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Rural–urban correlates of skilled birth attendance utilisation in Sierra Leone: evidence from the 2019 Sierra Leone Demographic Health Survey

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ABSTRACT

Objectives Understanding the rural–urban context-specific correlates of skilled birth attendance (SBA) is important to designing relevant strategies and programmes. This analysis aimed to assess for the rural-urban correlates of SBA in Sierra Leone.

Setting The latest nationally representative Sierra Leone Demographic and Health Survey of 2019.

Participants The study included a weighted sample of 7326 women aged 15–49 years. Each of them had a live birth within 5 years prior to the survey (4531 in rural areas and 2795 women in urban areas).

Primary and secondary outcome measure SBA (primary) and predictors of SBA (secondary).

Results SBA was higher in urban areas at 94.9% (95% CI 94.1% to 95.7%) compared with 84.2% (95% CI 83.8% to 85.9%) in rural areas. Rural women resident in the Southern, Northern and Eastern regions, with postprimary education (adjusted OR (aOR) 1.8; 95% CI 1.3 to 2.5), exposure to mass media (aOR 1.5; 95% CI 1.1 to 1.9), not having difficulties with distance to the nearest health facility (aOR 2.3; 95% CI 1.7 to 3.0) were associated with higher odds of SBA. Urban women resident in the Southern, Eastern region, with households having less than seven members (aOR 1.5; 95% CI 1.1 to 2.3), exposure to mass media (aOR 1.8; 95% CI 1.1 to 2.9) and not having difficulties with distance to the nearest health facility (aOR 1.6; 95% CI 1.1 to 2.5) were associated with higher odds of SBA.

Conclusion Given the observed differences, improving SBA requires programmes and strategies that are context-specific.

Strengths and limitations of this study

- ► This is the first nationally representative analysis that explores the rural-urban correlates of skilled birth attendance in Sierra Leone.
- ► We used the latest nationally representative sample from the 2019 Sierra Leone Demographic and Health Survey, hence findings are generalisable to women in Sierra Leone.
- ► Given the cross-sectional nature of the data, we could not establish the temporal relationship between the outcome variable and the independent variables.
- ► Since the data were collected from women who had childbirths within 5 years prior to data collection, we anticipate recall bias in the process of collecting this data among the respondents.

INTRODUCTION

Globally, 83% of births in 2020 occurred with skilled birth attendance (SBA), but coverage continues to be uneven around the world with significant discrepancies between regions with only 64% of births in sub-Saharan Africa being attended to by SBA.[1] About 303 000 maternal deaths are registered annually with 99% being recorded in low-income and middle-income countries.[2 3] SBA has been documented as an effective intervention for reducing maternal and neonatal deaths.[4 5] Skilled attendance at birth can reduce intrapartum-related complications by up to 20%.[6] Therefore, ensuring increased utilisation of SBA can substantially contribute towards achievement of the "Sustainable Development Goal 3 that aims at reducing the global maternal mortality ratio (MMR) to less than 70 per 100, 000 and neonatal mortality ratio of ≤12 per 1000 live births by 2030".[6–8] A skilled birth attendant is 'an accredited health professional such as a midwife, doctor, or nurse who have been trained with adequate skills needed to handle uncomplicated pregnancies, childbirth and the immediate postnatal period, and in the identification, management, and referral of complications in women and newborns'.[6]

Besides the women losing their lives, effects of maternal mortality and morbidity are also experienced at the household and community level.[9 10] Children left behind after maternal deaths have increased odds of mortality or other health challenges including undernutrition and the society loses resources when women die in their most productive years.[9] In Sierra Leone, pregnancy is associated with a 1

in 17 lifetime risk of maternal death making it among the highest globally.[6] Despite several measures being implemented in the country, utilisation of maternal health services such as utilisation of at least four or more antenatal care (ANC) contacts marginally increased by three percent points (76%–79%) between 2013 and 2019 while initiation in the first trimester decreased by 1% point (45%–44%).[11] In 2017, the Ministry of Health adopted the latest 2016 WHO guidelines for ANC, recommending eight or more ANC contacts during pregnancy.[12] To date, there are no data available about the progress made regarding the utilisation of eight or more ANC contacts. The latest Sierra Leone Demographic and Health Survey (SLDHS) only reported on the utilisation of at least four ANC contacts.[11]

