Correlates of Utilization of Skilled Maternal Health Services in Siaya County, Western Kenya

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Abstract: _Background: Evidence suggests that antenatal care, skilled attendance at birth, postnatal care and continuum of care are key factors in reducing the risk of maternal death. However, in counties such as Siaya County, utilization of skilled maternal health services has remained low with high maternal morbidity and mortality from preventable conditions. Hence this study aimed to assess the correlates of utilization of skilled maternal health services in Siaya County in western Kenya._ _Methods: The study was carried out in Siaya County as a baseline for a longitudinal study which was involving a total of 517 pregnant women who had had previous maternal health utilization experience (those who had had previous delivery). The correlates were identified using binary and multivariate logistic regression._ _Results: Those who received at least one antenatal care visit were 84.9%, skilled delivery were 55.7% while only 23.6% received post-natal care within 48 hours of delivery. Of note was that only 53.2% received the WHO recommended ≥4 ANC visits. This study also revealed that those with no source of income (aOR=0.96, 95% CI: 3.21–8.27) and farmers (aOR=0.37, 95% CI: 7.32–6.74) were less likely to utilize maternal healthcare services relative to traders/self-employed and salaried. Women with secondary (aOR=2.62, 95% CI: 4.33–4.58) and tertiary (aOR=1.43, 95% CI: 2.87–4.63) education were more likely to utilize maternal healthcare services relative to those with no education and those with primary education. Similarly, women whose husbands had no education (aOR=0.89, 95% CI: 2.07–1.60) or had primary education (aOR=0.89, 95% CI: 2.07–1.60) were less likely to utilize maternal healthcare services relative to those whose husbands had secondary or tertiary level of education. Those who walked (0.91 (1.62-2.88) or used bicycle 0.84 (1.69-2.02) were less likely to utilize skilled maternal health services compared to those who used motorbike or private car. Despite intensified follow ups, only 53.2% utilized 4th antenatal care visits which could be an indication that there was pregnancy uncertainty. The study also revealed that some households (15.3%) had never been visited by a community health volunteer (CHV) which is an indication of disconnect in the continuum of care._ _Conclusion: Having no source of income, being a farmer, low education, husband/ partners education and walking or using a bicycle to hospital were significantly associated with low utilization of skilled maternal health services. There is need to avail pregnancy testing kits at the community for early diagnosis of pregnancy followed by early initiation of antenatal care services. A well designed performance evaluation system is important in ensuring that CHVs visit all the households assigned to them and that they deliver their tasks appropriately. Hence programs targeting increased utilization of skilled maternal health services needs to address these barriers._

Keywords: Skilled maternal healthcare services, continuum of care, facility factors, communal factors

1. Introduction

Globally, a woman dies every two minutes from complications related to childbirth [1]. Of note, approximately 800 women die from preventable causes related to pregnancy and childbirth every day, with most of the deaths and disability occurring among women of reproductive age in the developing countries of the world [2]. Previous studies have shown that a woman's lifetime risk of dying in pregnancy or childbirth is 1 in 150 in developing countries compared to 1 in 3800 in developed countries [1]. This is partly due to inadequate utilization and poor quality maternal health care, antenatal care, skilled attendance at birth and postnatal care [3, 4]. Hence there is a need for women to maximize utilization of skilled maternal healthcare services (antenatal care, skilled attendance at birth and postnatal care) in order to prepare physically, mentally and even logistically for childbirth. Studies have shown that antenatal care is critical in improving maternal and neonatal health outcomes [3, 4] through delivery of targeted interventions and use of emergency obstetric care services at the health facilities [3].

