To understand the extent of contribution on uptake of skilled birth delivery services by the Health Innovations and socio economic factors - a case of Kimilili Sub County -Bungoma Count, Kenya

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Abstract: *The adoption of Skilled Birth Delivery services (SBDs) significantly enhances maternal and child health by lowering Maternal and Child Mortality Rates (MCMR). Maternal morbidity and mortality profoundly impact individuals, families, communities, and society at large. According to WHO, global productivity suffers an annual loss of USD15.5 billion due to maternal and child deaths. In Bungoma County, the rate of SBDs rose above 50% over the past eight years, except in 2017 when it dropped to 46% due to a prolonged health workers' strike. The sustainability of this high SBD rates post-program closure was uncertain. This study aimed to examine how awareness of health innovations influences the use of Skilled Birth Delivery Services in Kimilili Sub County, Bungoma County. The research used a cross-sectional descriptive quantitative analytical design, employing both probability and non-probability sampling techniques to select participants. Descriptive statistics, including means and percentages, summarized the data, while multiple regression analysis explored the relationship between health innovations and increased uptake of skilled birth delivery. The study revealed that awareness of health innovations supporting financial aspects of delivery significantly influenced skilled birth delivery uptake (p=0.000). It was concluded that innovations providing financial and emotional support during pregnancy play a crucial role in increasing skilled birth delivery rates in Kimilili Sub County.*

Key words: Extent of contribution on uptake of skilled birth delivery services, Health Innovations and socio economic factors

1.0 Introduction

1.1 Skilled Birth Delivery Services

Skilled birth delivery (SBD) service in the context of this study included all those services offered to pregnant mothers during delivery and immediately after delivery by individuals or attendants who had the requisite knowledge and skills acquired through training in medical sciences and could be found in the Health facility or a way from the Health facility. Un-skilled Birth Delivery (UBD) services are all those services offered to mothers during delivery and immediately after delivery and usually away from the Health facilities by service providers without the requisite training. This could either be by traditional birth attendants (TBA), friends or relatives (Kenya DHIS 2011-2020). They were often illiterate, unhygienic and ignorant about the risks involved in the activity. Mothers who received assistance of skilled birth attendants were handled hygienically, monitored properly during labor and were protected against labor complications that would lead to maternal or neonatal death during perinatal or postnatal period. Early recognition of complications during delivery, proper monitoring of labor and hygienic handling of mother was therefore the whole mark prevention of maternal mortality (MM) and neonatal (NM). The current rising trend of SBD services observed in Kenya from 44.3% in 2011 to 77.8% in 2020 though perceived to be a temporal occurrence, was likely to go a long way in reducing maternal mortality rates and child mortality rates (MMR and CMR) (Kenya. DHIS 2011-2020).

Despite the political goodwill aimed at improving maternal health, such as the Free Maternity Policy of 2013, which aimed to remove financial burdens for delivering mothers, and the Beyond Zero program, which sought to enhance access to health services for mothers and children while strengthening referral strategies and providing emotional support through Community Health volunteers and birth companions, the results varied by region. The uptake of skilled delivery services

was comparatively lower in some areas, while consistently good in others. Most residents were small-scale farmers relying on maize and bananas for food, with those in lowland areas growing maize and sugar cane as cash crops. A few living along the slopes of Mt. Elgon cultivated coffee on a limited scale, while town residents engaged in business. Due to scarce formal employment, many young men relied on motorcycle taxi transport for income. Female literacy levels were low, leading to high rates of adolescent pregnancy and marriage (KDHS 2013).