Postcivil war and Ebola epidemic Sierra Leone era has witnessed left a fragile health system having poor infrastructure and inadequate skilled health personnel who are irregularly paid low salaries.[13] Despite the government's efforts to improve maternal health with approaches such as exemption of user fees for maternal healthcare services,[14] the country ranks among the top three countries with the highest MMR, globally.[3 6 15] Furthermore, the exemption of user fees is challenged by inadequate skilled health personnel, increasing workload and inadequate supplies and equipment.[16 17] Secondary and tertiary care in Sierra Leone is provided by 14 district and regional governmental hospitals.[17] At national level, there are four tertiary referral hospitals which are all located in the Western Area Urban District.[18] The country has one of the lowest nurse densities in the world, at approximately 0.2 nurses and midwives per 1000 people.[13]

Although differences in the levels of utilisation of SBA between Sierra Leone's rural and urban women have been documented,[6 11] there is a paucity of information on this topic as it is not adequately explored. Therefore, it is important to further understand these factors when stratifying by rural–urban place of residence among women because this may be key to designing effective context-specific strategies and interventions targeting rural and urban areas. We aimed to determine the correlates of SBA in Sierra Leone, stratified by rural-urban place of residence.

METHODS

Data source

Secondary data from the 2019 SLDHS was analysed for this study. SLDHS data collection occurred between May and August 2019 by Statistics Sierra Leone (Stats SL) with technical assistance from Inner City Fund (ICF) international through the DHS programme.

Study sampling and participants

A stratified, two-stage cluster sampling design was used for the survey leading to 13 872 households.[11] The 2019 SLDHS final report contains a detailed description of the sampling procedures.[11 19] Women of reproductive age who had a live birth within 5 years preceding the SLDHS were included in this secondary analysis. Originally, a weighted sample of 15 574 women was included in the individual women's data set of which 7326 had given birth within 5 years prior the survey (with 4531 in rural areas and 2795 in urban areas),[3] as shown in online supplemental file 1.

Variables

Dependent variables

SBA was defined as delivery conducted by a doctor, nurse or midwife[11] and was coded as 1 while unskilled birth attendance was coded as 0.

Independent variables

The analysis included independent variables based on evidence from available literature and data.[6 9 20] Sixteen explanatory variables were included and categorised as shown in table 1.

Statistical analysis

Due to the multistage cluster study design used by SLDH, complex sample package of SPSS (V.25.0) statistical software was used with the analysis plan designed to include sample : individual weight, strata for sampling errors/design and cluster number.[21–23] Associations between independent variables and SBA were assessed by cross tabulation and p values presented. Before the final adjusted model, each independent variable was assessed individually for its association with SBA using bivariable logistic regression and the crude OR, 95% CI and p values are presented and independent variables with a p≤0.25, and not strongly collinear with other independent variables were included in the final multivariable logistic regression model.[24] In the final adjusted model, adjusted ORs (AOR), 95% CI and p values were calculated at significance level set at p<0.05. Online supplemental file 2 shows the Strengthening the Reporting of Observational Studies in Epidemiology checklist. Sensitivity analysis was done with unskilled birth attendance as the outcome and the results are shown in online supplemental file 3.

Patient and public involvement

Patients were not involved. However, local authorities in the different regions were contacted before data collection. A comprehensive report on the survey results was released and openly available on the DHS website.[11]

RESULTS

Table 2 shows a comparison of background characteristics of study participants. Rural areas had more participants (4,531) compared with urban areas (2,795). Remarkable differences were observed in region with 1.1% of rural women residing in Western region compared with 51.1% in urban areas. Furthermore, 63.2% of rural women had no education compared with 35.5% in urban areas, 34.8% in rural areas belonged to the poorest quintile compared with 0.4% in urban areas and 36.2% had exposure to mass media in rural areas compared with 69.7%