The World Health Organization (WHO) recommends a minimum of four antenatal care visits, based on reviewing the effectiveness of different models of service delivery [5]). WHO guidelines also specify the content of antenatal care visits, which should include blood pressure measurement, urine testing for bacteriuria and proteinuria, and blood testing to detect syphilis and severe anemia [2]. Some other services, including giving tetanus immunization, providing iron and folate tablets and teaching women about danger signs of pregnancy complications, are also important to improve both maternal and newborn health [6]. Access to skilled delivery care is key to reducing maternal mortality, particularly in sub-Saharan Africa, where 99% of maternal deaths occur [7]. Evidence suggests that skilled attendance at birth, access to emergency obstetric care and postnatal care are key factors in reducing the risk of maternal death, in both industrialized and developing countries [6, 8, 9]. However, utilization of skilled attendance at birth in developing countries low with only 34% in the least developed countries delivering in a health facility providing skilled care [1]. Compared to antenatal care and skilled attendance at birth, postnatal care has been largely neglected in safe motherhood programs in developing countries [6]. Postnatal care, especially within the first 48 hours after birth,

is critical to the management of postpartum hemorrhage, an important cause of maternal deaths in developing countries [6]. Postnatal care is an important opportunity to asses the physical and psychosocial health of the mother and baby and has been shown to be a key strategy for reducing maternal mortality[10, 11] though the majority of women in developing countries do not receive it [10, 11]. Continuum of care throughout pregnancy, childbirth and postnatal period is also considered key in improving maternal and newborn health in order to reduce maternal and child morbidity and mortality [12, 13]. According to partnership for maternal, newborn and child health, 2011; Community Health Volunteers are important in identification of pregnant mothers and referrals, follow up and provision of community maternal health care services[13]. Previous studies and reviews have showed that that community health workers are important in provision of a continuum of care for maternal and child health services[14-17].

Kenya was among the top ten countries that contributed to 58% of the global maternal deaths reported in 2013 [18]. Maternal mortality levels in Kenya have remained high at 495 per 100,000 live births [19], well above the MDG target of 147 per 100,000 by 2015 [20]. With over 6,000 women dying every year due to pregnancy related conditions despite the launch of Safe Motherhood campaigns twenty years ago [21, 22]. In addition, it is estimated that another 20-30 women suffer serious injury or disability due to complications during pregnancy or delivery in Kenya [23]. These high rates have persisted despite improvements in other health indicators over the past decades [24]. This problem is partly due to lack of access to skilled maternal health services, including ante-natal care, skilled delivery, and post-natal services [24]. Although there has been increased growth of health sector infrastructure, many women face various barriers to accessing skilled maternal health services[24-26] , This is attributed to supply-side and demand-side factors including individual and household factors, socio-cultural factors and health facility factors[24, 27, 28]. In Kenya there are major gaps and challenges associated with supply-side and demand-side factors leading to geographical disparities in coverage of health services between counties, urban and rural residents and different population groups[19]. In attempt to address the identified challenges affecting uptake of skilled maternal healthcare services, the government of Kenya introduced community health strategy to empower individual and families to take responsibility for their health[29] and also initiated a policy of free maternity services in all public facilities[25].The Kenya reproductive health policy also emphasized continuum of care for reproductive maternal and child health which includes the seamless and integrated service delivery for women and children throughout the life cycle-from pregnancy to delivery and the immediate postnatal and childhood period, and across all places of care [30].

The use of community health workers in creating demand for skilled maternal health care services in Siaya County began in 2006 after the launch of the NHSSP 11 and the county has so far managed to scale up these services to reach every household in the county [31].However despite all the effort, Counties like Siaya County continue to have high maternal deaths (691/100,000 live births) above the national

average of 495 deaths for every 100,000 live births, with most of these deaths being attributed to home deliveries and low utilization of skilled maternal healthcare services [20]. Previous studies done in Siaya County to establish factors affecting utilization of antenatal care services associated low uptake of antenatal care with uncertainty about pregnancy, poor communication between health workers and women, cultural and religious beliefs, vague knowledge and quality of ANC services among others [32, 33]. However, the researcher could not trace any study related to uptake of skilled delivery and postnatal care services in Siaya County despite the worrying trend. Although in the quest to increase utilization of skilled maternal health services in Siaya County, the county has scaled up implementations of key interventions such as provision of free maternity services, training of healthcare providers on focused antenatal care and scale up of community healthcare services to enhance maternal healthcare continuum[31, 34] utilization of skilled maternal healthcare has remained low; 4th antenatal care-45%, skilled delivery -52% and postnatal care- 30% [34] while mothers continue to die from preventable conditions. Therefore, this study aims to identify correlates associated with utilization of skilled maternal health services among women currently pregnant and had an experience of giving birth prior to the study period from selected community health units in Siaya County.

