Determinants of Maternal Mothers towards Utilization of Maternal Healthcare Services in Kilosa District, Tanzania

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Abstract: The importance of health care services for a healthy pregnancy has been acknowledged globally. However, for that case, worldwide efforts including introduction of Community Health Workers (CHWs) approach which aimed at bringing health service closer to the community are reported. Despite the reported achievement made, the world has continued to report high mortality rate. Therefore, this study examines the relationship between the introduction of CHWs approach and improvement in maternal mothers' attitudes towards utilization of maternal healthcare services and predictors that are likely to influence an individual woman to use quality and affordable maternal healthcare services in Kilosa DC, Tanzania. The study adopted a cross-sectional study and employed multistage sampling to obtain 384 women who gave birth in the two years preceding to participate in this study. Data were collected using a structured questionnaire, followed by statistical analyses using descriptive and probit model. The findings show statistically significant differences in the likelihood of married mothers at visits, $p<01$ and $p<1$ respectively of attending at least four ANC and PNC visits, with married mothers outperforming unmarried mothers; mothers living near health facilities have highly significant of access health services than those who were living in the interior and far away from health facilities; and mothers exposed to media had high statistical significant at 5% level (p-value=0.012) than those who are not access information from the media. The study revealed that pregnant women with high wealth index were likely to visit a health provider compared to an individual with low wealth index. The likelihood of maternal mothers to deliver at health facility against deliver at home decreases by 1.304 times. The study concludes that, CHWs, marital status, education level of the mother, access to media and household wealth index are important predictors of maternal mothers' utilization of maternal healthcare services. Hence the study recommends to Tanzanian health policymakers and stakeholders should pay additional attention to CHW programs. Provide compensation for their efforts, create career prospects, and find various ways to motivate them.

Keywords: Community health workers; Health facility delivery; Antenatal care; pregnant mothers; Kilosa-Tanzania.

2.1 Introduction

For many decades, the importance of health care services for a healthy pregnancy has been acknowledged globally because not only it improves attainment of Universal Health Coverage (UHC) and achievement of Sustainable Development Goals (SDGs) related to maternal and child health but also economic aspects of specific country or community. For that case, worldwide efforts including introduction of Community Health Workers (CHWs) approach which aimed at bringing health service closer to the community are reported. As the result Eastern Europe and Southern Asia reports achievement of the greatest mortality ratio (MMR) while Sub-Saharan Africa reports achievement of substantial reduction in MMR of 33% between 2000 and 2020 (WHO, 2023). Despite the reported achievement made, the world has continued to report high-rate mortality rate whereby about 287000 women died during and following pregnancy and child birth in 2020 (WHO, 2023). These trends of variations in achievements reached per continent reflect inequalities in accessing high quality and affordable health services worldwide.

In the view of Blanchard et al. (2019) introduction of CHWs intended at promoting and improving maternal and newborn health in low-income and middle-income countries. Maternal health service is very important for improving health and survival among mothers (Aji et al., 2022). However, in different specific locations reports have revealed either underutilization or poor utilisation of this important service. A study conducted in Indonesia reveal that MHS despite being available, yet it is underutilized (Aji et al., 2022). In the same line a study by Gurara et al. (2023) shows that despite efforts to make maternal health care services available in rural Ethiopia, utilization status remains low. The same scenario is reported in Urban Slums of an Industrialized City, in Western India where Sarma et al. (2020) observed that utilization of MHC services was poor as compared to national averages in urban slums. In the same vein, Mekwunyei and Odetola (2020) reported poor utilisation of Maternal Health Services (MHS) by pregnant teenagers in Delta State, Nigeria.

Studies that attempted to understand the determinants of MHS are rampant (Mottiar and Lodge, 2018; Sarma et al., 2020; Aji et al., 2022; Gurara et al., 2023). However, these studies are conducted in a specific geographical location. It is from this ground that, this study was set to assess the determinants of maternal mothers towards utilization of Maternal Healthcare Services in Kilosa district, Tanzania. Different factors are reported to constrain the utilization of high-quality healthcare service provided, these includes long distances to and from the health centers, under-resourcing, topographical issues, and a lack of basic medication, the lack of sufficient trained healthcare workers further compelled the provision of high-quality healthcare services (Silal et al., 2012), Mottiar and Lodge (2018). The deficiency of qualified healthcare professionals, such as doctors, pharmacists, and nurses, may also result in suboptimal health outcomes in rural locations (Mottiar and Lodge, 2018; Singh and Sachs, 2013).

Current literature such as that of Mwami and Oleche (2017) reveal that factors such as gender, household size, cost per visit, area of residence, income level and employment status significantly affect the utilization of health care in Kenya. Furthermore, a study by Gandhi et al. (2022) shows that individual characteristic, for instance- access to media, mother's education, income level and place of residence play a pivotal role in seeking complete care. Studies by (Samuel et al., 2021; Udenigwe and Yaya, 2022) confirm the existing inequalities in accessing high quality and affordable maternal health services whereby in Sub-Saharan Africa the situation is worse. In these studies, it is highlighted that low education, poverty, poor infrastructure or limited political will fuel existing socioeconomic inequities, and seemed to underlie poorer health care quality. It is further reported that, in Sub-Saharan Africa majority of women are without access to essential healthcare during pregnancy and childbirth (UN, 2015).

In efforts to improve maternal healthcare service provision, the Tanzanian government like other countries decided to develop a paid community health workers (CHWs) cadre with additional tasks apart from focusing on Human Immunodeficiency Virus (HIV) care alone to dual roles, which included Maternal, Newborn and Child Health (MNCH) by adding MNCH supervision and data handling techniques to their training packages (Hackett et al., 2019). These creativities help to address one of the key constraints to the provision of essential, life-saving interventions such as maternal health care services and childhood immunization services for mothers (Onambele et al., 2022). The historical success achieved over a decentralized health system proved the principles of Primary Health Care (PHC) and decentralization still deliver a wide range of decision-making varieties to address the health needs and inclinations across all districts in Tanzania (Dynes et al., 2018). However, inequalities among districts in terms of focus, capability, and leadership, coupled with health system challenges, did not foster projected changes in a homogeneous manner and prohibited projected gains from reaching their full potential in each district.

