

**Socio-economic determinants of maternal health care utilization in Kailahun District,  
Sierra Leone, 2020**

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## ABSTRACT

**BACKGROUND:** Ascertaining the key determinants of maternal healthcare service utilization and their relative importance is critical to priority setting in policy development. Sierra Leone has one of the world's highest maternal death ratios in the context of a weak health system. The objectives of this study were to determine; the level of utilization of Antenatal Care (ANC), Skilled Delivery Attendants (SDA), Postnatal Care (PNC) services, and factors that influence the utilization of these services.

**METHODS:** We conducted a community-based cross-sectional study involving 554 women of reproductive age (15-49 years) who had at least one delivery in the last 3 years and lived in the Kailahun District, Sierra Leone from November 2019 to October 2020. Stata IC version 15.0 was used to analyse factors affecting maternal care utilization use.

**RESULTS:** The median age of respondents was 25 years (Q1=17 years, Q3=30 years). Eighty-nine percent (89%) had 4 or more ANC visits. Only 35.9% of women were delivered by SDA. Women residing in urban areas had over six-fold increased odds of utilizing SDA as compared to women residing in rural areas (AOR=6.20, 95% CI=3.61-10.63). Women whose husbands had a primary level of education had 2.38 times increased odds of utilizing SDA than women whose husbands had no education (AOR=2.38, 95% CI=1.30-4.35). Women that walked longer distances (30-60 minutes) to seek healthcare had 2.98 times increased odds of utilizing SBA than those that walked shorter distances (<30 minutes) (AOR=2.98, 95% CI=1.67-5.33). Women who had a secondary/vocational level of education had 2.35 times increased odds of utilizing the standard PNC category as compared to those with no education (OR=2.35, 95% CI=1.19-4.63).

**CONCLUSION:** The majority of women had 4 or more ANC visits yet the use of skilled birth attendants was low. Urban residence and education were significantly associated with the use of the standard PNC category. Education level and occupation of women, Husband's education, urban residence, and longer distance to health facilities were significant determinants of SDA

use. To improve the utilization of maternal health care services, national healthcare policies should target the advancement of education, rural infrastructure, and the empowerment of women.

**Keywords:** Determinants, Maternal healthcare, Healthcare utilization, Skilled birth attendant, Antenatal care, Postnatal care, Kailahun, Sierra Leone

## INTRODUCTION

Maternal health care (MHC) utilization is essential for women's health, childbirth, and the well-being of the mother and child. Maternal health care includes the care a woman receives throughout her pregnancy, labor, and postnatal [1]. The World Health Organisation has set a goal in alignment with the 3<sup>rd</sup> Sustainable Development Goals (SDG) which aims to reduce the global maternal mortality ratio (MMR) to less than 70 per 100,000 live births by 2030" [2].

Ascertaining the determining factors of maternal health care utilization and how these factors affect the livelihood of mothers is critical and must be a priority in policy development [3]. Research suggests that there is a high prevalence of maternal, neonatal, and child death rates which are linked to non- or poor availability of quality maternal healthcare services [4, 6]. The evidence also indicates that accessing skilled care before, throughout pregnancy, and after delivery saves the lives of mothers and their new-born child infants [4, 5]. If mothers have access to healthcare facilities that provide interventions and preventive measures to treat obstetric complications, especially in an emergency, then an estimated 74% of maternal mortality could be prevented [6]. Antenatal care, skilled delivery attendants, and postnatal care attendants are therefore identified as key providers to improve health outcomes for mothers and their babies [7]. Studies in Ethiopia, Ghana, and Cambodia showed similar findings [4, 8, 9].

In Sub-Saharan Africa, the factors that influence the increase in maternal mortality are also associated with prenatal care coverage and skilled attendance at delivery. The inability to utilize these maternal healthcare services is a key predictor of perinatal mortality [2]. Regular antenatal care (ANC) attendance throughout the pregnancy enables the healthcare providers to have a better chance to detect and reduce any risk factors associated with adverse pregnancy outcomes [10]. The ANC session further serves as a platform to counsel the mothers' on why a skilled attendant is crucial at delivery [11]. Only 45% of women used skilled delivery attendants at delivery in Sub-Saharan Africa [5].

In Sierra Leone, data from the past five years shows that approximately, 83% of births occurred in a health care facility; 81% occurred in government healthcare centers, 2% in a private health setting, 16% at home, and 1% in other places like in-transit or secret society bushes [12]. About 87% of deliveries are attended by a skilled attendant; 81% were attended by a nurse/midwife, 2% by an MCH Aide, and 4% by a doctor. On the other hand, 10% of childbirths are supervised by traditional birth attendants and 3% by family members or others [12]. Similarly, 79% of mothers received at least 4 antenatal care visits during their pregnancy and 14% of mothers did not receive any postnatal check-ups [12].