2. Material and Methods

Study design, setting and participants

The study was carried out in Siaya County as a baseline for a longitudinal study which was involving a total of 517 pregnant women who had had previous maternal health utilization experience (Those who had had previous delivery). The baseline took 21/2 months beginning January 7th to 25th March 2015. The study was conducted in 8 community health units (CHU) and their link facilities in Siaya County. Siaya County is one of the counties in Kenya located in the western region of the Country. It has six sub counties namely Ugenya, Ugunja, Gem, Siaya Alego, Rarieda and Bondo with an estimated population of 935,555 [35]. The county has sex-balanced ratio of female: male (52:48) with the population being predominantly youthful and 23 percent of the population is made up of women of reproductive age 205,356 (15-49). The estimated no of pregnant women is 37,592 and estimated deliveries is 37,592[34]. The study was conducted in selected community health units and their link health facilities. The County has a total of 156 health facilities out of which 122 are government facilities. The County has 187 community health units (an equivalent of a sub location) linked to the government health facilities and 2148 Community health volunteers (CHVs) who provide community based healthcare. Each community unit has approximately 10 CHVs who manage about 100 households each. The study sites included Ndori community unit linked to Akala Health Center in Gem Sub County; Nyawita Community Unit linked to Nyawita dispensary in Bondo sub county; West Katweng'a Community Unit linked to Chianda Dispensary in Rarieda Sub County, Gongo community unit linked to Gongo Dispensary in Gem Sub county and Ulafu and Umala community unit linked to Umala dispensary in Alego Usonga sub county, Marenyo community Unit linked to

Midhine dispensary and Yiro west community unit linked to Sikalame dispensary in Ugunja sub county. The term community unit referred to in this study is an equivalent of a sub location [36]

Study population

Pregnant women with previous delivery experience and living within the selected community health units were enrolled in the study. The link health facility and Community Health Workers (CHWs) were consulted to get lists of mothers.

Sampling and sample size calculation

The desired sample size was determined using the formula of Fisher et al 1991 as cited in Mugenda and Mugenda 2003: The target population was pregnant women in Siaya County while the accessible population was pregnant women from the selected community health units. Since Siaya County has a population of 939,793(Siaya AWP3, 2014) and women of child bearing age form 23% = 216,153 (Siaya Annual Work Plan 3- 2014/15). The target population is pregnant women who account for 4% of the total population = 4% of 939,793 = 37592

$$n = \frac{N}{1+N(e)^2}$$

n = the desired sample size (if the target population is greater that 10,000)
N = Population size
e = Accepted level of error taking alpha as 0.05
Therefore:
$$n = \frac{37592}{1+37592(0.05)^2}$$
n= 400

The sample size was increased by 20% to take care on non-response and fall outs. A final minimum sample size of 480 was obtained. However since the study was longitudinal with the likelihood of having fall outs, all pregnant women with previous delivery experience who were living within the selected community health units and were willing to participate were enrolled for the study thus bringing the number to 517.

The study sites were selected using multistage simple random sampling methodology. From a sampling frame of all community health units per sub-county, one community unit was randomly picked from the list in each sub county and having calculated that each community unit would have approximately 50 pregnant mothers, for the study to achieve the recommended target of 400, an additional of 2 community health units had to be selected randomly to be included. In total 517 sampled pregnant mothers who were willing to participate in the study were interviewed using structured questionnaires. All the questions were directed to the women's maternal health utilization experience in the previous pregnancy. Data was collected on four indicators of the use of maternal healthcare services (antenatal care, skilled attendance at birth, postnatal care and continuum of care) using structured questionnaires.

Informed consent process

Information on skilled maternal health were given to the pregnant women who were selected from the sample frame by research assistants as part of the informed consent process before signing the consent form. The study questionnaires and key informant interviews were administered thereafter.