Antenatal Care, Health Facility Delivery and Post Natal Care are proven primary and secondary prevention strategy for improving maternal and newborn health and survival during pregnancy and childbirth (Tiruneh et al., 2017). Haemorrhages, hypertensive disorders, eclampsia, sepsis, abortion complications, and obstructed labor are among the direct causes, whereas severe anemia, human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) problems, and severe malaria are among the indirect causes of maternal mortalities (Fekadu et al., 2019).

Although it is a fact that maternal mortality is preventable and cost-effective interventions, yet, it continues to be a world-wide public health concern (Bustreo and Doebbler, 2020), whereby antenatal care (ANC), health facility delivery (HFD) and postnatal care (PNC) are among effective interventions (Kigume and Maluka, 2019). The World Health Organization (WHO) recommends all pregnant women with normal pregnancies to make at least four ANC visits during the pregnancy period, deliver at the health facility, and receive PNC two days after delivery (Alkema et al., 2016). In fact, this target requires every country regardless of national income to attain universal health coverage through considerable political process or priorities.

Despite the fact that, several countries have achieved universal health coverage at different levels of economic development, evidence from 27 selected countries in Sub-Saharan Africa including Tanzania shows much difference between urban and rural areas in the use of maternal healthcare services caused by different factors. These factors include but not limited to household wealth index, exposure to media and educational level of women and their husbands/partners plays an important role in influencing the healthcare services utilisation between Urban and Rural areas (Samuel et al., 2021). In the study conducted in Kigoma region by Prasad et al. (2022) results show the persistence of high perinatal deaths in the region. According to the World Health Organization in every day in 2020, approximately 800 women died from preventable causes related to pregnancy and childbirth - meaning that a woman dies around every two minutes (WHO, 2023). In Tanzania, according to the WHOthe maternal mortality ratio (MMR) is estimated to be 578 per 100 000 live births with about 80% of deaths occurring during childbirth (Bailon, 2022). This is unacceptable rate. as the target is to make sure that by 2030 To end up this preventable maternal mortality, the Tanzanian government initiatives in accordance with the SDGs is to ensure that 90% pregnancy women to attend four or more antenatal care

visits, 80% women who have just given birth to access postnatal care within two days of delivery by 2030.

Based on the reviewed literatures, it is clear that there are mixed results on the specific factors which determine Maternal Mothers towards utilization of Maternal Healthcare Services worldwide. This is because, while studies done by Mwami and Oleche (2017); Gandhi et al. (2022) and Aji et al. (2022) show that mother's age, education level, household wealth index were typical determinants of all maternal healthcare utilisation, a study by Sharma et al. (2020) reveal that there was no association between age of mother, birth order, educational and occupational status of head of family with utilization of services. This implication implies the fact that what determines maternal mother's utilisation of maternal health services in one geographical location in other location may not be the case. Furthermore, the type of model employed to analyse data has also implication because, those who employed Probit model and Multivariable logistic regressions revealed that age of the mother, household wealth index determined the utilisation of maternal health service, but the answer with association did not find age of the mother to be statistically significant predictor. Therefore, this study has two major reasons to why it was important to be conducted: One, the study was set to assess the determinants of maternal mother's utilisation of maternal healthcare service specifically in Kilosa district. Second, none of these studies has attempted to assess the relationship between introduction of CHWs as the means of bringing maternal healthcare services closer to the community and possibility of maternal mothers to attain four ANC visits during pregnancy as recommended by WHO.

Findings from this study informs both policy makers and the Ministry of health on the factors constraining achievement of SDGS goal 3 for reduction of mortality rate among pregnant mothers and infants which is still very high in Sub-Saharan Africa. Further, the study findings inform local government of Kilosa district on factors that hinder maternal women in utilizing the available maternal healthcare services within their locality, by doing so the district health service sector will improve the services provision by curbing all determinants in the area.

2.2 Conceptual Framework

This study adopts a conceptual framework which represents the hypothesized relationship between the introduction of CHWs approach and improvement in the Maternal Mothers towards utilization of Maternal Healthcare Services as well as predictors which are likely to influence an individual woman to use quality and affordable maternal healthcare services available. These predictors are categorized into different categories namely: Demographic characteristics, individual, community and institutional factors. The stated independent variables are assumed to influence the three dependent variables (maternal healthcare services (ANC, HFD and PNC) use in the Kilosa district community. Increased uptake of ANC, HFD and PNC services by pregnant women of the Kilosa community depends on different factors, such age, sex, marital status, education level, household wealth index, knowledge obstetric danger signs and many more. These social, economic, demographic, environmental, and social cultural factors directly influence the dependent variables (ANC, HFD, and PNC) and its utilisation depending on their variability (Figure 2.1).