Globally, 810 women die per day owing to pregnancy-related complications [13]. Maternal death remains a great concern with virtually 99% of all maternal deaths occurring in developing nations, but the prevalence is higher in Sub-Saharan Africa [14]. One in 41 pregnant women died during childbirth in developing countries as compared to 1 in 3,300 in developed nations [14]. “Sierra Leone has one of the world’s highest maternal death ratios at 1360 deaths per 100 000 babies born. WHO estimated that up to 6% of women in Sierra Leone will die from maternal causes during their reproductive life” [2]. The use of maternal health care services are known to better health outcomes for mothers and their children [15]. What is unclear is how service utilization is affected by socio-demographic and economic factors within which the women live especially in Sierra Leone and particularly in the Kailahun district which is one of the farthest from the national capital and the hub of the civil conflict in 1991. There are limited researches that identify factors influencing the utilization of MHC services in Kailahun District, Sierra Leone. The Sierra Leone Demographic and Health Survey (SLDHS) does not address factors influencing utilization and other previous studies conducted in Sierra Leone focused on one or two of the components of MHC service [16, 17].

This research sought to investigate the socio-economic factors that influence women's use of maternal healthcare services in Eastern Sierra Leone with a focus on prenatal, delivery care,

and postnatal care. It will provide a further understanding of factors influencing uptake of maternal health services in Kailahun, Sierra Leone, thus help in implementing policies that would improve maternal and child health.

## **METHODS**

### **Study design, population, and setting**

We conducted a community-based cross-sectional study that involved women of reproductive age (15-49 years), who had at least one delivery in the 3 years before this study in the Kailahun District, Eastern Sierra Leone from November 2019 to October 2020. Kailahun District is located about 450 kilometers from Freetown ( the capital) in the Eastern province of Sierra Leone. Its capital and largest city is the town of Kailahun. It is divided into 15 chiefdoms. Healthcare facilities are divided into 15 community health centers (CHC), 52 community health posts (CHP), 17 maternal child health posts (MCHP), 3 government hospitals, and 2 private clinics. The total projected population for 2020 is 625,500 (Statistics Sierra Leone, 2015). The total fertility rate is estimated at 6 children per woman (Statistics Sierra Leone, 2015). The ANC attendance for ANC1 and ANC4+ was 15,656 and 13,785 respectively [2]. The District of Kailahun shares borders with the Republic of Liberia to the East, and the Republic of Guinea to the North.

### **Sampling method**

Kailahun District was purposively selected. Administratively, Kailahun is divided into 15 Chiefdoms. Each Chiefdom is subdivided into sections. Each section is subdivided further into Enumeration Areas (EAs). EAs are in administrative sections without overlapping into other

sections. The unique identifier is the EA code. The domain of this study is the Urban and Rural areas of Kailahun District. The 2015 census EAs were used as the Primary Sampling Unit (PSU). The sample was selected from the frame of PSUs. Kailahun district has 891 EAs of which 276 are urban and 615 rural. The total number of households (HH) in the Kailahun district was 83,348, of which 57,316 are rural and 26,032 are urban. The average households per urban and rural EAs were 94 and 93 respectively. The proportional allocation of HH in the Kailahun District concerning the domain was 69% rural and 31% urban.

The sample size was determined using Cochran's formula [18] with the following assumptions: the estimated proportion ( $p$ ) of births by SBA was 0.6, the estimated proportion of births by an unskilled attendant ( $q$ ) was 0.4, and a design effect (DEFF) of 1.5 from a previous study conducted in Sierra Leone [12]. The level of precision ( $d$ ) was 0.05, and a 95% CI ( $z$ ) was 1.96, were used to obtain a sample size of 554.

$$n = \frac{z^2 pq}{d^2} \times \text{DEFF}$$

To allocate the sample, we considered the precision of the domain level i.e. urban and rural areas of Kailahun. To have a safe weighting sample, we allocated the 554 households proportionately to the urban and rural areas. The EAs were selected using Probability to Proportion size. The first sampling number was the product of the random number ( $r$ ) and the sampling interval. The sampling interval was the total HH divided by the number of EAs to be selected. The first sampling number was used in selecting the EAs using PPS. A Random-walk technique was used in selecting households/respondents. The first author facing east walked into the center of the EA and randomly selected the third house from his right-hand side with a definite pattern of selecting the 3, 6, 9, etc till we achieved the required number of households. The choice of selecting the interval 3, 6, and 9 depended on the size of the EA. The smaller the EA, the shorter the interval vice versa. Upon arrival in the HH only one eligible female 15-49 years had given birth in the past 3 years before this study was enrolled. If no eligible in a particular HH, we continued with the pattern of selecting the HH.

## **Data collection technique and tools**

The primary data was collected using a structured and pre-tested questionnaire. Antenatal cards and hospital record books mothers had were inspected to confirm the information provided by women during the interview. The questionnaire was written in English and was adapted from the Standard Sierra Leone DHS Questionnaires [12]. To ensure quality data, interviewers were trained, a pre-test was performed before the actual data collection. The interviewers were frequently supervised by the principal investigator during data collection and interviews were done in local languages.