Table 1 Categorisation of independent variables

Variable	Categorisation	Explanation
Maternal age	15–19 years, 20–34 years and 35–49 years	–
Wealth index	Poorest, poorer, middle, richer and richest quintiles	The SLDHS collected data on household asset ownership and calculated wealth index using Principal Component Analysis.[68] Among rural women, only 0.9% and 5.7% belonged to the richest and richer quintiles, hence these were combined into one to have rich, middle, poorer and poorest quintiles in logistic regression. Among urban women, only 0.3% and 3.0% belonged to the poorest and poorer quintiles, hence these were combined into one to have poor, middle, richer and richest quintiles in logistic regression.
Region	Northern, Eastern, Southern, Western and Northwestern	Among rural women, only 1.1% belonged to the Western region hence in logistic regression, Western and Northwestern regions were combined.
Education	No education, primary education, secondary and tertiary education	Among rural women, only 0.5% of the women had tertiary education and only 7.1% in urban hence secondary and tertiary were combined to have post-primary in the logistic regression analysis.
Household size	Less than seven members and seven and above members	Based on the dataset average of seven members per household
Sex of household head	Male or female	
Marital status	Married and not married	Marriage included those in formal and informal unions while not married included the never married, divorced, separated and widowed.
Religion	Muslims and Christians and others	
Problem seeking permission to access healthcare	Big problem and no big problem	In the original SLDHS questionnaire, three responses had been suggested: no problem, no big problem and big problem. However, the no problem response was not reported by anyone .
Difficulties accessing nearest health facility	Big problem and no big problem	In the original SLDHS questionnaire, three responses had been suggested: no problem, no big problem and big problem. However, the no problem response was not reported by anyone
Exposure to media	Yes and No	Yes included women who had exposure to any of the four mass media (radio, television and newspapers and internet)
Working	Yes and No	–
Visited by fieldworker	Yes and No	–
Parity	5 and above, 2–4 and 1	–
ANC frequency	8 and above ANC contacts and less than 8 ANC contacts	–
ANC timing	Within the first trimester and after first trimester	–

ANC, antenatal care; SLDHS, Sierra Leone Demographic and Health Survey.

in urban areas. Over 60.3% of rural women had big problems with distance to the nearest health facility compared with 25.8% in urban areas. Overall, 88.3% (6468/7326, 95% CI 87.9 to 89.4) of the women had SBA. SBA was higher in urban areas at 94.9% (2653/2795, 95% CI 94.1 to 95.7) compared with 84.2% (3816/4531, 95% CI 83.8 to 85.9) in rural areas.

Factors associated with SBA

Tables 3 and 4 presents the predictors of rural and urban SBA. Our analysis revealed that region of residence, exposure to mass media and distance to the nearest health facility have significant positive association with SBA among women from both regions of residence. In the rural areas, the likelihood of being delivered by a skilled birth attendant was three times higher in the Southern (aOR 3.1; 95% CI 2.1 to 4.7), Northern (aOR 2.9; 95% CI 1.9 to 4.4) and six times higher in the Eastern regions (aOR 5.7; 95% CI 3.1 to 10.7), one and a half times higher among women who had been visited a field worker (aOR 1.4; 95% CI 1.1 to 1.8), two times higher among women with postprimary education (aOR 1.8; 95% CI 1.3 to 2.5), one and a half times higher among women with exposure to mass media (aOR 1.5; 95% CI 1.1 to 1.9), twice higher among women not having big problems with distance to the nearest health facility (aOR 2.3; 95% CI 1.7 to 3.0) while the likelihood was 0.8 times lower among women who initiated ANC after the first trimester (aOR 0.8; 95% CI 0.6 to 0.9).

In the urban areas, the likelihood of being delivered by a skilled birth attendant was five times higher in the

Table 2 Sociodemographic characteristics of women in Sierra Leone as per the 2019 SLDHS

Characteristics	Rural N=4531	%	Urban N=2795	%
Age				
15–19	375	8.3	223	8.0
20–34	2835	62.6	1995	71.4
35–49	1322	29.2	577	20.6
Visited by field worker				
No	3126	69.0	1933	69.2
Yes	1405	31.0	862	30.8
Region				
Western	51	1.1	1428	51.1
Eastern	1059	23.4	483	17.3
Northwestern	1096	24.2	285	10.2
Northern	1082	23.9	351	12.6
Southern	1244	27.5	248	8.9
Religion				
Islam	3729	82.3	2036	72.9
Christianity and others	802	17.7	758	27.1
Sex household head				
Male	3663	80.8	1857	66.4
Female	868	19.2	938	33.6
Household size				
Seven and above	2083	46.0	1236	44.2
Less than 7	2448	54.0	1559	55.8
Working status				
Not working	684	15.1	998	35.7
Working	3847	84.9	1796	64.3
Marital status				
Not married	606	13.4	723	25.9
Married	3925	86.6	2072	74.1
Education level				
No education	2866	63.2	992	35.5
Primary education	729	16.1	304	10.9
Secondary education	913	20.1	1302	46.6
Tertiary	24	0.5	197	7.1
Wealth index				
Poorest	1576	34.8	11	0.4
Poorer	1466	32.4	85	3.0
Middle	1192	26.3	296	10.6
Richer	258	5.7	1184	42.4
Richest	40	0.9	1219	43.6
Parity				
1	1011	22.3	977	35.0
2–4	2522	55.7	1493	53.4
Five and above	998	22.0	324	11.6
Exposure to mass media				
No	2890	63.8	846	30.3
Yes	1641	36.2	1948	69.7
Permission to access healthcare				
Big problem	1427	31.5	399	14.3
Not big problem	3104	68.5	2396	85.7
Distance to health facility				
Big problem	2732	60.3	722	25.8
Not big problem	1799	39.7	2073	74.2
ANC timing*				
First trimester	2048	45.5	1165	42.9
After first trimester	2451	54.5	1549	57.1
ANC attendance				
Eight contacts and above	988	21.8	622	22.3
Less than eight contacts	3543	78.2	2173	77.7