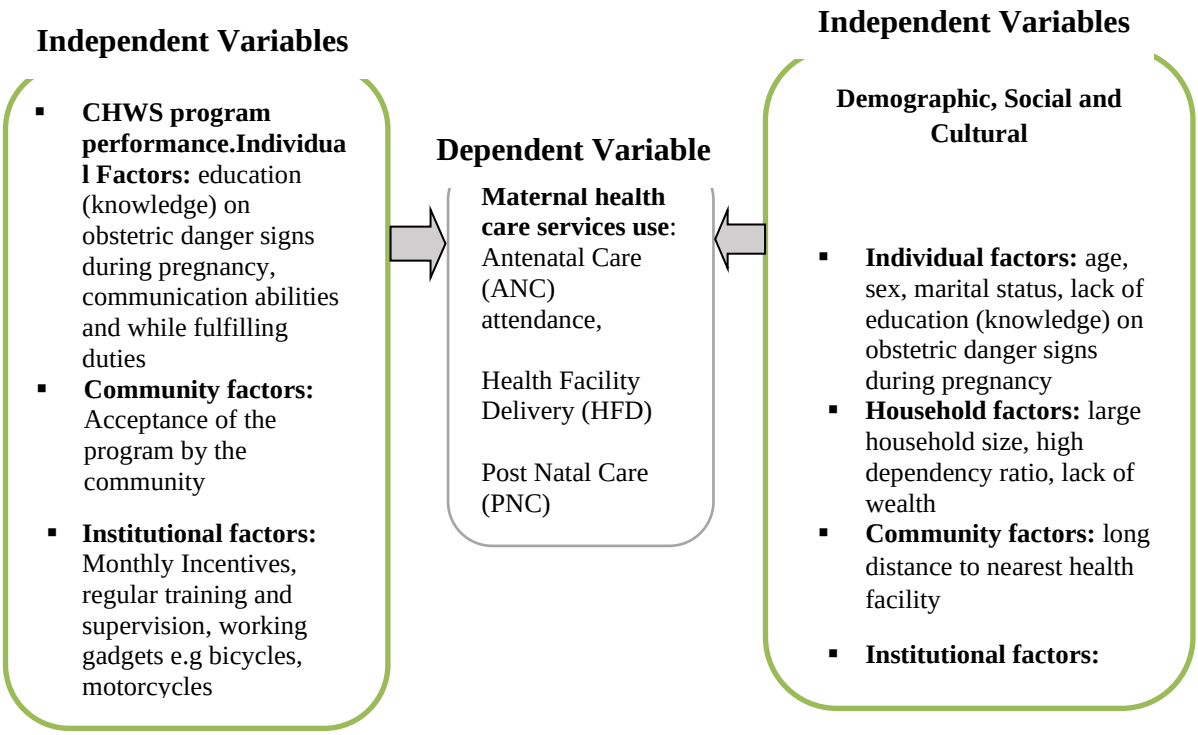

Figure 2.1: Conceptual Framework

2.3 Methodology

A descriptive, cross-sectional design was adopted in this research. A multi-stage design was employed to select eligible family units for participation in the study with the help of ward and village executives. A list of all family units from two villages was acquired for each ward in 20 of the 40 Kilosa District wards (main frame), from which the number of households for the survey was randomly selected.

2.3.1 Setting and design of the study

Kilosa is a district located in east central Tanzania, 148 kilometers from Morogoro. It extends between 5°55', 7°53' south latitude, 36°30', and 37°30' east longitude. The district contains 40 wards, 137 registered villages, and 807 hamlets with a population of 1 172 283 people, covering 12 394 square kilometres (Ishengoma et al., 2016). The population-based cross-sectional survey was conducted in twenty of the forty wards of the Kilosa district: Magomeni, Mkwatani, Ulaya, Kidodi, Kasiski, Mbumi, Masanze, Ruhembe, Kimamba, Ruaha, Kitete, Mvumi, Msowero, Maguha, Dumila, Magubike, Berega, Ilonga, Mikumi, and Rudewa.

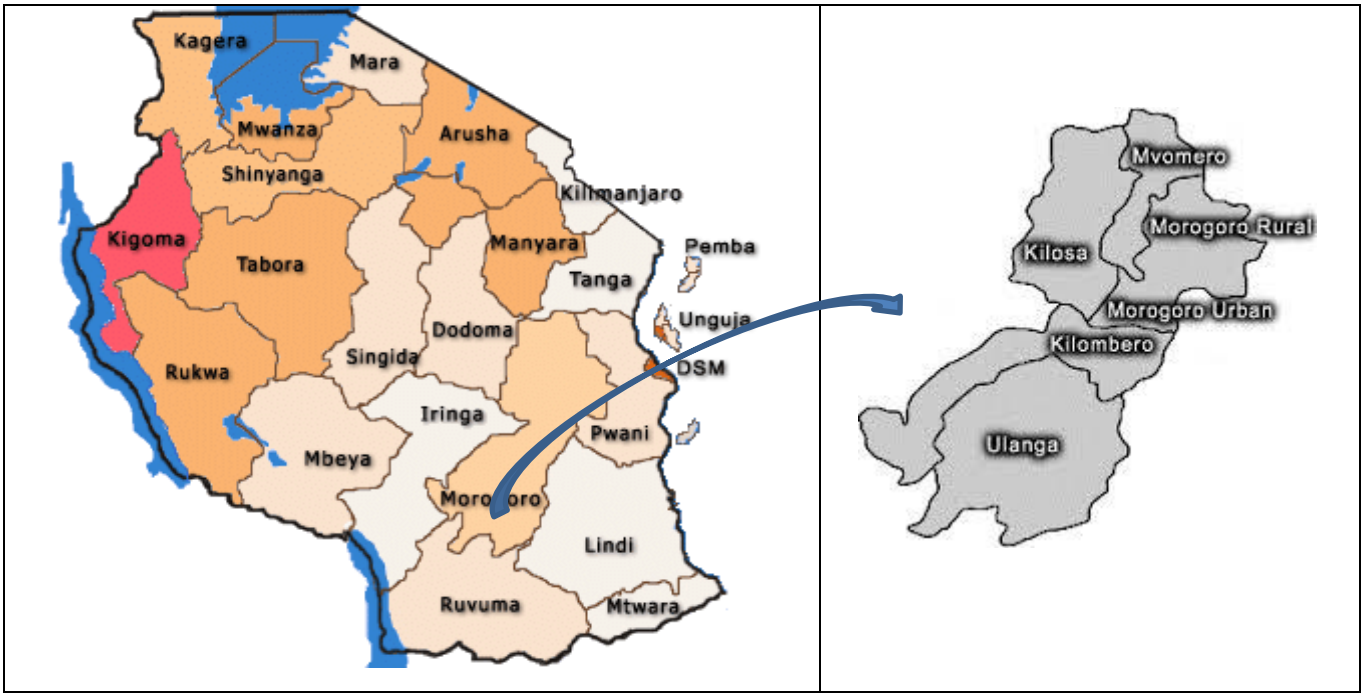

Figure 2.2: Tanzania Administrative Map (Left) and Districts of Morogoro Region (Right)

2.3.2 Study participants

Ward Executive Officers' (WEOs) and Village Executive Officers' (VEOs) offices, which are the government institutions within the Kilosa DC, were consulted to get lists of mothers of children born 2 years ago who gave informed consent to be interviewed.