Kimilili Sub County had three Level 4 health facilities serving as referral centers for the sub-county and neighboring areas, providing obstetric and gynecological services. Daily family planning and antenatal services were offered at maternal child welfare clinics. Kimilili Hospital had a 10-bed maternity ward with two delivery beds. Dreamland Mission Hospital also offered maternity services, though not under the free maternity policy at the time of the study, requiring payment through out-of-pocket, private medical, or National Hospital insurance. Level 3 and 2 facilities offered reproductive health services, including family planning, antenatal care (ANC), and maternity services, except for Sulwe, Kamasielo, Chebukwabi, and Kambini Dispensaries, which did not provide maternity services but served large populations. Staff shortages were common, as in many other health facilities in the region. However, facilities were within the 5 km radius recommended by WHO. The sub-county hospital had two ambulances for referral cases, either to the sub-county hospital or Dreamland Hospital. The free maternity service policy applied to all county health facilities providing maternity services, except Dreamland Mission Hospital.

In the primary health care sector, there were 25 fully established community health units (CHUs) that offered Health Promotion messages and referral services, including but not limited to birth companion (BC) activities. These CHUs were distributed across all four wards, with each CHU comprising 25 Community Health Volunteers (CHVs). Ten of these volunteers received a monthly stipend of Ksh 2000/=. Additionally, the county health sector had an approved and operational referral strategy policy.

1.2 Statement of the Problem

The increasing trend in skilled delivery service uptake observed in Kimilili Sub County, which mirrors County and National levels, indicates an improvement in maternal and child health, thereby reducing maternal and child mortality rates. This positive trend coincided with the introduction of numerous health innovations such as the Beyond Zero campaign, Birth Companion, and Linda Mama program. These innovations were believed to contribute to the significant increase in skilled delivery service uptake from 33.4% to 85.5% in Kimilili Sub County. The concern, however, was whether this trend could be sustained. Therefore, the study aimed to determine if there were any effects and associations between these health innovations and the rising number of mothers seeking skilled birth services. If a relationship was found, recommendations would be made to county policymakers to ensure continued investment in these strategies to maintain or even improve the uptake rates post-program. The study's purpose was to evaluate the contribution of health innovations and socio-economic factors on the uptake of skilled birth delivery services in Kimilili Sub County, Bungoma County, Kenya, by examining the association and influence of socio-economic, cultural, and innovative factors on this uptake.

1.3 Objective of the Study

To evaluate the contribution of health innovations and socio-economic factors on the uptake of skilled birth delivery services in Kimilili Sub County, Bungoma County, Kenya.

1.4 Research Question

To what extent did the tested factors and innovations influence the uptake of skilled birth delivery services in Kimilili Sub County, Bungoma County, Kenya?

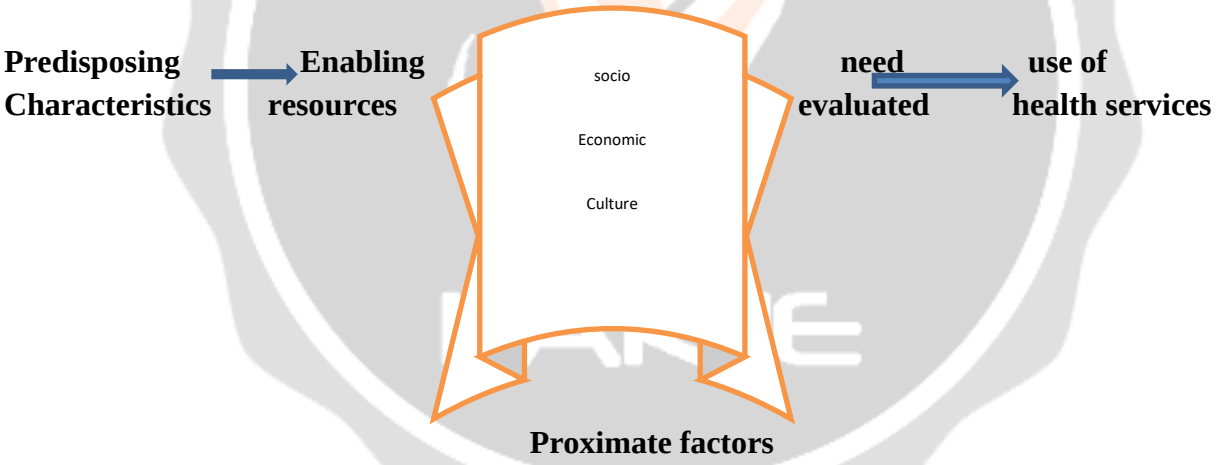
1.5 Conceptual Framework

Andersen's behavioral model of use of health services (Andersen RM, 1995)