*Missing 32 (0.7%) respondents in rural and 81 (2.9%) in urban areas.
ANC, antenatal care; SLDHS, Sierra Leone Demographic and Health Survey.

Southern (aOR 5.1; 95% CI 2.0 to 13.3), 12 times higher in the Eastern region (aOR 11.7; 95% CI 4.6 to 30.2), one and a half times higher among women from households with less than seven members (aOR 1.5; 95% CI 1.1 to 2.3), twice among women who had exposure to mass media (aOR 1.8; 95% CI 1.1 to 2.9) and one and a half times among women who had no big problems with distance to the nearest health facility (aOR 1.6; 95% CI 1.1 to 2.5) compared with those from the western and northwestern regions, households with seven and above household members, with no mass media exposure and those with big problems with distance, respectively. Wealth index was imprecisely significant with urban women belonging to the richest quintile (aOR 2.5; 95% CI 1.0 to 6.5) being more likely to have SBA compared with those in the poor quintile.

DISCUSSION

In this study, we looked at factors associated with SBA utilisation in Sierra Leone stratified by rural-urban place of residence. Overall, 88.3% (95% CI 87.9% to 89.4%) of the women had SBA. The overall, urban, rural and SBA prevalence in our study shows 28, 15 and 31 percentage point increases respectively compared with that of 2013.[6 25] This shows a tremendous improvement in the uptake of the SBA between 2013 and 2019 in Sierra Leone which could

Table 3 Factors associated with SBA in rural Sierra Leone as per the 2019 SLDHS

Characteristics	Not by SBA n (%)	Delivered by SBA n (%)	Crude model cOR (95% CI)	P value	Adjusted model aOR (95% CI)
Age				0.002	
35–49	249 (34.8)	1073 (28.1)	1		1
20–34	424 (59.3)	2410 (63.2)	**1.3 (1.1 to 1.6)**		1.2 (0.9 to 1.5)
15–19	42 (5.9)	333 (8.7)	**1.9 (1.3 to 2.8)**		1.5 (0.9 to 2.3)
Visited by fieldworker				0.004	
No	540 (75.6)	2586 (67.8)	1		1
Yes	175 (24.4)	1230 (32.2)	**1.5 (1.1 to 1.9)**		**1.4 (1.1 to 1.8)**
Region				<0.001	
West and Northwestern	339 (47.4)	808 (21.2)	1		1
Southern	165 (23.1)	1079 (28.3)	**2.7 (1.8 to 4.1)**		**3.1 (2.1 to 4.7)**
Northern	134 (18.7)	947 (24.8)	**3.0 (1.9 to 4.6)**		**2.9 (1.9 to 4.4)**
Eastern	77 (10.8)	982 (25.7)	**5.4 (3.0 to 9.8)**		**5.7 (3.1 to 10.7)**
Religion				0.199	
Christianity and others	109 (15.2)	693 (18.2)	1		1
Islam	606 (84.8)	3123 (81.8)	0.8 (0.6 to 1.1)		1.4 (0.9 to 1.9)
Sex household head				0.269	
Male	590 (82.5)	3072 (80.5)	1		
Female	125 (17.5)	744 (19.5)	1.2 (0.9 to 1.5)		
Household size				0.065	
Seven and above	358 (50.1)	1725 (45.2)	1		1
Less than 7	357 (49.9)	2091 (54.8)	1.2 (1.0 to 1.5)		1.1 (0.9 to 1.4)
Working status				0.745	
Not working	104 (14.5)	581 (15.2)	1		
Working	611 (85.5)	3235 (84.8)	1.0 (0.7 to 1.3)		
Marital status				<0.001	
Not married	64 (8.9)	542 (14.2)	1		1
Married	651 (91.1)	3274 (85.8)	**0.6 (0.4 to 0.8)**		0.8 (0.6 to 1.1)
Education level				<0.001	
No education	525 (73.4)	2340 (61.3)	1		1
Primary	108 (15.1)	621 (16.3)	1.3 (1.0 to 1.7)		1.1 (0.8 to 1.4)
Postprimary	82 (11.5)	855 (22.4)	**2.3 (1.7 to 3.2)**		**1.8 (1.3 to 2.5)**
Wealth Index				0.282	
Poorest	265 (37.1)	1311 (34.4)	1		
Poorer	244 (34.1)	1222 (32.0)	1.0 (0.8 to 1.3)		
Middle	173 (24.2)	1018 (26.7)	1.2 (0.9 to 1.6)		
Rich	33 (4.6)	265 (6.9)	1.6 (1.0 to 2.7)		
Parity				0.018	
5 and above	175 (24.4)	823 (21.6)	1		1
2–4	409 (57.3)	2112 (55.3)	1.1 (0.9 to 1.3)		0.9 (0.7 to 1.1)
1	131 (18.3)	881 (23.1)	**1.4 (1.1 to 1.9)**		1.0 (0.7 to 1.3)
Exposure to media				0.001	
No	514 (71.9)	2378 (62.3)	1		1
Yes	201 (28.1)	1440 (37.7)	**1.6 (1.2 to 2.0)**		**1.5 (1.1 to 1.9)**
Permission to access healthcare				0.916	