Participants and Recruitment

The participants were recruited through a combination of random and purposive sampling methodology. Some were invited to participate in the interview after being attended to at the link health facility; others were identified through snowballing technique and others through household's visitation. Purposive sampling was used to capture the community health workers and health providers from the selected community health units and link health facilities.

Data Analysis

The quantitative data was analyzed using both descriptive and inferential statistics. The descriptive statistics was used to describe and summarize the data inform of tables, frequencies and percentages. The inferential statistics was used to help make inferences and draw conclusions. Statistical tests including chi-square test, bivariate and multivariate logistic regression analysis was carried out to identify barriers associated with utilization of maternal health care services. All tests of significance was computed at $\alpha = 0.05$. The Statistical Package for Social Sciences (SPSS) version 22 was used to analyze the data.

Ethical Consideration

The study was approved by the ethical review board of University of East Africa Baraton (REC: UEAB/05/02/2015).All the study participants parents and legal guardians gave their written informed consents.

3. Conceptual Framework

The model to be used in this study is adopted from Anderson and Newman (1973 and1995).This behavioral model propose that the use of health care services is a function of three sets of individual characteristics: Predisposing, Enabling and Need characteristics. In this study, the following were taken into considerations; (i) predisposing characteristics to include; age, education, marital status, education, husbands education and employment status, health-related attitude, Autonomy and current maternal health status. (ii) Enabling characteristics to include; income, availability and accessibility of maternal health including the package provided during ANC, delivery and postnatal care, distance and transport to facility and Community support systems including community health volunteer's services, referral systems in place and continuum of care situation.(iii) need characteristics that include; maternal health status (whether pregnant, delivered or postnatal), awareness of availability of skilled maternal health care services, perceived / expected benefit from treatments, Knowledge on importance of skilled maternal healthcare services, past history of utilization of skilled maternal health care and quality of interaction with the skilled health care provider. To ascertain that continuum of care services are being provided at the community, availability of tools being utilized for documentations of services provided will be examined.

4. Results

Characteristics of Participants
As shown in table 1, most women (32.5%) were aged between 15-19 years, 72.5% were married and 39.1% were farmers. Most of the women and their partners or husbands had primary education 64% and 46% respectively while a majority (57.3%) walked to the health facility. In addition for most (38.7%) women it is their husbands who had authority over health issues.

Table 1: Summary of Socio-demographic characteristics of respondents (n=517) and utilization of maternal healthcare services in Siaya County.

Characteristics	n (%)	*P* Value
Age		
15-19 years	168 (32.5)	
20-24 years	162 (31.3)	
25-29 years	82 (15.9)	0.4931
30-34 years	58 (11.2)	
>35 years	47 (9.1)	
Marital Status		
Married	375 (72.5)	
Single	115 (22.2)	
Widow	22 (4.3)	**0.0001**
Separated	5 (1.0)	
Source of income		
None	102 (19.7)	
Farming	202 (39.1)	**0.6321**
Trading/self employed	140 (27.1)	
Salaried	73 (14.1)	
Level of education completed		**0.0023**
None	7 (1.4)	
Primary	331 (64.0)	
Secondary	166 (32.1)	
Tertiary	13 (2.5)	
Husbands / Partners Education		
None	100 (19.3)	
Primary	238 (46.0)	
Secondary	160 (30.9)	**0.0016**
Tertiary	19 (3.7)	
Authority over health/Autonomy		
Self	124 (24.0)	
Husband	200 (38.7)	
Family member	92 (17.8)	**0.02**
Grand parents	97 (18.8)	
Significant others	4 (0.8)	
Means of transport to facility		
Walked	296 (57.3)	
Bicycle	25 (4.8)	
Motorbike	193 (37.3)	**0.0042**
Private car	3 (0.6)	

Values in parentheses indicate % of total (n = 517). Chi-square test was used to test association between socio-demographic characteristics and utilization of maternal health services and other group. Bold font indicates "significantly associated at p < 0.05.