2.1 Theoretical Review

This research utilized Andersen's Behavioral Model of Health Services, a framework extensively applied to identify the determinants of an individual's health care utilization. The model categorizes these determinants into predisposing factors, enabling factors, and evaluated needs factors. In this study, health innovation featuring predisposing characteristics empowered the resource-constrained health sector to meet the predetermined objective of increasing the number of women delivering with skilled birth attendants. This health innovation had to function within the inherent background proximate factors, including demographic data, socio-economic conditions, and cultural influences.

Figure 2. 1 Theoretical framework



Andersen's behavioral model of use of health services (Adopted from Andersen RM, 1995).

2.2 Empirical Review

2.2.1 Uptake of Skilled Birth Delivery Services

To reduce maternal morbidity and mortality, it is crucial for every baby to be delivered with the assistance of a skilled birth attendant, such as a medical doctor, nurse, clinical officer, or midwife. Experts assert that the presence of a skilled birth attendant during delivery can lower the risk of stillbirth or maternal death due to intrapartum complications by about 20 percent (UNICEF, 2017). Recognizing its significance in reducing maternal morbidity and mortality, skilled birth attendance was included as indicator 3.1.2 under goal 3 and target 3.1 of the Sustainable Development Goals (UNICEF, 2019).

Various studies have explored factors that influence the use of maternal health services, focusing on health innovations and socioeconomic factors within specific age groups and regions. However, there is limited knowledge about changes in

demand for skilled birth attendance and the factors influencing the choice and location of delivery for mothers who had given birth in the five years preceding the studies. The World Health Organization (WHO) estimates that 300,000 women die from pregnancy-related causes yearly, with about 830 mothers dying daily (WHO, 2015, cited by UNICEF, 2019). Approximately 62% of maternal deaths worldwide occur in Africa, with Sierra Leone having the highest maternal mortality rate (MMR) at 1360 per 100,000 live births, followed by the Central African Republic at 882 per 100,000 live births (WHO, 2015). In contrast, countries like Finland and Greece have an MMR of 3 per 100,000 live births (WHO, 2015), a difference likely explained by varying levels of state development and other factors.

According to the Commission on Information and Accountability for Women and Children's Health 2013 Update Report, over 100,000 children died before their fifth birthday in 2012 due to preventable causes, and more than 500,000 women aged 15 to 49 die annually from pregnancy and childbirth-related causes that are preventable (WHO, 2019). In 2000, WHO estimated the lifetime risk of maternal death to be 1 in 16 in sub-Saharan Africa, compared to 1 in 2800 in developed countries (WHO, 2000). The United Nations General Assembly reported that quality antenatal care and assistance by skilled birth attendants significantly reduce maternal and child mortality rates, key indicators for achieving the Millennium Development Goals for Vision 2030 (United Nations General Assembly, 2000).

Ann Gitimu et al. (2017) emphasized the importance of promoting behavior change to enhance demand for skilled birth delivery services. The Kenya Demographic Health Indicator Survey (KDHIS) reported a reduction in the maternal mortality ratio for Kenya from 741 per 100,000 in 1998 to 342 per 100,000 live births in 2017, attributed to improved healthcare, literacy, nutrition, hygiene, and promotion of skilled delivery services (KDHIS, 2017). WHO (2017) stated that skilled care before, during, and after childbirth saves the lives of mothers and newborns. While the rate of skilled deliveries is low in developing countries, developed countries report few or no unskilled deliveries. This variation in maternal death rates can be matched with differences in these factors.