Continued

Table 3 Continued

Characteristics	Not by SBA n (%)	Delivered by SBA n (%)	Crude model cOR (95% CI)	P value	Adjusted model aOR (95% CI)
Big problem	224 (31.3)	1204 (31.6)	1		
Not big problem	491 (68.7)	2612 (68.4)	1.0 (0.8 to 1.3)		
Distance to health facility				<0.001	
Big problem	539 (75.4)	2193 (57.5)	1		1
Not big problem	176 (24.6)	1623 (42.5)	**2.3 (1.7 to 3.1)**		**2.3 (1.7 to 3.0)**
ANC timing*				0.001	
First trimester	260 (37.4)	1788 (47.0)	1		1
After first trimester	436 (62.6)	2015 (53.0)	**0.7 (0.5 to 0.9)**		**0.8 (0.6 to 0.9)**
ANC attendance				0.615	
Eight contacts and above	163 (22.8)	825 (21.6)	1		
Less than 8	552 (77.2)	2991 (78.4)	1.1 (0.8 to 1.4)		

Bold: significant at p<0.05.
*missing 32 (0.7%) respondents in rural and 81 (2.9%) in urban areas
aOR, adjusted OR ; cOR, crude OR; SBA, skilled birth attendance.

be attributed to the changes in health-seeking behaviour and transformation of the health systems witnessed after the Ebola epidemic.[26 27] The introduction of free maternal healthcare services in 2010 could also partly have contributed to the observed increase in SBA utilisation.[28 29] SBA was higher in urban areas at 94.9% (95% CI 94.1% to 95.7%) compared with 84.2% (95% CI 83.8% to 85.9%) in rural areas. Higher SBA utilisation among urban women has also been shown by Ameyaw and Dickson[6] and this could be partly explained by factors such as the huge negative effects of the conflict on the rural healthcare system, high concentration of health centres and hospitals and healthcare workers in urban areas enabling easier access to maternal healthcare services.[6 30 31] Higher SBA utilisation among urban women compared with rural women has been shown in several other studies.[32–34] The mismatch between high coverage of SBA and the persistently high numbers of maternal and perinatal deaths is not only unique to Sierra Leone. This may be partly attributed to delayed seeking of childbirth care and inadequate quality of care provided by skilled birth attendants.[35–37] Available evidence from similar low resource settings in sub-Saharan points towards poor quality of services offered.[29 38] The inadequate quality of care may be attributed to factors such as; poor remuneration which demotivates health workers, increased workload on health workers, lack of essential drugs and low quality pre-service and refresher training.[36 37] In Sierra Leone, preservice training for SBAs produces three cadres of nursing staff, namely; maternal and child health assistants who train for 2 years, state enrolled community health nurses spend two and half years in training, and state registered nurses whose training lasts 3 years. These cadres then have the option to undertake further midwifery training that lasts between 18 and 24 months depending on the nursing qualification and experience.[39 40] However, the quality of training is affected by factors such as; poor student attendance, delayed and low tutor allowances and poor schools' infrastructure especially for rural training schools.[30 40]