History of utilization of skilled maternal health care services
Out of the 517 respondents, 439 (84.9%) of the mothers received antenatal care (ANC) services, 288 (55.7%) received skilled delivery while only 122 (23.6) received post-natal care. Out of the 517 respondents, 439 (84.9%) of the mothers received Antenatal care (ANC) services while 15.1% did not receive the ANC services. Out of those who received ANC services, 53.2% received ≥4 ANC visits while their counterpart's 46.9% received <4 ANC services. Moreover, out of the 288 (55.7%) of the mothers who had Skilled delivery services; 47.7% of them had <4ANC visits while 52.3% of the mothers had ≥4 ANC visits. Again, out of 122 (23.6%) of the mothers who managed to have Postpartum care services, 55.2% of them had <4ANC visits while 44.8% of the mothers had ≥4 ANC visits (Table 2).

Table 2: Utilization of skilled maternal health care services

Maternal Health services	Total, n (%)	<4ANC (%)	≥4 ANC (%)	P value
Antenatal care (ANC)	439 (84.9)	46.9	53.2	
Skilled delivery	288 (55.7)	47.7	52.3	**0.003**
Postpartum care	122 (23.6)	55.2	44.8	

Association between knowledge and utilization of skilled maternal health care services
Knowledge plays a very important role in enhancing utilization of maternal health care services. Our data indicate that a majority of the respondents at 338 (65.4%) had **inadequate** knowledge on maternal health services. Furthermore, a majority (58.7%) of the respondents who were knowledgeable attended ≥4 ANC. The findings revealed significant (p=0.007) association knowledge and utilization of ANC services. Out of 517 mothers who participated in the study, 55.9% had adequate information on maternal health danger signs while 44.1% had inadequate. Out of the 55.9% of the mothers who had adequate information on danger signs; majority of them at 62.4% attended ≥4 ANC visits. The findings further revealed that there is association between knowledge of danger signs and utilization of maternal health care services (p = 0.001).

Table 3: Knowledge of Maternal Health Care services

Characteristics	Total, n (%)	<4ANC (%)	≥4 ANC (%)	P value
Knowledge on maternal health services				**0.007**
Adequate	179 (34.6)	41.3	58.7	
Inadequate	338 (65.4)	58.1	41.9	
Information on danger signs				**0.001**
Adequate	289 (55.9)	37.6	62.4	
Inadequate	228 (44.1)	62.8	37.2	

Continuum of care
On the continuum of care situation, table 3 shows that the majority of the mothers 438 (84.7%) had a CHV attached to their household. In addition, out of the 438 (84.7%) of the mothers who had a CHV attached to their household, only 119 (23%) of the mothers had been referred to the health facility by a CHV. The data further shows that out of those referred, only 12.0% were referred for pregnancy related care. Other referrals were for immunization services (12%) and curative services (12%) while 64.7% were referred to the health facility for either family planning, eye care and cervical cancer screening. All the mothers who participated in this study had no book/document in their household where services provided by the CHVs were recorded or referred to for continuum of care purposes. In addition, 434

(83.9%) of the mothers had the opportunity of being visited in their households by other health providers other than the CHV to offer services such as immunization 329 (75.8%), HIV Counseling and testing 65 (15%), pregnancy related services 28(6.4%), Health promotion 59(13.5%), net distribution 66 (15.1) and Malaria testing and treatment 28 (6.4).

Table 4: Continuum of care

Characteristics	Yes, n (%)	No, n (%)
Do you have a CHV attached to your HH?	**438 (84.7)**	**79 (15.3)**
Were you ever referred to the health facility by a CHV in your last pregnancy? If Yes, For what purpose	**119 (23.0)**	**398(77.0)**
Pregnancy related care	14 (12.0)	105 (88.0)
Immunization services	14 (12.0)	105 (88.0)
Curative services	14 (12.0)	105 (88.0)
Family Planning, Eye Care, Cervical cancer screening	77 (64.7)	42 (35.3)
Are there any book/ document in your household where services provided by the CHVs are usually recorded?	**0**	**517(100.0)**
Are there health providers who have visited your household in the past, other than the CHV?	**434 (83.9)**	**83 (16.1)**
If Yes, For what purpose?		
Pregnancy related services	28 (6.4)	386 (93.6)