2.3.3 Sampling techniques and sample size

With the assistance of ward and village executives, multi-stage design was used to select eligible family units for participation in the study. A list of all family units from 2 villages for every ward in 20 out of 40 Kilosa District wards was obtained (main frame), from which the number of households was randomly selected for the survey. In the first stage, 40 of 137 villages were selected across the twenty wards using a probability proportional to the size of the villages (i.e., the number of family units in the respective villages). The second stage involved the random selection of family units in each selected village (Kothari, 2004).

Sample size was calculated by using the following formula,

$$n = \frac{Z^2 p(1-p)}{d^2} \quad \ldots\ldots (1)$$

Where;

$n = (z)^2 p (1 - p) / d^2$

Or when p = 1/2 (0.5)

$n = (z)^2 / 4d^2$

n = sample size
z = level of confidence according to the standard normal distribution (for a level of confidence of 95%, z = 1.96)
p = estimated proportion of the population that presents the characteristic (when unknown we use p = 0.5)
d = tolerated margin of error 5% (0.05).

Kothari (2004), suggested that if there was any doubt about the value of P, it was best to err towards 50%, as it would lead to larger sample size. In this study, the investigator presents his results with 95% confidence intervals (CI), calculation was done using P=0.5 and d=0.05 as the investigator could not estimate P, so (when unknown we use p = 0.5).

The final sample size was estimated to be 384.16 ≡ 384, considering the 5% allowable error. A list of households was prepared to trace households with mothers of children aged less than 2 years. A total of 384 households out of 1064 were selected by the systematic random sampling method. This resulted in a required sample size of 384 family units, of which eligible members consented. No further sampling was undertaken in the sample family units; all women in those households aged 15–49 years who had delivered in the preceding 2 years were eligible to participate. Women present in the household at the time of the visit were given consent to participate and were interviewed. In non-response cases, the mother from another immediate household was interviewed.

2.3.4 Data collection

From selected households, women who delivered within the period of 2 years preceding this study were interviewed through a household visit using a structured electronic (ODK collect) questionnaire. All data was collected through face-to-face interviews in either English or Swahili by the enumerators in a private place in the selected household. In non-response cases, the mother from another immediate household was interviewed. The first author himself was involved in the data collection process and the supervision of enumerators. Data checking, editing, and coding were done by the researcher each day. A total of 384 women consented, resulting in a 100% response rate. All participants reported a live birth in the preceding 2 years.

2.3.5 Data analysis

Theoretical Model

The theory of consumer behavior served as the foundation for the demand for healthcare services. According to the idea, a consumer divides his income among many competing wants in an effort to maximize utility. According to the findings of this study, a sick person's decision to seek medical attention or not was based on the provider's production function and financial limitations. As a result, utility maximization is the optimization challenge, as indicated by the function:

$$U = f(C, Z, H) \quad \text{(2)}$$

In this equation, U stands for the utility of the consumer of health care services, C for consumption goods that provide utility to an individual but have no direct impact on their health, Z for health-related goods that do, and H for the individual's health status. Since a sick person strives to maximize utility while being constrained by the budget and the health production function, the budgetary restriction was announced by:

$$Y = CP_C + ZP_Z + IP_I \quad \text{(3)}$$

Where Y stands for income, C for consumption, Z for health-related items, and I for personal healthcare. Prices for consumer goods, healthcare-related goods, and individual health care are denoted by Pc, Pz, and PI, respectively. The function of producing health was provided by:

$$H = f(I, Z, S) \quad \text{(4)}$$

S stands for the predisposing factors, which include the demographic and socioeconomic characteristics of the sick person, such as age, education level, income, marital status, and gender; the characteristics of the health system, such as time spent in the facility, cost of services, and quality of services offered; health factors, such as chronic illness and health status rating; and enabling factors. Where I is the individual health care, Z is the health-related goods, and S represents the predisposing factors.

Solving the optimization problem using equation 3.12, 3.13 and 3.14 yields the Langragian function which is expressed as follows;

$$L = \{U - f(C, Z, H)\} + \lambda_1\{H - f(I, Z, S)\} + \lambda_2\{Y - CP_C - ZP_Z - IP_I\}\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

The demand function given by equation (5) and its solution yield the ideal values of C*, X*, and H* that maximize the utility of the consumer, in this case, the ill person. Equation (5) can be solved to produce the reduced version of the demand function for a sick person's use of healthcare services, which results in:

$$Ih = f(P_C, P_Z, P_I, Y, S) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

where Pc, Pz, PI, Y, and S are as previously established, and Ih represents the demand for individual health care services. As a result, this suggests that an individual's use of health care services depends on the demographic and socioeconomic traits of the sick person, the traits of the health system, and enablers.

