for non-MWA-women.

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Smith et al. (2022) in a scoping review and meta-analysis of the study of maternity waiting home interventions as a strategy for improving birth outcomes, found eleven studies on maternal mortality demonstrated a protective effect of MWHs (aggregate OR: 0.19 [0.10, 0.40]), as did all studies reporting perinatal mortality (aggregate OR: 0.29 [0.16, 0.53]). Studies reporting the cesarean section were more varied and indicated less of a protective effect (aggregate OR: 1.80 [1.18, 2.75]).

VI. CONCLUSION AND SUGGESTION

1. Conclusions

Several studies highlighted that the use of MWH influences the improvement of maternal and child indicators. This theory is demonstrated by the studies below:

A recent meta-analysis suggests that in low-income countries, MWHs users were 80% less likely to die than non-users. Further analysis of these data on over 68,000 births revealed that MWH use had a significant effect in reducing perinatal mortality, stillbirths, and early neonatal deaths (Lori et al., 2021).

Facilitators of MWH utilization according to users and staff were perceived as high-quality EmONC, integrated health services, awareness of pregnancy-related complications, and the husband's support in overcoming barriers (Vermeiden et al., 2018).

Improving both the availability and the quality of MWHs represents a potentially useful strategy for increasing facility delivery in rural Zambia (Henry et al., 2017).

There is some indication that MWHs are an effective strategy for reducing maternal and perinatal mortality in resource-limited settings (Smith et al., 2022).

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In line with the findings found in the literature review above, the present study showed that:

A. The utilization of maternity waiting homes influenced significantly on the improvement of institutional delivery coverage, in-hospital maternal mortality ratio, and stillbirth rate in Mozambique, with p-value, = < .001, respectively.
B. The implementation of the strategy of the maternity waiting home in Mozambique improved institutional delivery coverage, in-hospital maternal mortality ratio, and stillbirth rate in Mozambique, with p-value = < .05, respectively.

2. Suggestions

Thus, it is suggested that:

- The Mozambican Ministry of Health should continue to implement the HWM strategy, as the study found that HWHs influence improving maternal and child indicators;
- Ministry of Health and other stakeholders, WHO continues to support the deployment of MWH as a vital element of a low-cost strategy to bridge the obstetric gap in care between rural and urban areas;
- The Ministry of Health continues to promote the use of MWHs because they bring benefits in increasing institutional births and reducing maternal and infant mortality;
- The Ministry of Health should build more MWHs to increase the existing number and ensure the sustainability of the houses;
- The Government should allocate more qualified professionals to provide EmONC in remote health facilities once the implementation of the MWH strategy is adequate to improve access to qualified childbirth care;

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- Health professionals should continue to carry out community mobilization and awareness activities to create demand for maternal health services;
- The Ministry of Health must continue to train health professionals in EmONC to strengthen their capacity to deal with the obstetric complications that are responsible for the majority of maternal deaths;
- The Ministry of Health should continue to carry out monitoring and evaluation of the maternal and child program, including the MWH strategy to facilitate communication and demonstration of results.
- The family and the community have an important role in the success of the MWH strategy, they must be involved in the implementation to guarantee that the pregnant woman has access to specialized care during childbirth;
- The Ministry of Health should continue to advocate and communicate the importance of the MWH and the need for community support.
- The decline in health service utilization during the COVID-19 pandemic has magnified the harmful impacts of COVID-19 on health outcomes and threatens to reverse gains in reducing maternal and child mortality. Therefore, it is suggested that the Ministry of Health continue to make efforts to allocate resources for the prevention and treatment of COVID-19 in order to maintain essential maternal and child health services.

3. Limitations

- Not enough literature was found in Mozambique that addresses the present research topic, this fact makes it impossible to compare the conclusions of this study with other similar studies carried out in Mozambique;
- lack of some historical data disaggregated by province.

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APPENDICES

Appendix 1. Tool and data collected by year (2006 - 2021)

Period	% of health units with maternity that has waiting house for pregnant women (MWH): MoH-Mozambique, National reports	Birth delivery Coverage (DB) (%): INE-Mozambique, Administrative data	Institutional maternal mortality Ratio (IMMR): MoH-Mozambique, National reports	Stillbirth rate with a positive focus (%): MoH-Mozambique, National reports	Maternal mortality ratio (Mozambique): World Bank data	Maternal mortality ratio (Sub-Saharan Africa): World Bank data	Neonatal mortality rate (NNMR) (Deaths per 1,000 live births): UNICEF data
2006	31.6	48.4	190	0.26	539	713	37.05
2007	64	51.6	198	0.34	505	685	36.1
2008	37.8	55	193	0.35	471	664	35.28
2009	40.8	55.3	162	0.28	439	645	34.59
2010	47	61.8	172	0.28	412	626	33.96
2011	54.7	61.1	165	0.26	389	610	33.41
2012	50	63.8	146	0.23	371	596	32.85
2013	49	68.9	130	0.49	356	582	32.34
2014	51	71	125	0.54	339	571	31.79
2015	51.4	75.4	94	0.39	318	557	31.26
2016	52.3	76.6	87	0.26	301	545	30.73
2017	53	82.6	67	0.14	289	534	30.15
2018	54	87.1	66	0.14			29.49
2019		84.8	77	0.16			28.9
2020		85	75	0.1			28.34
2021		88.9	54	0.03			

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Appendix 2. Tool and data collected by province, 2021

Organization unit	Number of maternity waiting homes (MWH)	Number of pregnant women who used MWH and gave birth at the health facility	Number of Birth delivery	Number of maternal deaths	Number of Stillbirth with a positive focus
Niassa	44	505	100.821	67	165
Cabo Delgado	35	1016	95.949	25	87
Nampula	94	2477	259.254	150	53
Zambézia	127	4532	243.522	63	90
Tete	84	8975	121.333	58	133
Manica	76	10.458	98.735	51	53
Sofala	116	6.108	101.012	81	283
Inhambane	127	6.950	64.589	37	96
Gaza	101	8243	58.620	48	59
Maputo Província	47	231	51.978	24	42
Mozambique (Total)	852	49.496	1.195.813	604	1.061