Region of residence, exposure to mass media, and distance to the nearest health facility had higher likelihood of SBA uptake in both rural and urban areas. Household size was only significantly associated with SBA in urban areas while being visited by a fieldworker, level of education and timing of initiation ANC were only significant in rural areas. Being a resident of the South, the Eastern and Northern regions was associated with more odds of SBA utilisation among rural areas compared with those in the Western and North-western regions which was a similar finding for urban women in the Eastern and Southern regions. This is an unexpected finding since the Western region has the highest concentration of skilled personnel and health facilities, the most developed and is the most economically vibrant region and therefore has better quality social amenities compared with other regions.[28 30] However, the Western areas have witnessed increasing numbers of urban poor who are experiencing high standards of living and inequitable distribution of social amenities hence negatively affecting their ability to access quality healthcare.[41 42] Furthermore, the documented staff challenges in urban areas such as poor delegation, favouritism and a lack of autonomy could partly affect quality of services in public health facilities which further limits utilisation of healthcare.[28 30] The government's efforts to ensure better service delivery in the less developed regions that are far away from the developed Western region could also have contributed to this observation.[12] Region has been documented to have an association with SBA in other studies.[43]

Exposure to mass media was associated with more odds of SBA utilisation in both rural and urban areas. Mass media have been documented to improve health literacy

Table 4 Factors associated with skilled birth attendance (SBA) in urban Sierra Leone as per the 2019 SLDHS

Characteristics	Not by SBA n (%)	Delivered by SBA n (%)	Crude model cOR (95% CI)	P value	Adjusted model aOR (95% CI)
Age				0.825	
35–49	28 (19.7)	549 (20.7)	1		
20–34	101 (71.1)	1894 (71.4)	0.9 (0.6 to 1.6)		
15–19	13 (9.2)	210 (7.9)	0.8 (0.4 to 1.7)		
Visited by fieldworker				0.625	
No	102 (71.8)	1831 (69.0)	1		
Yes	40 (28.2)	822 (31.0)	1.1 (0.7 to 1.9)		
Region				<0.001	
West and Northwestern	116 (81.7)	1597 (60.1)	1		1
Southern	4 (2.8)	244 (9.2)	**4.3 (1.6 to 11.4)**		**5.1 (2.0 to 13.3)**
Northern	16 (11.3)	336 (12.7)	1.6 (0.7 to 3.3)		2.0 (0.9 to 4.5)
Eastern	6 (4.2)	477 (18.0)	**6.1 (2.7 to 13.6)**		**11.7 (4.6 to 30.2)**
Religion				0.094	
Christianity and others	27 (19.0)	732 (27.6)	1		1
Islam	115 (81.0)	1921 (72.4)	0.6 (0.3 to 1.1)		0.9 (0.5 to 1.7)_
Sex household head				0.522	
Male	90 (63.4)	1767 (66.6)	1		
Female	52 (36.6)	886 (33.4)	0.9 (0.6 to 1.3)		
Household size				0.036	
Seven and above	79 (55.6)	1157 (43.6)	1		1
Less than 7	63 (44.4)	1496 (56.4)	**1.6 (1.1 to 2.6)**		**1.5 (1.1 to 2.3)**
Working status				0.080	
Not working	40 (28.2)	958 (36.1)	1		1
Working	102 (71.8)	1695 (63.9)	0.7 (0.5 to 1.0)		0.8 (0.5 to 1.3)
Marital status				0.885	
Not married	38 (26.8)	686 (25.8)	1		
Married	104 (73.2)	1967 (74.2)	1.0 (0.7 to 1.6)		
Education level				0.020	
No education	72 (50.7)	920 (34.7)	1		1
Primary	12 (8.5)	292 (11.0)	1.9 (1.0 to 3.8)		1.7 (0.8 to 3.6)
Postprimary	58 (40.8)	1441 (54.3)	**1.9 (1.2 to 3.2)**		1.4 (0.8 to 2.5)
Wealth Index				0.200	
Poor	7 (4.3)	90 (3.4)	1		1
Middle	19 (13.5)	277 (10.4)	1.0 (0.3 to 3.3)		1.2 (0.4 to 3.5)
Richer	73 (51.8)	1110 (41.9)	1.1 (0.4 to 3.0)		1.5 (0.6 to 3.4)
Richest	43 (30.5)	1176 (44.3)	2.0 (0.7 to 5.7)		2.5 (1.0 to 6.5)
Parity				0.106	
Five and above	25 (17.6)	299 (11.3)	1		1
2–4	79 (55.6)	1414 (53.3)	1.5 (0.8 to 2.9)		1.0 (0.5 to 1.2)
1	38 (26.8)	940 (35.4)	**2.1 (1.1 to 4.3)**		1.3 (0.6 to 2.7)
Exposure to media				<0.001	
No	68 (47.9)	779 (29.4)	1		1
Yes	74 (52.1)	1874 (70.6)	**2.2 (1.4 to 3.4)**		**1.8 (1.1 to 2.9)**
Permission to access healthcare				0.398	