In Kenya, the utilization of skilled delivery services varies by region. The North Eastern province had a skilled delivery rate of 32.3% in 2008, consistent with high maternal mortality rates in Mandera and Wajir counties (KDHS, 2008). Poor rural communities with numerous challenges experience the highest rates of maternal death, which the Ministry of Health addresses with scientifically proven policies and health innovations. An observed increase in the rate of skilled delivery (DHIS, 2020) in Kenya may lead to reduced maternal and child mortality.

Achieving universal health coverage is central to Sustainable Development Goal 3, which aims to ensure healthy lives and promote well-being for all ages. The Countdown to 2030 initiative tracks progress in countries with high maternal and child mortality burdens. A UNICEF report highlighted reductions in maternal and child mortality over the past two decades, indicating that greater efforts are needed to achieve the 2030 goals (UNICEF, 2020). Data from the United Nations shows a 38% reduction in maternal mortality from 2000 to 2017, translating to an average annual reduction of 2.9%, which is below the 6.4% needed to achieve the sustainable goal of 70 per 100,000 live births (UN, 2019). South Asian countries reduced maternal mortality from 365 per 100,000 to 163 per 100,000 over 17 years, a success attributed to sustainable skilled health delivery services like those observed in Kenya.

The WHO (2015) reports that 80% of maternal deaths are preventable, even in low-income countries, and that skilled attendance at delivery can avert approximately 16–33% of maternal deaths. In 2006, international evidence from Nigeria revealed that only about one-third of births were attended by skilled personnel, consistent with findings from other developing countries, including Kenya (MOH Nigeria, 2006).

2.2.2 Health Innovations and Social Economic Factors

In 2018, Beyond Zero expanded its operations with a new strategic framework (2018-2022) that included increasing the enrollment of pregnant women in the Kenya National Hospital Insurance Fund (NHIF) or Linda Mama Program. This aimed to reduce the financial burden on mothers and promote access to skilled birth delivery services, thereby reducing maternal mortality. The United Nations (UN) member states' community strategy seeks to improve community access to global health care, enhancing individual productivity and reducing poverty, hunger, and child and maternal deaths (Community Health Strategy Implementation Guide, 2007). In Kenya, one key innovation was the introduction of Community Health Units (CHUs) to empower households to improve their primary healthcare through health promotion and risk identification.

The concept of birth companions (BCs) was introduced to transform the roles of traditional birth attendants (TBAs) from assisting with home deliveries to escorting mothers to skilled birth attendants, as outlined in WHO guidelines (WHO, 2020). BCs, often laypeople with no formal medical training, receive basic health lessons and advocacy training to educate communities about disease prevention and early danger signs in pregnancy. Research by Ngigi (2009) identified distance

from service providers as a significant factor influencing the uptake of delivery services in Webuye East, Bungoma County. Despite efforts by partners and NGOs, the rate of unskilled births remained high until new innovations were introduced. Chuma and Maina (2016) reported that despite the introduction of free maternal health services in Kenya in 2013, the country's economic performance improved, transforming it from a low to middle-income country. This suggests that free maternal health services did not negatively impact the economy, warranting further study.
WHO's 2016 guidelines on birth companions emphasize their role in increasing skilled birth delivery (SBD) rates. Birth companions, who are Community Health Volunteers (CHVs), support pregnant mothers throughout pregnancy, labor, and postpartum periods, offering practical and emotional support (WHO, 2020). In England, birth companion groups are recognized and supported by local authorities and partners.

The involvement of CHUs in Kenya, supported by Beyond Zero, includes public sensitization programs to encourage early health screenings and antenatal clinics, promoting primary health care and reducing costs and time through community dialogue and action days. A 1995 agreement between WHO, UNICEF, and UNFPA aimed to promote adolescent health and development, with a focus on providing tailored information and services for youth (WHO, 1995). Perez (2009) found that education level and age significantly influenced the utilization of youth-friendly reproductive health services, while religion and parental employment status had a lesser impact. Economic factors, such as poverty and financial constraints, negatively affect health-seeking behavior (Saeed, 2016). Godia et al. (2014) noted that adolescents and young people have unique behaviors influencing their health-seeking actions. Gabrysch and Campbell (2009) found that older mothers are more likely to deliver in health facilities due to greater confidence in the health system and knowledge of risks, while young mothers are more inclined to follow modern trends.