## **Operational definitions**

- Skilled delivery attendant: professionals with midwifery skills including Doctors, midwives, community health officers (CHO).
- Antenatal care: This is the routine health control of presumed healthy pregnant women without symptoms, to diagnose diseases or complicating obstetric conditions without symptoms, and to provide information about lifestyle, pregnancy, and delivery. Pregnancy services are provided by health professions (Nurses, Doctors, CHOs, and Midwives).
- Postnatal care: services provided to women within 42 days after delivery by health professionals (Nurses, Doctors, CHOs, and Midwives).

## **Outcome variables**

A set of questions on maternal healthcare, covering place of delivery, delivery attendant, place of PNC, PNC attendant, the timing of the first postnatal visit, follow-up after discharge, and place of follow-up after discharge were asked. For the purposes of the study, the outcome variable which was utilization of maternal health care services was assessed by two services:

- Skilled Delivery Attendant use (yes/no)
- Postnatal care service (Standard, Average and Undesirable) :



1. Standard category: PNC from a skilled provider in a health facility within 1 hour after delivery; had at least one follow-up after discharge.
2. Average category: PNC from a non-skilled provider in a health facility within 1 hour after delivery and had at least one follow-up after discharge or PNC from a skilled provider but did not receive any of the other components- health facility delivery; no follow-up after discharge.
3. Undesirable category: Postnatal care from a non-skilled provider in a non-health facility, no follow-up after discharge.

### **Independent variables**

Andersen's behavioral model was adopted to determine the influence or effect of the independent variables (predisposing and enabling factors) on the utilization of maternal health services [18, 20]. The predisposing factors were; age, women's education, parity, ethnicity, religion, marital status, occupation, number of births in the last 5 years, number of children alive, and the enabling factors were; husbands education, residence, distance to the health facility, type of floor and toilet.

### **Data Management and Analysis**

The data were entered into MS Excel 2018 and cleaned. The analysis was done using Stata 15.0 IC. Description of the Predisposing and Enabling characteristics was first done, followed by a description of the components/patterns of antenatal care, perinatal care/skilled delivery attendant, and postnatal care using frequencies, tabulations, and proportions. Bivariate analysis was done to determine the level of utilization of Maternal Healthcare services (Antenatal care, Skilled delivery attendant, and Postnatal care services).

In the case of a skilled delivery attendant, a dichotomous dependent variable was constructed to indicate whether or not the woman used services from a skilled provider. Because the indicator is dichotomous, a logistic regression model was used. Bivariate and multivariate

analysis techniques were used to estimate the nature of association and magnitude between dependent variables and independent variables (Individual and Enabling factors).

$$\log \left[ \frac{p_{i2}}{p_{i1}} \right] = \beta_0 + \beta_1 X_{ij} + \beta_2 Y_{ij} + \dots + \epsilon_{1ij} \quad 1$$

The outcome variable is the log odds that individual  $i$  chose alternative  $j$  relative to 1, where alternative 1 is the non-use of a skilled delivery attendant and 2 is the use of a skilled provider. The independent variables are classified into individual and enabling factors represented by  $X$  and  $Y$  respectively.  $\epsilon_1$  follows a logistical distribution and represents the unobserved determinants of antenatal care or postnatal care.

Initially, a simple binary logistic model was run for each independent variable against the outcome variable. All independent variables that showed a significant association at  $p < 0.05$  were included in the multivariate binary regression model. The P-value, crude odds ratios (COR), adjusted odds ratios (AOR), and 95% confidence interval were estimated.

For postnatal care services as a dependent variable, a trichotomous variable was constructed; the standard PNC service category, average PNC service category, and the undesirable PNC service category. Since the variable is trichotomous, the multinomial logistical regression model was estimated.

$$\log \left[ \frac{p_{ij}}{p_{i1}} \right] = \alpha_0 + \alpha_{1j} X_{ij} + \alpha_{2j} Y_{ij} + \dots + \epsilon_{2ij} \quad 2$$

The outcome variable was the log odds that individual  $i$  chose PNC service alternative  $j$  ( $j=2,3$ ) relative to 1, where alternative 1 was the standard PNC service category, 2 was the average PNC service category and 3 was the undesirable PNC service category. The independent variables are classified into individual and enabling factors represented by  $X$  and  $Y$  respectively.  $\epsilon_2$  represents the unobserved determinants of birth delivery alternative.

## **Ethical clearance**

Ethical approval was obtained from the Sierra Leone Ethics and Scientific Review Committee (October 2019). Permission was also sought from the Kailahun Regional Health Directorate.

233 Informed consent was obtained from the respondents. For respondents below 18 years, consent  
234 was granted by the parent or guardian and assent sought from respondents. They were assured  
235 of confidentiality and informed on the purpose of the study. The information was stored  
236 without the names of the respondents in a folder that is only accessible to the research team.  
237 For participants who could not read, the consent was read and explained to them in the presence  
238 of an impartial witness or stakeholder in the community. All study methods were carried out  
239 in accordance with relevant guidelines and regulations  
240

## RESULTS

### Enabling and Predisposing/individual characteristics of respondents

Five hundred and fifty-four (554) women aged between 15-49 years, who had at least a delivery/birth 3 years before this study commenced were interviewed. The median age of respondents was 25 years with minimum and maximum ages of 15 and 49 years respectively (Table 1). Taking into consideration parity, the median parity was 3 with a minimum and maximum parity of 1 and 9 respectively. Forty-six percent (46%) of respondents in this survey were between the ages of 25-35 years and 37.9% had no educational level. The majority (60.8%) of respondents were Muslims. The Mende ethnic groups was predominant, (72%).