Health promotion	59 (13.5)	375 (86.5)
HIV Counseling and testing	65 (15.0)	369 (965.0)
National immunization days	329 (75.8)	105 (24.2)
Malaria testing and treatment	28 (6.4)	406 (93.6)
Net distribution	66 (15.1)	368 (84.9)

Factors associated with utilization of skilled maternal health services

Multivariate regression analysis revealed that those with no source of income (aOR=0.96, 95% CI: 3.21–8.27) and those who were farmers (aOR=0.37, 95% CI: 7.32–6.74) were less likely to utilize maternal healthcare services relative to traders/self-employed and salaried. Further analysis showed that those with is secondary (aOR=2.62, 95% CI: 4.33–4.58) and tertiary (aOR=1.43, 95% CI: 2.87–4.63) education were more likely to utilize maternal healthcare services relative to those with no education and those with primary education. Similarly, the respondents' whose husbands had no education (aOR=0.89, 95% CI: 2.07–1.60) or had primary education (aOR=0.89, 95% CI: 2.07–1.60) were less likely to utilize maternal healthcare services relative to those whose husbands had secondary or tertiary level of education. Those who walked (0.91 (1.62-2.88) or used bicycle 0.84 (1.69-2.02) were less likely to utilize skilled maternal health services compared to those who used motorbike or private car.

Table 5: Factors associated with utilization of maternal health care Services

Variables	Yes, n (%)	Unadjusted odds ratio (95%CI)	Adjusted odds ratio (95%CI)
Main Source of Income			
None	102 (19.7)	0.21 (3.25–5.50)[**]	0.96 (3.21–8.27)[**]
Farming	202 (39.1)	0.33 (5.41–8.13)[**]	0.37 (7.32–6.74)[**]
Self-employed	140 (27.1)	1.00	1.00
Salaried	73 (14.1)	1.00	1.00
Level of education completed			
None	7 (1.4)	1.00	1.00
Primary	331 (64.0)	1.00	1.00
Secondary	166 (32.1)	3.23 (3.15–6.51)[**]	2.62 (4.33–4.58)[**]
Tertiary	13 (2.5)	2.05 (3.25–4.50)[**]	1.43 (2.87–4.63)[**]
Husbands / Partners Education			
None	100 (19.3)	0.91 (3.97–4.23)[**]	0.12 (4.23–2.59)[**]
Primary	238 (46.0)	0.13 (3.84–3.62)[**]	0.89 (2.07–1.60)[**]
Secondary	160 (30.9)	1.00	1.00
Tertiary	19 (3.7)	1.00	1.00
Means of transport to facility			
Walked	296 (57.3)	0.33 (2.94-3.41)[*]	0.91 (1.62-2.88)[*]
Bicycle	25 (4.8)	0.67 (1.21-2.60)[*]	0.84 (1.69-2.02)[*]
Motorbike	193 (37.3)	1.00	1.00
Private car	3 (0.6)	1.00	1.00

5. Discussion

Consistent with data displayed in DHIS 2014, the findings shows that although a majority (84.9%) of women received at least one ANC service, 55.7% utilized skilled delivery services while only 23.6% utilized postnatal care services. Averagely only about 50 % utilized at least 4 ANC visits as recommended by [37]. This utilization rate is still far below set target of increasing utilization of skilled delivery and 4th ANC services to 60% and 80% respectively [38].   Similar to findings from previous studies, the low uptake of skilled maternal health service may be partly due the inadequate knowledge among women (65.4%) on skilled maternal health services as revealed by the study[39, 40].In addition there was association between knowledge of danger signs and utilization of maternal health care services.

The use of community health workers in creating demand for health care services in Siaya County began in 2006 after the launch of the NHSSP 11. However, the gains have been very minimal especially with regard to uptake of skilled maternal healthcare services [34, 41] The low utilization of

skilled maternal healthcare services in Siaya County may be attributed to the fact that assumptions are made that all household (100%) are visited by CHVs which is not the case as revealed by this study that only 84.7% have had the opportunity of being visited by CHVs. Significantly our data also indicate that although 83.9% of the mothers in our study had been visited in their households by health providers other than the CHV, only 6.4% were offered pregnancy related services which is an indication that although more opportunities exist for engagement with mothers to create demand for skilled maternal healthcare services, they are underutilized.