Increased education levels enhance women's autonomy and decision-making capacity regarding delivery place (Koblinsky et al., 2006). Khosla et al. (2015) emphasized the importance of sexual health in overall well-being, noting that antenatal care and skilled delivery services are influenced by socioeconomic and cultural factors. Findings from the 1994 ICPD in Cairo highlighted the unique socio-economic needs and vulnerabilities of youth (Aden et al., 2018). Nalalie (2013) discussed financial constraints as a barrier to accessing health services, particularly for unemployed youth who feel embarrassed to ask parents for money for reproductive health services. Zahan (2014) and Ndayishimiye (2020) also identified high costs as a significant barrier to quality health services. Employment status can increase a woman's independence and ability to choose her delivery place (Koblinsky et al., 2006). Interventions involving birth companions have shown improvements in skilled birth attendance (Magoma et al., 2013).

3.0 Research Methodology

The study utilized a quantitative descriptive analytical cross-sectional survey research design. The objective was to describe and analyze the relationship between the independent variables (innovations and factors) and dependent variables (Creswell, 2012). This survey design also focused on gathering data regarding the occurrence or incidence of events (deliveries) in different contexts and situations (innovations and factors) to understand the reasons, opinions, attitudes, preferences, and perceptions of individuals relevant to the research (Orodho, 2003).
The research was conducted in Kimilili Sub County, Bungoma County, Kenya. The sample frame included mothers aged 15 to 45 years with children residing in Kimilili Sub County. The sample population consisted of mothers who had lived in Kimilili Sub County for at least one year and had children aged 0-59 months. Both probability and non-probability sampling techniques were employed, beginning with a listing of all 25 community health units (CHUs) and all mothers with children aged 0-59 months in those CHUs who had lived in Kimilili Sub County for at least five years before the study.
The sample size of mothers participating in the study was calculated using Cochran's formula as detailed below:

$$n = \frac{\left(Z\,{}^{\alpha}/_{2}\right)^{2} p(1-p)}{e^{2}}$$

P = 0.885
e = 0.05
α = significance level=0.05
Z = 1.96
Total sample size =n + 10 % (n)=384+38=422.
The Total sample size was then divided by the total number of CHUs (25) in the sub county
(422/25) which was rounded to a figure of 17 Mothers that was randomly sampled from each CHU using rotary method.

422/25 CHU =16.88 mothers/CHU. Rounded off to 17mothers /CHU.

Data was collected using a pre-tested structured questionnaire and a checklist, both administered by the research assistant. Questionnaires were chosen for this study because, as Kombo and Tromp (2006) suggest, they are effective for collecting data from large samples and are time-efficient. Additionally, they minimize bias from both the researcher and respondents. The collected data was organized and presented in tables, charts, and graphs for analysis. The study focused on women aged 15-49 years with children aged 0-59 months. The data gathered through the questionnaires was validated, edited, and coded, which helped determine the return rate of the questionnaires.

Data cleaning and analysis were conducted using STATA version 14, following the presentation of the data in tables, charts, and graphs. Descriptive statistics, such as means and percentages, were used to summarize and assess the relationship between identified innovations and factors influencing Skilled Birth Deliveries. Multiple regression analysis was employed to examine the relationship among the three innovations in scaling up Skilled Birth Delivery uptake. Odds ratios (OR) and 95% confidence intervals (CI) were calculated.

4.0 Findings

4.1 Demographic Characteristics

Before conducting the actual analysis, the demographic characteristics of the respondents were examined. These characteristics included gender, education level, and work experience. The findings are summarized in Table 1.