### The components of ANC, skilled delivery, and PNC utilization

The majority of women (77.6%; 430/554) have had ANC from a skilled provider. Most of the women (57.9%; 321/554) received ANC from a State Enrolled Community Health Nurse (SECHN). Regarding the timing of the first ANC visit, (54.5%; 302/554) of respondents attended their first ANC visit in the first trimester. The majority of respondents (88.6%; 491/554) had 4 or more ANC visits in their last pregnancy before this study. (Table 2)

269 **Table 2** Characteristics of MHC service utilization by respondents who had at least one  
270 delivery in the 3 years before the study, Kailahun District, 2020

Variable	Number (n=554)	Percent(%)
At least one ANC from Skilled Provider		
No	124	22.4
Yes	430	77.6
ANC Provider		
Traditional Birth Attendant	26	4.7
MCHA	98	17.7
Midwife	100	18.1
Doctor	2	0.4
Nurse	321	57.9
CHO	7	1.3
Timing of First ANC		
Don't Know	15	2.7
<4 months	302	54.5
4-6 months	234	42.2
7-9 months	3	0.5
Number of ANC visit		
Do not know	5	0.9
Once	4	0.7
2 times	11	2.0
3 times	43	7.8
4 or more	491	88.6
Skilled Delivery Attendant		
No	355	64.1
Yes	199	35.9
Delivery Attendant		
TBA (health facility/ community)	23	4.2
Nurse	13	2.3
MCHA	319	57.6
Midwife	177	31.9
Doctor	22	4.0
Place of Delivery		
MCHP	58	10.5
CHP	199	35.9
CHC	198	35.7
Hospital	75	13.5
Private Facility	20	3.6
Home	3	0.5
Ambulance/Transit	1	0.2
Postnatal Care		
Yes	540	97.5
No	14	2.5

## **Socio-demographic characteristics and the use of MHC**

The level of utilization of skilled ANC attendants was more common among respondents aged >35 years compared to the other age groups. In general, the use of skilled ANC attendants was more than 75.0% in all age groups. With regards to parity, as the parity increased the use of skilled ANC attendants decreased, women with one parity used more skilled ANC attendants (79.6%; 105/132) compared with 77.4% (102/132) of women with 2 to 4 births and 76.2% of women with 5 or more births.

The use of SDA was found to be higher (42.1%; 32/76) amongst women in the age group of 10-19 years old compared with 36.1% (62/172) of women in the age group 20-24 years old, 35.4% (90/254) of those in the age group 25-35 years old, and 28.9% (15/52) in those older than 35 years.

Similar to ANC use, the use of skilled birth attendants decreased as the parity increased, 43.2% (57/132) of women who had 1 parity used skilled birth attendants compared with 37.3% (226/292) of those who had 2-4 parities and 25.4% of those who had 5 or more births. The utilization of PNC services was slightly higher amongst women in the age group 20-24 years compared with the other age groups. In contrast to ANC and skilled birth attendant use, PNC service use was slightly higher (97.9%; 372/381) among women in rural areas than women in urban areas (96.5%; 167/173)(Table 3).

## **Background characteristics influencing the use of a skilled delivery attendant**

Parity was significantly associated with the use of skilled birth attendants (Table 4). Women who had given birth 5 or more times had 55% reduced odds of been delivered by a skilled attendant as compared to those with 1 birth (COR=0.45, 95% CI=0.27-0.76). However, after controlling for the effect of the other variables, parity was not significantly associated with skilled birth attendant use. Women who had a senior secondary or vocational level of education had 1.22 times increased odds of been delivered by a skilled attendant as compared to those

with no educational level which was statistically not significant after controlling for the effect of other variables (AOR=1.22, 95% CI=0.57-2.59). Women residing in urban areas had over six-fold increased odds of been delivered by a skilled attendant as compared to women residing in rural areas. This association remained statistically significant even after controlling for the effect of the other variables (AOR=6.20, 95% CI=3.61-10.63). Women whose husbands had a primary level of education also had 2.38 times increased odds of using skilled birth attendants than women whose husbands had no education. This association was also statistically significant even after controlling for the effect of the other variables in the model (AOR=2.38, 95% CI=1.30-4.35).

#### **Background characteristics influencing the use of postnatal care services**

The level of education of a woman, residence, and the husband's education level were significantly associated with the use of the standard PNC category relative to the average category after controlling for the effect of the other variables in the model (Table 5). Women who had a secondary/vocational level of education had 2.35 times increased odds of utilizing the standard PNC category as compared to those with no education relative to the average PNC category (OR=2.35, 95% CI=1.19-4.63). Women's residence was significantly associated with the use of the standard PNC category relative to the average category. Women residing in urban areas had 2.29 times increased odds of utilizing the standard PNC category as compared to those residing in rural areas (OR=2.29, 95% CI=1.21-4.32). Husband's education was significantly associated with the use of the standard PNC category relative to the average category. Women whose husbands had a primary level of education had 2.36 times increased odds of utilizing the standard PNC category as compared to those whose husbands had no education relative to the average PNC category (OR=2.36, 95% CI=1.10-5.05).