More puzzling was the finding that, there was no (0%) book/document/evidence in all the households where services provided by the CHVs and other health providers were recorded or could be referred to for continuum of care purposes. Hence these data suggest that improving maternal healthcare continuum in Siaya County will require strengthening linkage between facility and community, enhancing household visitations and care continuum by providing households with health visitor's log-book for documentation of services provided by all health providers who visit the households and for reference purposes.

Similar to findings from previous studies that utilization of skilled maternal healthcare services is influenced by a multiplicity of factors including economic status of the mother, mothers education, husbands income, husbands education and distance to health facility/ transport costs [12, 40, 42-46]. The findings of this study also revealed the association between mother's education, income, husband's education and transport and utilization of skilled maternal healthcare services. As suggested in the Andersen's model that people's use of health services is a function of their predisposition to use services, factors which enable or impede use, and their need for care. The study adopted this model and assessed the use of services as defined to be a function of 3 main elements: need, enabling, and predisposing factors[47-49], the findings of this study shown above revealed that mothers education ($p<0.0023$), marital status ($p<0.001$), husbands education($p<0.0016$), transport ($p<0.0042$), knowledge on maternal health/ danger signs ($p<0.007/ p<0.001$) and continuum of care situation were associated with utilization of skilled maternal healthcare services, which is similar to Andersen's assertion.

These data therefore suggest the need to develop evidence based interventions targeting those with lower education, lower income, whose live far from the health facilities, empowering women with knowledge on maternal health, enhance maternal healthcare continuum by integrating health care service provision at the households to maximize every opportunity.

Conclusion
The study established that the major variables associated with the use of skilled maternal healthcare services include: mother's education, husband's education, means of transport to the health facility, knowledge of maternal health and continuum of care situation. Based on the observed statistics, accelerating the progress towards optimizing utilization of skilled maternal healthcare services in Siaya County would

require that the barriers identified above are addressed using context specific and evidence based interventions which include: Intensifying maternal education on importance of skilled maternal health care, instituting mechanisms of ensuring that each household has access to basic community healthcare services including monthly visitations by CHVs, enhancing maternal healthcare continuum by ensuring that all households are visited and for purposes of reference, a log book/ tool is placed at the household for documentation of all health services provided at the household.

What is known about this Subject Despite well publicized policies and guidelines on recommended interventions for increasing utilization of skilled maternal healthcare services, the uptake of skilled maternal healthcare services remain low in developing countries and mothers continue to die from preventable conditions. Community health volunteers are also known to be effective in creating demand for skilled healthcare services. **What this study adds** Apart from the socio demographic characteristics such as mother's income, low maternal education/ awareness, husband/ partner's education and transport; the support systems at the community also significantly affect utilization of skilled maternal healthcare services. To enhance effectiveness of community health volunteers in creating demand for skilled maternal healthcare services, performance monitoring mechanism should be instituted to ascertain household visitation and tools for documentation of services provided at the household level f. or reference purposes and care continuum.

6. Declarations

Ethical considerations
Ethical clearance was obtained from Research Ethics Committee of University of Eastern Africa, Baraton, Eldoret (REC: UEAB /05/02/2015). The research assistants were trained on research ethics. Informed written consent from the study participants was obtained and the objective of the study was explained to them. Privacy and confidentiality of collected information was ensured at all levels.

Consent to publish
Consent to publish was obtained from Research Ethics Committee of University of Eastern Africa, Baraton, Eldoret (REC: UEAB /05/02/2015).

Competing interests
The authors declare that there are no competing interests.

7. Author Contributions

OEO conceptualized the paper, searched literature, and wrote the manuscript draft. ASO contributed to the design of the study and provided advice regarding data interpretation. FAA helped develop the data analysis framework and also helped train field researchers for data collection. OEO and ASO analyzed the qualitative data. AK made critical revisions to the paper and provided advice regarding data interpretation. OSO participated in data collection and helped write the results and discussion sections. All authors read and approved the final manuscript.

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