Continued

Table 4 Continued

Characteristics	Not by SBA n (%)	Delivered by SBA n (%)	Crude model cOR (95% CI)	P value	Adjusted model aOR (95% CI)
Big problem	16 (11.3)	383 (14.4)	1		
Not big problem	126 (88.7)	2270 (85.6)	0.8 (0.4 to 1.4)		
Distance to health facility				0.104	
Big problem	47 (32.6)	676 (25.5)	1		1
Not big problem	95 (67.4)	1977 (74.5)	1.4 (0.9 to 2.2)		**1.6 (1.1 to 2.5)**
ANC timing*				0.041	
First trimester	46 (33.3)	1120 (43.5)	1		1
After first trimester	92 (66.7)	1457 (56.5)	0.7 (0.4 to 1.0)		0.8 (0.5 to 1.2)
ANC attendance				0.060	
Eight contacts and above	21 (14.8)	601 (22.7)	1		**1**
Less than 8	121 (85.2)	2052 (77.3)	0.6 (0.4 to 1.0)		0.6 (0.4 to 1.1)

Bold: significant at p<0.05.
* missing 32 (0.7%) respondents in rural and 81 (2.9%) in urban areas.
.ANC, antenatal care; aOR, adjusted OR; cOR, crude OR; SLDHS, Sierra Leone Demographic and Health Survey.

by sensitising communities on the positive outcomes of timely healthcare seeking and utilisation hence leading to positive attitudes, challenging negative social norms and improving health seeking behaviour.[44 45] Furthermore, women who are exposed to mass media are more likely to be educated, have discussions with their peers which interpersonal interactions contribute greatly in challenging negative norms that might affect health seeking and hence lead to positive health seeking behavioural change.[46 47] Hence, enhancing mass media exposure can be used to provide targeted maternal health messaging that can lead to increase in the utilisation of SBA.[48] Exposure to media has been shown in previous studies done in similar contexts to have a positive association with SBA.[6 49 50]

Rural and urban women who reported that distance to health facilities was not a major challenge had higher odds of SBA utilisation. Our study observed that the mothers in rural areas and urban areas who had no big problem with distance to a health facility had 2.25 and 1.62 higher odds, respectively, of being attended to by a skilled birth attendant compared with their counterparts who had challenges of distance to the nearest health facility. The strong association between distance to health facility and SBA utilisation among the rural mothers compared with urban can be partly explained by the fact that rural areas of Sierra Leone have poor road networks compared with urban areas with most roads being only accessible by off-road vehicles or motorbikes. This is further compounded by the lack of access to affordable transport and health facilities that far apart from each other, which contributes to delays faced by women in rural areas.[35 51] Distance to health facilities has been shown to impede access to maternal child health services including SBA in several other studies.[9 52 53]

Unlike in urban areas, being visited by a field health worker, such as a community health worker (CHW) among rural women was significantly associated with SBA utilisation. The high demand of CHWs in rural areas due to limited accessibility of healthcare because of shortage of health facilities and large distances needed to be covered by rural women[30 51] compared with easier access of health facilities in urban areas could partly explain the observed difference in association. The increased SBA utilisation among rural women who were visited by field health workers could be partly explained by the fact these field health workers equip mothers with knowledge on the dangers of using unskilled birth attendants and complications of pregnancies in addition to encouraging them to seek care within health facilities.[54] Being visited by field health workers has been shown to be associated with SBA in several other studies.[55 56]