324 **Table 1** Multinomial logistic regression results on the determinants of PNC services,  
325 Kailahun District, Sierra Leone, 2020

Variables	Number (n=554)	Standard PNC			Undesirable PNC		
		OR(95% CI)		P- Value	OR(95% CI)		P- Value
Age (Continuous)	554	1.04(0.98	1.10)	0.199	0.99(0.88	1.12)	0.923
Parity	554	0.69(0.38	1.24)	0.215	1.15(0.34	3.90)	0.818
Residence							
Rural	381	1.00			1.00		
Urban	173	2.29(1.21	4.32)	0.011*	1.59(0.37	6.79)	0.535
Marital Status	554	0.82(0.38	0.76)	0.617	1.09(0.15	7.80)	0.933
Religion							
Christian	217	1.00			1.00		
Islam	337	0.71(0.41	1.23)	0.220	1.99(0.43	9.14)	0.375
Ethnicity							
Others	399	1.00			1.00		
Mende	124	1.23(1.23	0.67)	0.720	0.31(0.05	1.91)	0.207
Kissi	31	0.62(0.18	2.13)	0.453	0.26(0.02	2.76)	0.263
Occupation							
Employed	433	1.00			1.00		
Unemployed	121	1.13(0.61	2.11)	0.689	4.04(0.46	35.88)	0.210
Education level attainment							
None	210	1.00			1.00		
Primary	142	1.10(0.55	2.22)	0.780	0.35(0.06	1.90)	0.224
Secondary/Vocational	202	2.35(1.19	4.63)	0.013*	0.89(0.21	0.69)	0.872
Number of Births in past 5 years							
1	265	1.00			1.00		
2+	289	1.02(0.56	1.84)	0.958	0.90(0.26	3.10)	0.867
Husband's Education level attainment							
None	238	1.00			1.00		
Primary	72	2.36(1.10	5.05)	0.027*	1.73(0.30	9.97)	0.537
Junior Secondary	109	1.88(0.96	3.69)	0.064	1.09(0.20	6.06)	0.923
Senior Secondary	82	0.81(0.35	1.85)	0.610	1.27(0.20	8.06)	0.802
Vocational/Higher	53	2.29(1.03	5.12)	0.042*	4.07(0.77	21.51)	0.098
Distance to Health Facility (Minutes)							
<30	196	1.00			1.00		
30-60	132	1.36(0.71	2.62)	0.357	0.61(0.10	3.55)	0.580
>60	226	1.42(0.72	2.81)	0.312	0.82(0.19	3.66)	0.802
Type of Floor							
Natural	394	1.00			1.00		
Modern	160	1.35(0.80	2.27)	0.266	0.49(0.12	1.99)	0.318

326 \*Significant association at P<0.05, n=554, pseudo R<sup>2</sup>=8.81%, LR Chi2=54.37

327 Prob. Chi2=0.025, Base model= Average category

328



## DISCUSSION

This study assessed the level of utilization and determinants of ANC, skilled birth attendant, and uptake of the different packages of PNC services in Kailahun District Sierra Leone. This study found that 100.0% of women received ANC services, of which 77.6% of them sought at least one ANC visit from a skilled ANC provider and 88.6% made 4 or more ANC visits as recommended by the World Health Organization. These findings are similar to reports in the Sierra Leone Demographic and Health Survey which showed that 98.0% of women received ANC from a skilled provider and 79.0% made 4 or more ANC visits [12]. However, our results are also inconsistent with the Uganda Demographic and Health Survey UDHS 2016, which showed that 97.0% of women received ANC from a skilled provider but only 60.0% of the women made 4 or more ANC visits [25]. The disparity between the present study and the UDHS may be related to the maternal demographic characteristics in both countries and the fact that the sample size in the UDHS was far larger, thus influencing the precision of the findings.

Regarding the timing of the first ANC, 54.5% of women sought their first ANC in the first trimester of pregnancy and this prevalence was higher than that obtained in the Sierra Leone Demographic and Health Survey 2019, where 44.0% made their first visit in the first trimester [12]. This discrepancy could be attributed to the demographic survey having had a larger coverage area as compared to the present study. It has been recommended that all pregnant women should start their ANC in the first trimester [26]. The findings of this research suggest that the use of ANC services was higher among urban residents (81.5%), which corroborates to a study conducted in Holeta Town, Ethiopia where 86.7% of urban women used ANC services [27]. According to the Sierra Leone Demographic Survey (2019), 73.0% of women in urban areas made 4 or more ANC visits which is slightly lower patronage as compared to our population. The high use of ANC services in urban areas may be because, Kailahun District has 87 peripheral health units and 3 hospitals, of which all the hospitals and most of the PHUs

are in urban areas thus increasing access. Increased awareness and information sharing might also be related to the economic status of urban residents since women in urban areas have more physical and economic access to health facilities.