Table 1: Demographic Characteristics

	Place of Delivery								
Age of Mother	**Attendant's Home**		**Health Facility**		**On the Way**		**Total**		
	n	**%**	**N**	**%**	**n**	**%**	**N**	**%**	**Pr**
Teenage Mother (13 -19)	0	0.00	83	100.00	0	0.00	83	100.00	
Young Mother (20 -35)	4	1.79	216	96.43	4	1.79	224	100.00	
Adult Mother (36 -44)	8	8.89	79	87.78	3	3.33	90	100.00	
Elderly Mother (45-49)	0	0.00	6	100.00	0	0.00	6	100.00	**0.006**
Religion									
Christian	1	3.12	337	95.47	5	1.42	353	100.00	
Muslim	0	0.00	27	93.10	2	6.90	29	100.00	
Native	0	0.00	3	100.00	0	0.00	3	100.00	
Protestant	1	5.56	17	94.44	0	0.00	18	100.00	0.378
Employment Status									
Employed (Salaried)	3	7.69	36	92.31	0	0.00	39	100.00	
Self employed	4	2.48	155	96.27	2	1.24	161	100.00	
Unemployed (Unsalaried)	5	2.46	193	95.07	5	2.46	203	100.00	0.309
Level of Education									
Up to Primary 8	8	5.10	147	93.63	2	1.27	157	100.00	
Form Four	2	1.07	182	97.33	3	1.60	187	100.00	
Tertiary/College	2	3.39	55	93.22	2	3.39	59	100.00	0.201
Parity									
1	2	1.77	111	98.23	0	0.00	113	100.00	
2	0	0.00	97	100.00	0	0.00	97	100.00	
3	1	1.16	81	94.19	4	4.65	86	100.00	
4	2	3.70	52	96.30	0	0.00	54	100.00	
5	3	6.98	40	93.02	0	0.00	43	100.00	
6	1	20.00	3	60.00	1	20.00	5	100.00	
more than 6	3	60.00	0	0.00	2	40.00	5	100.00	**0**

Table 1 above indicates that age (p=0.006) significantly impacts the choice of delivery location among mothers. Analysis of frequencies and percentages reveals that teenage and elderly mothers (ages 13-19 and 45-49, respectively)

predominantly opt for skilled birth delivery services (SBDS). Conversely, young and adult mothers show rates of non-skilled birth attendance at 3.5% and 12.1%, respectively.
Similarly, parity (p=0.000) significantly affects SBDS uptake. The table illustrates that mothers with six or more births have notably lower rates of skilled birth delivery services, at 60% and 0% respectively.
In contrast, religion does not significantly (p=0.378) influence SBDS uptake, with non-skilled birth rates ranging from 4 to 6 births per hundred across different religions. The introduction of Birth Companions addresses cultural barriers restricting men from supporting their wives during pregnancy and accompanying them to health facilities.
Employment status also shows no significant association (p=0.309) with skilled birth delivery service uptake, with non-skilled delivery rates ranging from 3 to 7 births per hundred across different employment levels.
Lastly, education level does not influence SBDS uptake (p=0.201), with 2 to 6 births across various education levels occurring without the assistance of a skilled birth attendant.

4.2 To understand the extent of contribution on uptake of skilled birth delivery services by the Health Innovations and socio economic factors

This section describes the results of a multivariate binary logistic regression analyzing the impact of health innovations and socio-cultural variables on the uptake of skilled birth attendance.

4.2.1 Health Innovations

A multivariate binary logistic regression model was conducted to evaluate how health innovation factors influence the utilization of skilled delivery services in Kimilili Sub-County. According to the model, mothers who were aware of the Linda Mama program were significantly more likely to opt for skilled delivery, being 181 times more likely compared to those who were not aware of this intervention (p=0.000). The regression model demonstrated statistical significance in explaining changes (p=0.000) in skilled birth uptake, accounting for 18.57% of the variance in skilled birth attendance. Refer to Table 4 for more details.