Econometric model

Contribution of community health workers program on maternal healthcare services

The probability model was used to examine how much the Community Health Workers Program contributed to maternal healthcare services. Since the dependent variable was binary in nature, the study used the probit model to examine the factors that influence how maternal mothers in Kilosa use healthcare facilities. The dependent variable in this probabilistic regression can have one of two values between 0 and 1. The binary-choice paradigm, according to Machio (2008), is predicated on the idea that people must select one of two options and that their decision will be influenced by a variety of circumstances. The error term in this instance adopts the conventional normal distribution. We hypothesized that an underlying response variable would determine whether or not a maternal mother would use healthcare services. Probit's model was described as:

$$\text{Prob}(Y = \frac{1}{X} = \Phi(X'\beta) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Where Y stands for the cumulative standard normal distribution function, Prob stands for probability and is a vector of the parameters that need to be estimated. Let's define the latent variable Y* as follows: Let's observe some variable, say Y, which has a range of values between 0 and 1:

$$Y^* = X_i\beta + \varepsilon\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Where Y* is the dependent variable that determines whether or not a patient uses medical services. The independent variables, or Xi, that affect use include things like age, income, education, the standard of the health care provided, and time, among others.

The coefficients that need to be estimated are:

e is the error term that has N (0, 1) and a normal distribution. If y > 0, which denotes consumption, or if y = 0, which denotes no utilization, the dependent variable Y can be detected.

i.e.

$$Y_i = \begin{cases} 1, \text{if a pregnant woman visited a health provider} \\ 0, \quad \text{Otherwise} \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Therefore, the probability that Y=1 given X is estimated using the standard normal cumulative function which was illustrated by the equation below.

$$Prob(y_i = \frac{1}{X} = \Phi(S) = \int_{-\infty}^{-s}(2\pi)^{-1/2}e^{-S^2/2}\,ds \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

$$S = X_i\beta$$

Where;

The probability's standard normal transformation (S) constraint ranges from 0 to 1. Equation (3.19) can be understood as a conditional likelihood that, given certain recognized factors, a sick person will use healthcare services. Xi. The likelihood function provided was used to estimate the model:

$$L = \prod_{i=1}^{n}\Phi(X_i\beta)^{y_i}[1 - \Phi(X_i\beta)^{y_i}]^{1-y_i} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Nevertheless, it is convenient using the log likelihood function given as:

$$\ln = \sum_{i=1}^{n}\{y_i\ln[\Phi X_i\beta] + (1 - y_1)\ln[1 - \Phi(x_i'\beta)]\}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

In order to find estimates, we seek those that maximize the log likelihood function. The comprehension of the importance

of coefficients and the sign is made easier by the Probit model. Therefore, in order to comprehend both the sign and magnitude, it is important to estimate the marginal effects. Per unit change in the independent variable X, the marginal effects display the change in probability of y = 1. It is determined as

$\partial p/\partial xj = \Phi(X'\beta)\beta_J$…….……..…….. (13)

Both the average sample member in x and the average of individual marginal effects are used to estimate the marginal effect. In this instance, the estimated average of the various effects was presented as follows:

$\partial p/\partial xj = [\{\sum F'(X'\beta'(X']\beta\beta_J$…..……..……..……..... (14)

Model Specification

Healthcare services are either utilized or not in the occurrence of disease hence the use of Probit model since it is a binary variable. Here, we assumed that the probability of an individual utilizing or not utilizing healthcare services is determined by some identified factors (independent variables) as shown below.

$U_h = \beta_0 + \beta_i X_i \ldots . + \beta_n X_n + \varepsilon$…..…….……. (15)

Where;
U_h Represent the utilization
β_i are the coefficients to be estimated
ε is the error term
$X_i$is a vector for independent variables which are the predisposing factors such as the demographic and socio-economic characteristics of the maternal mother, the characteristic of health system, health factors and enabling factors. Therefore, the estimable model was specified as:

$$\text{Utilization} = \beta_0 + \beta 1_{\text{Age}} + \beta 2_{\text{mstatus}} + \beta 3_{\text{Parity}} + \beta 4_{\text{MatrnalEdu}} + \beta 5_{\text{Wealthindex}} + \beta 6_{\text{religion}} + \beta 7_{\text{dist}} + \beta 8_{\text{CwCHW}} + \beta 9_{\text{Avisit}} + \beta 10_{\text{place}} + \beta 11_{\text{Rpostcare}} + \beta 12_{\text{Fsize}} + \beta 13_{\text{ExpMedia}} + \beta 14_{\text{knwldg}} + \varepsilon$$

…..…….…….…….... (16)

Where; Age represents Age of mother, Mstatus represents Marital status, Parity represents The number of births given (parity), MtrnalEdu represents Maternal education, Wealthindex represents income(wealth index) of the respondents, Religion represents religion of the respondents, dist represents Distance to health facility delivery, CwCHW represents Community Health Worker's Communication, ANCvisit represents Antenatal Care visit, place represents Place of delivery, Rpostcare represents Received Postnatal Care, Fsize represents Family size, ExpMedia represents Exposure to the media and Knwldg represents Knowledge of pregnancy danger signs.

Statistical analyses

First, descriptive statistics on ANC use, place of delivery, and postnatal care were compiled using a frequency table, as shown in Table 2.2. With the characteristics listed in Table 2.1, crude odds ratios were calculated using Probit models to assess the likelihood of using ANC, health facility delivery, and postnatal care. The association between the three outcome variables and the explanatory/independent variables was determined using Probit model analysis as shown in the Table 2.3; the model used all of the independent variables because they were all significantly related to the three outcome variables at 5% (i.e., $p<0.05$) during Probit analyses. STATA v15.0 was used for all statistical analyses. To account for the complex sampling design, Probit model analysis were fitted using STATA's complex survey command (svy). Probit model analysis, a backward stepwise elimination technique was utilized to eliminate highly correlated variables before they were put into the final model and only possible factors with $p<0.20$ were used in the final model. The final model does not include factors that demonstrate collinearity.

2.3.6 Definition of variables

Table 2.1 shows the variables that were used in data analysis. The dependent variables were the visiting a qualified health provider and several independent variables were used to estimate the model.