This research further indicated that the use of SDA was generally low. Only 35.9% of women had at least one delivery in 3 years before this study used SDA compared to 11.7% in a study in Ethiopia [5]. The majority, 57.6%, and 4.2% were delivered by Maternal and Child Health Aide (MCHA) and Traditional Birth Attendant (TBA) respectively, who are considered non-skilled. According to the Demographic and Health Survey (2019), 87% of deliveries were assisted by a skilled provider. The disparity between the DHS and this study may be related to the fact that our study did not consider MCHA and State Enrolled Community Health Nurses (SECHN) as a skilled attendant. Kailahun District is one of the most remote areas in Sierra Leone, physical accessibility is a major challenge due to the bad road network, thus most healthcare workers find it difficult to travel, work and stay in the district which creates opportunities for non-skilled workers. The WHO has recommended that there should be a critical threshold of 23 skilled healthcare workers (doctors, nurses, and midwives) per 10,000 population [28]. Nevertheless, it has been very difficult for Sierra Leone to cope with such recommendations due to the severe scarcity of qualified healthcare workers, thereby providing merely 2 skilled workers per 10,000 populations [29]. The 10 years of civil war which ended in 2002 and the 2014 Ebola epidemic, all started in Kailahun District and left a huge impact on health service delivery in the district. Sierra Leone is among the world's highest maternal death ratios at 1360 mortality per 100000 births [2] because most women are not delivered by a SDA, and most ANC services are provided by non-skilled providers. It further found that 10.5% and 35.9% of deliveries took place at Maternal and Child Health Post (MCHP) and Community Health Post (CHP) respectively, which are facilities manned by non-skilled attendants.

This study found that the area of residence is a major determinant of SDA utilization. The use of skilled birth attendants was higher among urban residents than rural. These findings are consistent with other studies [5, 7]. The disparity in the utilization of MHC services may be due to the concentration of health facilities in urban areas combined with the high number of qualified birth attendants in urban areas and also the economic status of the urban residents. In the Kailahun district, there is an uneven distribution of health workers, most are found in urban areas. Distance to the health facility was considerably connected with the use of SDA. Women that walked 30-60 minutes or more than 60 minutes to access health care services were more likely to use SDA than those that walked less than 30 minutes. In another study conducted in Kenya, although the distance was cited as a barrier to MHC service utilization, 18% of women did not visit the nearest facility [30].

In the present study, the husband's education was significantly associated with the use of a skilled delivery attendant. Women whose husbands had at least primary education were more inclined to use SDA than those whose husbands had no education which is consistent with other studies [5]. Similarly, in another study conducted in Nigeria, husbands education played a key role in the utilization of SDA [1], research has shown that education increases health awareness and knowledge on the significance of MHC services and improves other forms of learning [5]. This could be through; radio, the internet, written information, and a better cultural understanding. Educated husbands may provide more autonomy to their wives [5].

Our study found that the majority 97.5% of women received PNC services and 58.1% of them received it from MCHA. The 2013 Sierra Leone Demographic and Health Survey reported that 7.8% of PNC services were delivered by MCHA [12]. The disparity between the national and district figures may be related to the fact that the Demographic Survey was done in the entire 16-district taking into consideration the major urban areas where good healthcare services are concentrated compared with Kailahun being one of the most remote districts. Also, due to the

limited number of skilled providers in the district, most PNC services are provided by a non-skilled provider.

In the present study, women's residence, education of women, and husband's education are significant predictors of the utilization of the standard PNC package. These observations are consistent with a study conducted in Ethiopia among women of reproductive age which reported a significant influence of respondent education and urban residence on the utilization of MHC services [5].

Some of the respondents seemed to have difficulty in the recollection of events that had happened during the last 3 years before the study. Women had difficulties in recalling or identifying the nature of healthcare services they received or the trained healthcare worker that provided the service. As a way of minimizing this challenge, the interviewers requested for participants' ANC cards to fact-check their responses.

We did not assess the healthcare facility and the health workers' related-factors that affect antenatal, postnatal, and skilled delivery utilization, all of which are known to be key determinants of maternal health care utilization.

## **CONCLUSION**

Our findings indicate that PNC service utilization in the Kailahun district is much higher compared to skilled ANC and birth attendant utilization, even though the uptake of the standard PNC package was low. The utilization of SDA was low and urban residents seemed to be using more of the skilled birth attendant services. As recommended by WHO, the majority of women had 4 or more ANC visits, and most made their first ANC visit in the first trimester. Most of the deliveries were done by unskilled personnel. Education of women, residence, parity, occupation, husband's education, and distance to health facility had a significant association with the use of skilled birth attendants. Finally, the findings show that urban residence and

432 higher/vocational education are significantly associated with the uptake of the standard PNC  
433 package.

434 To improve the utilization of maternal health care services, the Ministry of Health and  
435 Sanitation/Central Government should Work with relevant stakeholders to formulate policies  
436 and design programs that target the advancement of education, rural infrastructure, and the  
437 empowerment of women. The ministry of health should Engage the research and scientific  
438 committee to undertake or facilitate further research programs to determine the healthcare  
439 factors that influence the uptake of MHC services.