Level of education was significantly associated with SBA in rural areas but not urban areas. Women with post-primary education had more odds of SBA utilisation compared with women with no education. Educated women are believed to easily understand counselling given from healthcare workers, more health literate hence informed on obstetric danger signs, which enables them to seek early maternal healthcare.[48] Educated women have also been shown to develop greater confidence, be more conscious of their health and better abilities to make wise decisions about their own health, hence better SBA utilisation.[6 9] Furthermore, higher levels of education have an influence on women's positive interpretation of mass media messages leading to positive healthcare seeking behaviour change.[48] In predominantly patriarchal African societies and mainly in rural areas,[57] men are the main providers with the highest decision making powers.[58] Women in rural areas are usually

less empowered due to the more conservative societies in rural areas hence factors such as education that might increase women's status and decision making are more likely to have an impact on healthcare seeking.[59–62] This might partly explain the significance of education in rural areas and the non-significance in urban areas. Our findings indicate the need for government to strengthen access to quality girl child education among rural areas to at least secondary school level. Level of education has been shown to be associated with SBA utilisation among several other studies.[48 63] Delayed initiation of ANC among rural women was associated with less odds of SBA utilisation. ANC utilisation has been shown to be associated with several other studies.[48 52 64] Delayed initiation could partly reflect poor health seeking behaviour which is further observed by reduced odds of SBA utilisation. However, there is need for further studies to explore the association of ANC utilisation and SBA given the fact that ANC frequency was not significantly associated with SBA but timing of ANC initiation was.

Besides the three factors that were significant in both rural and urban areas, household size was the only factor that showed significance in urban areas. Women who belonged to households with less than seven members had more odds of SBA utilisation compared with their counterparts. This is in agreement with a study done in Nigeria and India.[65 66] Although wealth index was marginally significant in urban areas, women belonging to the richest wealth quintile had 2.5 odds of SBA utilisation compared with their counterparts in the poorest households. We hypothesise that families with smaller sizes tend to have less expenditure which enables savings that can be used for the direct and indirect costs involved in accessing healthcare.[66] Furthermore, smaller sizes could be attributed to better maternal healthcare seeking such as modern contraceptives utilisation which is further translated into SBA utilisation.[66] Lastly, having smaller family size might lead to less time spent by women while doing household chores and providing care to other family members and increase their time to seek healthcare.[67] However, given the dearth of information regarding household size and SBA utilisation, we recommend further studies to explore this.

Strengths and limitations

The study used a nationally representative sample for the analysis and thus the results can be generalised to all Sierra Leone women. Since the data was extracted from DHS surveys, we are confident that standardised procedures such as validated questionnaires were used in data collection to ensure the validity of the results. This being a cross-sectional study, this creates a limitation in establishing casual relationships from the established associations. In addition, since most of the data was for women who had childbirths within 5 years preceding the survey, we anticipate recall bias in the process of collecting this data among the respondents.

CONCLUSION AND PUBLIC HEALTH IMPLICATIONS

In Sierra Leon, SBA utilisation has greatly improved in the last decade. Utilisation is higher in the urban compared with the rural areas. Region of residence, exposure to mass media, and distance to the nearest health facility had a significant association with SBA uptake in both rural and urban areas. Household size was only significantly associated with SBA in urban areas while being visited by a fieldworker, level of education and timing of initiation ANC were only significant in rural areas. Hence ensuring context specific policies and strategies is crucial to ensure effective SBA utilisation. Generally, maternal stakeholders need to focus on Western region, use of mass media for awareness and sensitisation and ensuring increased availability of affordable and accessible health facilities in both rural and urban areas. In addition, urban-specific programmes need to focus on women residing in larger households and rural specific programmes need to focus on use of field health workers, women educated to primary level and below and ensuring timely initiation of ANC services. Further research is need to explore reasons why maternal mortality is high despite the high SBA focusing on areas such as quality of care provided.

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Ethics approval This study involves human participants and was approved by High international ethical standards are ensured during MEASURE DHS surveys and the 2019 SLDHS protocol was reviewed and approved by the Sierra Leone Ethics and Scientific Review Committee and the ICF Institutional Review Board. Besides, the local authorities before implementing the survey and well-informed verbal consent are sought from the respondents prior to data collection. This data set was obtained from the MEASURE DHS website (URL: https://www.dhsprogram.com/data/available-datasets.cfm) after getting their permission, and no formal ethical clearance was obtained since we conducted a secondary analysis of publicly available data. Note: The SLDHS report does not provide the IRB approval number Participants gave informed consent to participate in the study before taking part.

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