Table 2.1: Definition of Variables

Definitions and categorization of variables used in the determinants of ANC and Institutional delivery			
Variable	**Description**	**Measurement**	**Expected effect**
Dependent variables			
Antenatal Care			
Health Facility Delivery			
Postnatal care			
Independent Variables			
Age of mother	Age was measured on a	Number of years	+
Marital status	The marital status of the participants widowed).	1=single, 2=divorced, 3=widowed	-
Parity	The number of births given (parity) was used to calculate parity.	0= low parity (dummy) 1= high parity (dummy)	+
Maternal education	Maternal education level	0=Primary education (seven or fewer years) 1= secondary education (eight or more years),	-
Wealth index	The wealth index (generated through primary component analysis based on household income).	0=low income (dummy) 1= high Income (dummy)	+
Religion	Religion of the respondents (categorical)		-
Distance to HF	The geographical distance from the mother's home to the nearest health facility was measured in kilometers.	0= nearby (dummy) 1= far (dummy)	-
Contact with CHW	Contact with community health worker		+
ANC Visits	A woman who has attended at least four ANC appointments during her pregnancy.	0= Women who did not attend ANC (dummy) 1= Women who attend ANC (dummy)	+
Place of Delivery	The place of delivery	0= at home ((dummy)), 1= health facility (dummy)	+
Received Postnatal Care	Women received postnatal care within 42 days after delivery (cont…)		+
Family Size	The number of family members	0= small family dummy) 1= big family (dummy)	_
CHW's Communication	Data on Community Health Worker's communication	0= insufficient (dummy) 1= sufficient (dummy)	+
Exposure to the media	The respondents were asked whether they were exposed to any mass media.	0= No(dummy) 1= Yes (dummy)	+
Knowledge of pregnancy danger signs	The knowledge of pregnancy danger signs	0= unsatisfactory knowledge (dummy) 1= satisfactory knowledge (dummy)	+

2.4 Results and Discussion

2.4.1 Summary statistics of the study variables

Almost all mothers, 96.9% (372), reported traveling less than 5 kilometers when in need of primary health care, similar findings were observed by Jia et al. (2022) studied the Inequalities of spatial primary healthcare accessibility, observed that ''In all, 56% of villages, or nearly 70% of the total population, had at least one PHC within a 6-km catchment area, whereas 44% had no access to PHCs within that distance''.

Most women, 70.1% (269), were married, with at least a primary education of 61.5% (236). More than three-quarters of the mothers, 75.3% (289), came from big families, and 75.3% (289) had a monthly family income below TZS 200 000. Nevertheless, 6.3% (24) were under the age of 20, and about three-quarters of the mothers, 75.0% (288), were not contacted by CHWs throughout their pregnancy period. It is from this ground that Prasad et al. (2022) recommends that, decentralizing high-quality maternal and reproductive health services in remote, low-resource settings is both feasible

and effective and should be considered in places with similar contexts. Table 2 shows that majority of the respondents (mothers) who visited ANC more than 4 times (83.7%) and sought health care were aged 15-24 (93.9%) and 66% of mothers who aged 35+ considered to have a good postnatal care. This may be attributed to the fact that most of the individuals were attained secondary education which means that an education effect played a big role to make them use health facilities on their significant health service needs. These results are in line with those of Sharma et al. (2020) who found that education and distance to reach health facility were significantly associated with the use of maternal healthcare services in India. On average, majority they covered a distance of 1 to 2 km to get to the health facility.

It is shown from the results that for those who used healthcare services 92.9% of the mothers were married, 89.4% of the mothers were Christians and 94.3% of the individuals had at least an ability to buy health services by a wealth index of more than TZS 400,000. On average, those who visited a health provider came from families with small size and 95.8% of them have satisfactory knowledge of pregnancy danger sign due to an attainable education they acquired, especially on health education.

Table 2.2: Summary statistics of the study variables

Percent distribution of ANC, Health facility delivery, and Postnatal care by women's characteristic						
Variable	**ANC Visits (%)**		**Place of Delivery (%)**		**Postnatal Care (%)**	
	<4	**≥4**	**Home**	**Health Facility**	**No**	**Yes**
Age of mother						
15-24	16.3	83.7	6.1	93.9	49.0	**51.0**
25-34	18.9	81.1	9.6	90.4	55.4	**44.6**
35+	41.4	58.6	22.5	77.5	66.2	**33.8**
Marital status						
Married	14.5	85.5	7.1	92.9	46.5	**53.5**
Single/Divorced/Separated/Widowed	40.2	59.8	19.1	80.9	74.8	**25.2**
Parity						
1-4	20.7	79.3	8.4	91.6	55.1	**44.9**
5+	37.0	63.0	37.0	63.0	51.9	**48.1**
Maternal education						
Primary	22.1	77.9	11.3	88.7	51.8	**48.2**
Secondary+	21.8	78.2	9.1	90.9	62.7	**37.3**
Wealth index						
0-400,000	26.7	73.3	13.6	86.4	58.0	**42.0**
>400,000	14.2	85.8	5.7	94.3	49.6	**50.4**
Religion						
Christianity	21.5	78.5	10.6	89.4	48.1	**51.9**
Islam	22.4	77.6	10.7	89.3	59.8	**40.2**
Tradition / Other	0	0	0	0	0	**0**
Distance to HF						
1-2	14.7	85.3	5.5	94.5	46.2	**53.8**
3+	47.1	52.9	27.3	72.7	83.0	**17.0**
Contact with CHW						
Yes	23.2	76.8	13.3	86.7	48.3	**51.7**
No	17.7	82.3	2.1	97.9	74.0	**26.0**
CHW's Communication						
Sufficient	50.0	50.0	28.1	71.9	84.4	**15.6**
Insufficient	19.8	80.2	11.4	88.6	43.7	**56.3**
Knowledge of pregnancy danger signs						
Unsatisfactory	23.1	76.9	11.6	88.4	53.9	**46.1**
Satisfactory	14.6	85.4	4.2	95.8	62.5	**37.5**
Exposure to the media						
No	12.3	87.7	3.4	96.6	59.5	**40.5**
Yes	23.8	76.2	12.0	88.0	29.3	**70.7**
Family Size						
Small	17.3	82.7	7.0	93.0	52.4	**47.6**