440

#### 441 **Abbreviations**

442 ANC: Antenatal care

443 AOR: Adjusted odds ratio

444 CHC: Community health center

445 CHO: Community health officer

446 CHP: Community health post

447 CI: Confidence interval

448 COR: Crude odds ratio

449 DHS: Demographic and health survey

450 EAs: Enumeration areas

451 MCHA: Maternal and child health aide

452 MCHP: Maternal and child health post

453 MHCS: Maternal health care service

454 PNC: Postnatal care

455 PSU: Primary sampling unit

456 SDA: Skilled Delivery Attendant

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458 **Ethics approval and consent to participate**

459 Ethical approval was sort from the Sierra Leone Ethics and Scientific Committee. Permission  
460 was also sorted from the Kailahun Regional Health Directorate. Informed consent was sort  
461 from the respondents. For respondents below 18 years, the accent was granted by the parent or  
462 guardian. They were assured of confidentiality and informed on the purpose of the study. The  
463 information was stored without the names of the respondents in a folder that is only accessible  
464 to the research team. For participants who could not read, the consent was read and explained  
465 to them in the presence of an impartial witness or stakeholder in the community. All study  
466 methods were carried out in accordance with relevant guidelines and regulations

467

468 **Consent for publication**

469 Not applicable

470

471 **Availability of data and materials**

472 All data generated or analyzed during this study are included in this published article [ and its  
473 supplementary information files]

474

475 **Competing interest**

476 The authors declare that they have no competing interest

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479

480 **Authors' contributions**

481 Conceptualization and design: DMK, AAL, AM, EK, DAB

482 Data collection: DMK, JYK

483 Analysis and report writing: DMK, AAL, JYK

484 Drafting manuscript: DMK, DAB, AM, JYK, AAL, EK

485 All authors read and approved the final manuscript.

486

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499 **Tables**

500 **Table 1** Enabling and predisposing characteristics of respondent who had at least one  
501 delivery in the 3 years before the study, Kailahun District, Sierra Leone, 2020

<b>Predisposing/Enabling Characteristics</b>	<b>Number (n=554)</b>	<b>Percent(%)</b>
Age		
10-19	76	13.7
20-24	172	31.0
25-35	254	45.8
>35	52	9.4
Schooling		
No	210	37.9
Yes	344	62.1
Education level attainment		
None	210	37.9
Primary	142	25.6
Junior Secondary	142	25.6
Senior Secondary	56	10.1
Vocational/Higher	4	0.7
Religion		
Christian	217	39.2
Islam	337	60.8
Ethnicity		
Mende	399	72.0
Kissi	124	22.4
Others	31	5.6
Number of Children Alive		
0-2	275	49.6
3-5	231	41.7
6+	48	8.7
Parity		
1	132	23.8
2-4	292	52.7
5+	130	23.5
Number of Births in the past 5 years		
1	265	47.8
2+	289	52.2
Marital Status		
Single	37	6.7
Married/Living Together	496	89.5
Divorced/separated/Widowed	21	3.8



Occupation		
Employed	433	78.2
Unemployed	121	21.8
Distance to Health Facility (Minutes)		
<30	196	35.4
30-60	132	23.8
>60	226	40.8
Husband's Occupation		
Unemployed	78	14.1
Employed	476	85.9
Husband's Education level attainment		
None	238	43.0
Primary	72	13.0
Junior Secondary	109	19.7
Senior Secondary	82	14.8
Vocational/Higher	53	9.6
Residence		
Rural	381	68.8
Urban	173	31.2
Type of Floor		
Natural	394	71.1
Modern	160	28.9
Type of Toilet		
Flush	14	2.5
Pit/Others	540	97.5

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517 **Table 3** Socio-demographic characteristics and the use of MHC Services among women in  
518 Kailahun District, Sierra Leone, 2020

Background Characteristics	Number (n=554)	Percentage who received at least one ANC	Percentage who received SDA	Percentage who received PNC services
Age				
10-19	76	76.3	42.1	97.4
20-24	172	77.9	36.1	98.3
25-35	254	76.4	35.4	97.2
>35	52	84.6	28.9	96.2
Residence				
Urban	173	81.5	57.8	96.5
Rural	381	75.9	26	97.9
Marital Status				
Single	37	78.4	48.7	100
Married/Living Together	496	77.2	34.7	97.2
Divorced/Separated/Widowed	21	85.7	42.9	100
Religion				
Christian	217	79.7	37.3	98.6
Islam	337	76.3	35	96.7
Ethnicity				
Mende	399	76.2	35.3	97.5
Kissi	124	80.7	37.9	98.4
Others	31	83.9	35.5	93.5
Parity				
1	132	79.6	43.2	97.7
2-4	292	77.4	37.3	97.9
5+	130	76.2	25.4	96.2
Occupation				
Employed	433	81.8	48.8	99.2
Unemployed	121	76.4	32.3	97
Education level attainment				
None	210	78.6	30.9	96.7
Primary	142	77.5	38	98.6
Junior Secondary	142	71.8	33.8	96.5
Senior Secondary/Vocational	60	88.3	53.3	100
Number of Births in the past 5 years				
1	265	80.4	39.6	97.7
2+	289	75.1	32.5	97.2
Husband's Occupation				
Unemployed	78	79.5	44.9	100
Employed	476	77.3	34.5	97.1
Husband's Education level attainment				
None	238	75.2	30.3	97.9
Primary	72	79.2	44.4	97.2
Junior Secondary	109	80.7	37.6	98.2