Table 4.1 Binary Logistic Regression Knowledge of Health Innovations against Skilled Birth Uptake in Kimilili Sub County

Health Innovations effect on Skilled Birth Uptake	**Odds Ratio**	**P>z**
Heard of Linda Mama	**181.00**	**0.000**
Heard of Beyond Zero	0.252	0.080
Prob > chi2 = 0.000	**Pseudo R2 = 0.1857**	

4.2.2. Socio- economic and cultural factors

In general, both parity and the entity responsible for covering delivery costs significantly influenced the uptake of skilled birth deliveries (p=0.005 and p=0.000, respectively), according to binary logistic regression analysis. Holding all other factors constant, an increase in parity by one unit was associated with a 0.34 decrease in skilled delivery uptake. Similarly, the individual or institution responsible for covering delivery expenses influenced skilled birth uptake by 0.033 units. The model effectively explains changes in skilled birth uptake (p=0.000), accounting for 69.78% of the variation (Pseudo R2=0.6978). Refer to Table 5 for more details.

Table 4.2 Socio-demographic and socio-economic factors affecting skilled birth uptake

Factors Affecting skilled birth uptake	**Odds Ratio**	**P>z**
Parity	**0.3376**	**0.005**
Who Paid for service	**0.03323**	**0.000**
Heard of Linda Mama	16.4538	0.386
Prob > chi2 = 0.0000	**Pseudo R2= 0.6978**	

5.1 Summary of Findings

In Kenya, there has been a significant increase in skilled birth attendance from 2003 to 2014, rising by approximately 20% to reach 62% (KDHS, 2014). To further enhance utilization of skilled birth services, the Ministry of Health and various Non-Governmental Organizations introduced health innovations aimed at overcoming barriers to access. In Kimilili sub-county, these efforts included initiatives like Linda Mama, Birth companion, and the Beyond Zero campaign, contributing to a notable increase in skilled birth uptake to 88.5% in 2020, surpassing national and county averages (DHIS, 2011-2020).

This study identifies socio-demographic factors such as age, parity, and marital status as significant influences on the utilization of skilled birth delivery services. Contrary to previous findings, teenage and elderly mothers were found to be more likely to utilize skilled delivery services, potentially due to targeted health education and support from initiatives like Birth companion. This contrasts with earlier studies suggesting younger and adult mothers were less likely to seek skilled delivery care.

Parity was highlighted as a factor negatively impacting skilled birth uptake, aligning with previous research indicating that women with more children are less inclined to use skilled birth services. Education was found to positively influence attendance at skilled deliveries, echoing findings that higher education levels empower women in household decision-making, including choices about childbirth location.

Marital status also emerged as a predictor, with single mothers showing a higher likelihood of seeking skilled birth services, possibly due to greater autonomy or financial relief. In contrast, socio-economic factors like employment status and socio-cultural factors such as religion did not show significant associations with skilled birth attendance in this study, possibly due to the influence of health education initiatives that enhance maternal knowledge and decision-making.

Overall, these findings underscore the complex interplay of socio-demographic factors in shaping access to and utilization of skilled birth services, suggesting targeted interventions can effectively address barriers and improve maternal healthcare outcomes.

5.2 Conclusions and Recommendations

The study found that health innovations like Linda Mama and Birth Companion, which provide financial and emotional support during pregnancy, significantly increase the rates of skilled deliveries in Kimilili Sub County. Based on these findings, the following recommendations were made: Health managers should strategize on ways of ensuring sustainable payment for delivery services since this is key for sustained increase in skilled birth delivery.

1. Health managers should develop strategies to ensure sustainable funding for delivery services, which is crucial for maintaining the increased rates of skilled birth deliveries.
2. The county government should explore ways to enhance the effectiveness of Linda Mama and Birth Companion programs in the county to ensure continued uptake of skilled birth services.
3. Further research should be conducted to explore the potential integration of Linda Mama and Birth Companion programs into the Community Health Strategy, either individually or together.

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