Big	26.5	73.5	14.1	85.9	57.3	**42.7**
Overall	21.9	77.3	10.7	89.3	54.9	**45.1**

2.4.2 Probit Model Analysis

Factors Influencing ANC visit among maternal mothers

Results in Table 2.3 shows that marital status has positively significant effect on antenatal care visits, p<0.01 and p<1 respectively; married mothers have more chances to attend at least 4 ANC visits compared to unmarried mothers. The logit of married mothers to attend at least 4 ANC visits against not attend at least 4 ANC visits increases by 0.604 if married mothers attend at least 4 ANC visits compared to unmarried mothers who does not attend at least 4 ANC visits. In other words, mothers who are married are more likely to attend at least 4 ANC visits than unmarried mothers. This result is in line with that of Mekwunyei and Odetola (2020) who found that seventy per cent of the pregnant unmarried teenagers stated that they utilised MHS by visiting an antenatal care centre (ANC) centre at least once during their pregnancy but only 28.3% had ANC attendance that was appropriate with their gestational age.

Distance (km) to nearby Health facility has negative significant effect to Antenatal care visit among maternal mothers, in Table 3 it was found that mothers who lived at location of more than 1km distance to nearby health facility has less chances to attend 4 ANC visits as compared to maternal mothers who live at less than 1km distance to nearby health facility. This is to say that the logit for a mother located interior and far areas from health facility decreases their chances to attend at least 4 ANC visits by 0.765 times those who located to nearby areas.

CHW communication skills has negative significant effect to Antenatal care visit among maternal mothers, if a mother has rating sufficient CHW communications skills her odds of attending at least 4 visits decrease by 0.762 times. This means that CHW communication skills do not influence mothers to attend at least 4 ANC visits. Hence there is no effect of CHW on antenatal care visits.

Concerning Wealth Index has positively significant effect to Antenatal care visit among maternal mothers, results shown that mothers who had the high-income level have significant on attending at least 4 ANC visits increase by 0.349 times. Same findings are reported in the study conducted by Samuel et al. (2021) that household wealth index not only determines the difference between urban and rural areas, but also the possibility of maternal mother status in the use of maternal healthcare services. This means that Wealth Index do influence maternal mothers to attend at least 4 ANC visits. Hence there is significantly affect of Mothers' Wealth index on antenatal care visits.

On exposure of mothers to social media, those who had exposure to social media have more chances to attend at least 4 ANC visits compared to unmarried maternal. The logit of media exposure mothers to attend at least 4 ANC visits against not attend at least 4 ANC visits increases by 0.280 if married maternal mothers attend at least 4 ANC visits compared to those had not exposed to media maternal mothers who does not attend at least 4 ANC visits. In other words, mothers who are exposed to media are more likely to attend at least 4 ANC visits than those who did not.

Table 2.3: Probit analysis results on factors influencing ANC visit among maternal mothers

ANC1	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Age of Mothers							
Youngage_15-24	-3.559	235.462	-0.02	.988	-465.055	457.937	
Middleage25-34	-3.532	235.462	-0.01	.988	-465.028	457.965	
Matureage35+	-3.909	235.462	-0.02	.987	-465.405	457.587	
Maritalstatus	0.604	.181	3.34	.001	.25	.959	***
Parity	-0.562	.318	-1.77	.077	-1.184	.06	*
Maternal_education	0.160	.194	0.83	.408	-.22	.54	
Wealthindex	0.349	.196	1.78	.075	-.035	.733	*
Religion	-0.061	.168	-0.36	.718	-.391	.269	
Distancekmtonearby~C	-0.765	.178	-4.29	0	-1.115	-.416	***
Contact_with_CHW	-0.762	.312	-2.44	.015	-1.375	-.15	**
Family Size	0.070	.177	0.40	.692	-.278	.418	
CHWscommunications~s	-0.742	.276	-2.69	.007	-1.283	-.202	***
Exposuretosocialme~a	0.280	.26	1.08	.281	-.23	.791	
Knowledgeofpregnan~s	-.013	.253	-0.05	.96	-.509	.483	
Constant	4.899	235.462	0.02	.983	-456.598	466.396	
Mean dependent var	0.781		SD dependent var		0.414		
Pseudo r-squared	0.195		Number of obs		383.000		
Chi-square	78.724		Prob > chi2		0.000		
Akaike crit. (AIC)	354.228		Bayesian crit. (BIC)		413.449		

*** p<.01, ** p<.05, * p<.1

Factors influencing the use of health Facility among maternal mothers

Results in Table 2.4 shows that, parity (high vs low) has a 1% significant effect on health facility delivery but negative influence on maternal mother's chances to health facility delivery. The logit of maternal mothers to deliver at health facility against deliver at home decreases by 1.304 times if high parity maternal mothers deliver at hospital compared to low parity maternal mothers who deliver at home. In other words, maternal mother who have high parity are less likely to deliver at health facility than low parity maternal mothers.

Distance (km) to nearby Health Facility, in Table 4 it was found that maternal mothers who live at location of more than 1km distance to nearby health facility has less chances to health facility delivery as compared to maternal mothers who live at less than 1km distance to nearby health facility. This is to say that the logit for a maternal mothers located interior and far areas from health facility has decrease their chances to health facility delivery by 0.891 times those who located to nearby areas.