Senior Secondary	82	78.1	30.5	97.6
Vocational/Higher	53	79.3	54.7	94.3
Distance to Health Facility (Minutes)				
<30	196	77	35.7	96.4
30-60	132	75	47	98.5
>60	226	79.7	29.7	97.8
Type of Floor				
Natural	394	77.4	34	97.2
Modern	160	78.1	40.6	98.1
Type of Toilet				
Flush	14	85.7	35.7	100
Pit and Others	540	77.4	35.9	97.4

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521 **Table 4** Factors associated with the use of skilled delivery attendant, Kailahun District, Sierra  
522 Leone, 2020

Variable	SDA		COR (95% CI)	AOR (95% CI)
	No n=355(%)	Yes n=199(%)		
Age				
10-19	44(12.4)	32(16.1)	1.00	
20-24	110(31.0)	62(31.2)	0.78(0.45 1.35)	.
25-35	164(46.2)	90(45.2)	0.75(0.45 1.27)	.
>35	37(10.4)	15(7.5)	0.56(0.26 1.18)	.
Residence**				
Rural	282(79.4)	99(49.8)	1.00	1.00
Urban	73(20.6)	100(50.3)	3.90(2.67 5.70)*	6.20(3.61 10.63)*
Parity**				
1	75(21.1)	57(28.6)	1.00	1.00
2-4	183(51.6)	109(54.8)	0.78(0.52 1.19)	0.90(0.56 1.47)
5+	97(27.3)	33(16.6)	0.45(0.27 0.76)*	0.58(0.31 1.10)
Religion				
Christian	136(38.3)	81(40.7)	1.00	.
Islam	219(61.7)	118(59.3)	0.90(0.63 1.29)	.
Marital Status				
Single	19(5.4)	18(9.1)	1.00	.
Married/Living Together	324(91.3)	172(86.4)	0.56(0.29 1.10)	.
Divorced/Separated/Widowed	12(3.4)	9(4.5)	0.79(0.27 2.33)	.
Ethnicity				
Others	20(5.6)	11(5.5)	1.00	.
Mende	258(72.7)	141(70.9)	0.99(0.46 2.13)	.
Kissi	77(21.7)	47(23.6)	1.11(0.49 2.52)	.
Occupation**				
Unemployed	62(17.5)	59(29.6)	1.00	1.00
Employed	293(82.5)	140(70.4)	0.50(0.33 0.76)*	0.67(0.40 1.13)
Education level attainment**				
None	145(40.9)	65(32.7)	1.00	1.00
Primary	88(24.8)	54(27.1)	1.37(0.87 2.14)	0.97(0.58 1.62)
Junior Secondary	94(26.5)	48(24.1)	1.14(0.72 1.79)	0.91(0.53 1.58)
Senior Secondary/Vocational	28(7.9)	32(16.1)	2.25(1.42 4.58)*	1.22(0.57 2.59)
Number of Births in past 5 years				
1	160(45.1)	105(52.8)	1.00	.
2+	195(54.9)	94(47.2)	0.73(0.52 1.04)	.
Husbands Occupation				
Unemployed	43(12.1)	35(17.6)	1.00	.
Employed	312(87.9)	164(82.4)	0.65(0.40 1.05)	.
Husband Education level attainment**				
None	166(46.8)	72(36.2)	1.00	1.00

Primary	40(11.3)	32(16.1)	1.84(1.07 3.17)*	2.38(1.30 4.35)*
Junior Secondary	68(19.2)	41(20.6)	1.39(0.86 2.24)	1.34(0.79 2.29)
Senior Secondary	57(16.1)	55(12.6)	1.01(0.59 1.74)	0.67(0.35 1.25)
Vocational/Higher	24(6.8)	29(14.6)	2.79(1.52 5.11)*	1.85(0.93 3.72)
Distance to Health Facility** (Minutes)				
<30	126(35.5)	70(35.2)	1.00	1.00
30-60	70(19.7)	62(31.2)	1.59(1.02 2.50)*	2.98(1.67 5.33)*
>60	159(44.8)	67(33.7)	0.76(0.50 1.14)	2.37(1.33 4.24)*
Type of Floor				
Natural	260(73.2)	134(67.3)	1.00	.
Modern	95(26.8)	65(32.7)	1.33(0.91 1.94)	.
Type of Toilet				
Pit and Others	346(97.5)	194(97.5)	1.00	.
Flush	9(2.5)	5(2.5)	0.99(0.33 3.00)	.

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\*Significant association at P<0.05 \*\* Variables adjusted for

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