Table 2.4: Probit analysis results on factors influencing use of health Facility among maternal mothers

HFD	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Age of Mothers							
Youngage	0.002	1.354	0.000	0.999	-2.650	2.655	
Middleage	-0.140	1.361	-0.100	0.918	-2.807	2.528	
Matureage	-0.118	1.378	-0.090	0.932	-2.818	2.583	
Maritalstatus	0.415	0.234	1.770	0.077	-0.044	0.875	*
Parity	-1.304	0.358	-3.640	0.000	-2.006	-0.602	***
Maternal_education	0.194	0.250	0.780	0.438	-0.296	0.683	
Wealthindex	0.323	0.265	1.220	0.223	-0.197	0.842	
Religion	-0.139	0.215	-0.650	0.518	-0.561	0.283	
Distancekmtonearby~C	-0.891	0.219	-4.070	0.000	-1.32	-0.462	***
Contact_with_CHW	-1.135	0.396	-2.860	0.004	-1.912	-0.359	***
FamilySizeNumber	-0.017	0.234	-0.070	0.943	-0.476	0.442	
CHWscommunications~s	-0.559	0.289	-1.930	0.053	-1.126	0.008	*
Exposuretosocialme~a	0.631	0.399	1.580	0.114	-0.151	1.413	
Knowledgeofpregnan~s	0.069	0.374	0.180	0.854	-0.665	0.803	
Constant	2.482	1.455	1.710	0.088	-0.370	5.335	*

Mean dependent var	0.893	SD dependent var	0.310
Pseudo r-squared	0.271	Number of obs	383.000
Chi-square	70.533	Prob > chi2	0.000
Akaike crit. (AIC)	220.139	Bayesian crit. (BIC)	279.359

*** p<.01, ** p<.05, * p<.1

Factors influencing the use of postnatal care among maternal mothers

Results in Table 2.5 shows that marital status has a 1% non-significant effect on post-natal care visits, married maternal has more chances to attend PNC visits compared to unmarried maternal. The logit of married maternal mothers to attend PNC visits against not attend PNC visits increases by 0.553 if married maternal mothers attend PNC visits compared to unmarried maternal mothers who does not attend PNC visits. In other words, maternal mothers who are married are more likely to attend PNC visits than unmarried maternal mothers.

Wealth index, results in Table 2.5 shows that the high-income earner has more chances to attend post-natal care visits (PNC) and low-income earner has low chance to attend post-natal care visits. The wealth index logit coefficient was significant at 1% level p-value=0.002 and therefore the logit for high income earner to attend the PNC services is 0.525 times low-income earner attendance to PNC services.

Distance (km) to nearby Health Facility, in Table 2.5 it was found that maternal mothers who live at location of more than 1km distance to nearby health facility has less chances to attend PNC as compared to maternal mothers who live at less than 1km distance to nearby health facility. This is to say that the logit for a maternal mothers located interior and far areas from health facility has decrease their chances to PNC by 0.806 times those who located to nearby areas.

Exposure to social media, Results in Table 2.5 shows that maternal mother who exposed to mass media including print, radio, and television that depicting information regarding PNC has 0.538 times more chances to attend post-natal care

services than maternal mothers who do not expose to social media. The strength of relationship (logit coefficient and odds ratio) was statistically significant at 5% level (p-value=0.012). Hence, maternal mothers who are exposed to social media have more chances to attend post-natal care visits. This result connotes other findings reported by Samuel et al. (2021) that maternal mother's exposure to media plays an important role in influencing their attendance to the PNC.

Table 2.5: Probit analysis results on factors influencing use of Postnatal care among maternal mothers

PNC	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Youngage	-4.38	237.914	-0.02	.985	-470.683	461.922	
Middleage	-4.593	237.914	-0.02	.985	-470.895	461.71	
Matureage	-4.86	237.914	-0.02	.984	-471.163	461.443	
Maritalstatus	0.553	0.177	3.12	.002	.205	0.900	***
Parity	-0.014	0.311	-0.05	.964	-.623	0.595	
Maternal_education	-0.238	0.170	-1.40	.162	-.572	0.096	
Wealthindex	0.525	0.167	3.14	.002	.197	.852	***
Religion	0.214	0.150	1.42	.155	-.081	.509	
Distancekmtonearby~C	-0.806	0.192	-4.19	0	-1.183	-.429	***
Contact_with_CHW	-0.158	0.350	-0.45	.653	-.843	.528	
FamilySizeNumber	.0118	0.160	0.74	.459	-.195	.431	
CHWscommunications~s	-1.016	0.323	-3.15	.002	-1.648	-.383	***
Exposuretosocialme~a	0.538	0.214	2.52	.012	.12	.957	**
Knowledgeofpregnan~s	-0.304	0.2190	-1.39	.164	-.733	.124	
Constant	4.302	237.914	0.02	.986	-462.001	470.606	

Mean dependent var	0.449	SD dependent var	0.498
Pseudo r-squared	0.220	Number of obs	383.000
Chi-square	115.719	Prob > chi2	0.000
Akaike crit. (AIC)	441.254	Bayesian crit. (BIC)	500.474

*** p<.01, ** p<.05, * p<.1

2.5 Conclusion and Recommendation

The study found that CHW has significant influence on maternal decision-making in the utilization of maternal healthcare. Furthermore, the study found that, marital status, distance to the nearest health service, access to the media, household wealth index were the key predictors influencing maternal mothers' towards the utilisation of maternal healthcare services in the study area. Based on the study findings the following conclusion and recommendation was drawn. The study concludes that marital status, education level of the mother, distance to the nearest health facility and household wealth index were important predictors of the possibility of maternal mothers to utilize the maternal healthcare services available in their areas within Kilosa district Council. Hence, the study recommends to policy makers and Kilosa Dc health workers that they should take into consideration all these important predictors when designing maternal healthcare service for improved maternal mothers' utilisation of the services provided. These should be done by ensuring that enough CHWs are trained and placed in all areas with maternal health services, while Kilosa DC health department should make sure entrepreneurship trainings are given to women for their household wealth index improvement and place each health facility within the recommended distance for easy accessibility.

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