Effects of Spatial Location and Household Wealth on the Utilisation of Skilled Birth Attendants at Delivery Among Women in Rural Ghana

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Abstract

Skilled attendance during delivery has been identified as a panacea to the amelioration of maternal and new-born mortality, but utilisation is lower in rural areas than in urban areas of Ghana. The study examined the role of spatial location and household wealth in the use of skilled birth attendants at delivery among rural women in Ghana. The paper made use of data from the 2014 Ghana Demographic and Health Survey. Women from rural areas who had given birth within five years prior to the survey were included in the analysis. Frequency, percentage, Chi-square tests as well as binary and multivariate logistic regression estimation techniques were used to analyse the data. The probability of utilising skilled birth attendants at delivery increased by household wealth. Rural women in coastal Ghana also had the least probability of utilising skilled assistance at delivery. There are spatial differences in the use of skilled birth attendants at delivery among women in rural Ghana with those in the coastal areas having the highest probability of non-utilisation. A perpetuation of the current spatial and wealth variations in the utilisation of skilled birth attendants at delivery among women in the rural parts of the country implies that Ghana may not be able to meet her Sustainable Development Goal target of reducing the maternal mortality ratio to less than 70 maternal deaths per 100,000 live births by the year 2030. The study, therefore, underscores the need for geographical and income vulnerability considerations in identifying rural populations for special skilled delivery care interventions in improving maternal health outcomes.

Keywords: skilled birth attendants, spatial location, household wealth, delivery, pregnancy, Ghana

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Introduction

Pregnancy and childbirth are natural and eventful phenomena which many women desire to experience in their lives, but the processes involved in giving birth often come with risks and complications including death not only to the mother but also to the newborn (World Health Organisation [WHO], 2004). In 2016, about 830 women died globally every day due to complications relating to pregnancy and childbirth (WHO, 2016). Almost all of these deaths (99%) occurred in developing countries and could have been prevented (WHO, 2016). Various studies have shown that more than two-thirds of maternal deaths recorded in developing countries are due to direct obstetric causes such as sepsis, abortion, haemorrhage, ruptured uterus, and hypertensive diseases of pregnancy which are easily preventable and treatable, and over 77% of maternal deaths occurred during or within 24 hours after delivery (Family Care International, 2007; United Nations Population Fund [UNFPA], 2012; WHO, 2016).

Due to the shattering effects of maternal mortality in these developing countries, maternal health was included among eight global Millennium Development Goals (MDGs) (adopted at the International Conference on Population and Development +5 [ICPD+5]) at the beginning of the new millennium; aimed at improving life particularly in the developing world (Zere, Oluwole, Kirigia, Mwikisa, & Mbeeli, 2011). One of the targets set was to have about 80% of all deliveries assisted by skilled birth attendants (SBAs) globally by 2005, 85% by 2010, and 90% by 2015 (Adegoke & Broek, 2009). Despite national and global efforts at achieving this target, the maternal mortality pointers of most countries in the developing world indicated minimal progress at the end of 2015. This, therefore gave rise to 17 newly created Sustainable Development Goals (SDGs) (The Guardian, 2015). One of the targets of Goal Three seeks to reduce the global maternal mortality ratio to less than 70 maternal deaths per 100,000 live births by 2030 (The Guardian, 2015).

A major reason for the poor maternal health outcomes of women in the developing world which even led to the inclusion of maternal health issues in both the MDGs and SDGs is their minimal utilisation of skilled delivery services by Skilled Birth Attendants (SBAs) (Choulagai et al., 2013). Research has indicated that maternal mortality is generally low when deliveries are generally attended by SBAs (Lule, Ramana, Ooman, Epp, Huntington, & Rosen, 2005; Abera, Gebremariam, & Belachew, 2011; Teferra, Alemu, & Woldeyohannes, 2012). SBAs play important roles in decreasing maternal mortality as they offer timely obstetric care for complications that are life-threatening (Onta, Choulagai, Shrestha, Subedi, Bhandari, &

Krettek, 2014). SBAs are health professionals who have basic obstetric and midwifery skills and they comprise of midwives, nurses, and physicians (WHO, 2004).

Maternal mortality is a health indicator which shows very wide healthcare utilisation disparities that exist between rural and urban areas, with the former being the disadvantaged (WHO, 2016). Alemayehu and Mekonnen (2015) in an Ethiopian study for instance, found that skilled attendance at delivery was 7.15 times more likely to be utilised by urban women compared with women in rural settings without any controls. When other confounding socio-demographic variables were controlled however, the odds of utilising skilled birth attendance was 5.46 times high among urban women compared with the rural ones.

According to the 2010 population and Housing Census of Ghana, 49.1% of the country's population lives in rural areas (Ghana Statistical Service [GSS], 2013). At the national level, 74% of all deliveries in the country are with the assistance of SBAs; 14% by a physician, 57% by a registered nurse/midwife, and 3% by a community health officer/nurse (GSS, Ghana Health Service [GHS], & ICF International, 2015). Based on rural-urban dichotomies, this translates to 90.1% in urban areas and 60.2% in rural areas; a difference of 29.9%. These findings are against the background that skilled delivery services are covered by the National Health Insurance Scheme, where pregnant women have the opportunity to utilise public health facilities free of any charges upon free subscription unto the scheme (National Health Insurance Authority [NHIA], 2012). It is, therefore, obvious that even though skilled attendance at delivery has been identified as a panacea to the amelioration of maternal and new-born mortality, utilisation of these services is low in rural Ghana (Daniels, Ahenkan, & Poku, 2013).

With a high maternal mortality ratio (MMR) of 485 deaths per 100,000 live births which translates to a maternal mortality rate of 4.9 deaths per 1,000 women (GSS, 2013), there is the need to pay attention to skilled delivery services in the country, particularly in the rural areas as they are more proportionally disadvantaged (GSS et al., 2015). Despite the need for attention to be paid to rural areas regarding skilled attendance at delivery, there is a paucity of empirical studies focusing on rural areas. The only study found was by Daniels et al. (2013) which was not nationally representative as it focused only on the Akuapim North District of the country. Spatial location and household wealth were also not included in the analysis by the authors. These two variables have, however, been found to predict the utilisation of health care services by women (Kumi-Kyereme & Amo-Adjei, 2013). Our study contributes to the existing literature on skilled delivery by providing the correlates of skilled birth attendants' utilisation by rural women in Ghana with emphasis on spatial location and household wealth.

Conceptual Framework

The Andersen Health Care Utilisation Model was adopted as the conceptual framework of the study. The model was originally developed by Ronald M. Andersen in 1968 as the outcome of a survey for the Center for Health Administration Studies and the National Opinion Research on families' use of health services (Andersen, 1968; Aday, Andersen, & Fleming, 1980; Andersen, 2008). The main tenets of the theory are; pre-disposing, need, and enabling factors (*see* Figure 1) (Andersen, 2008).

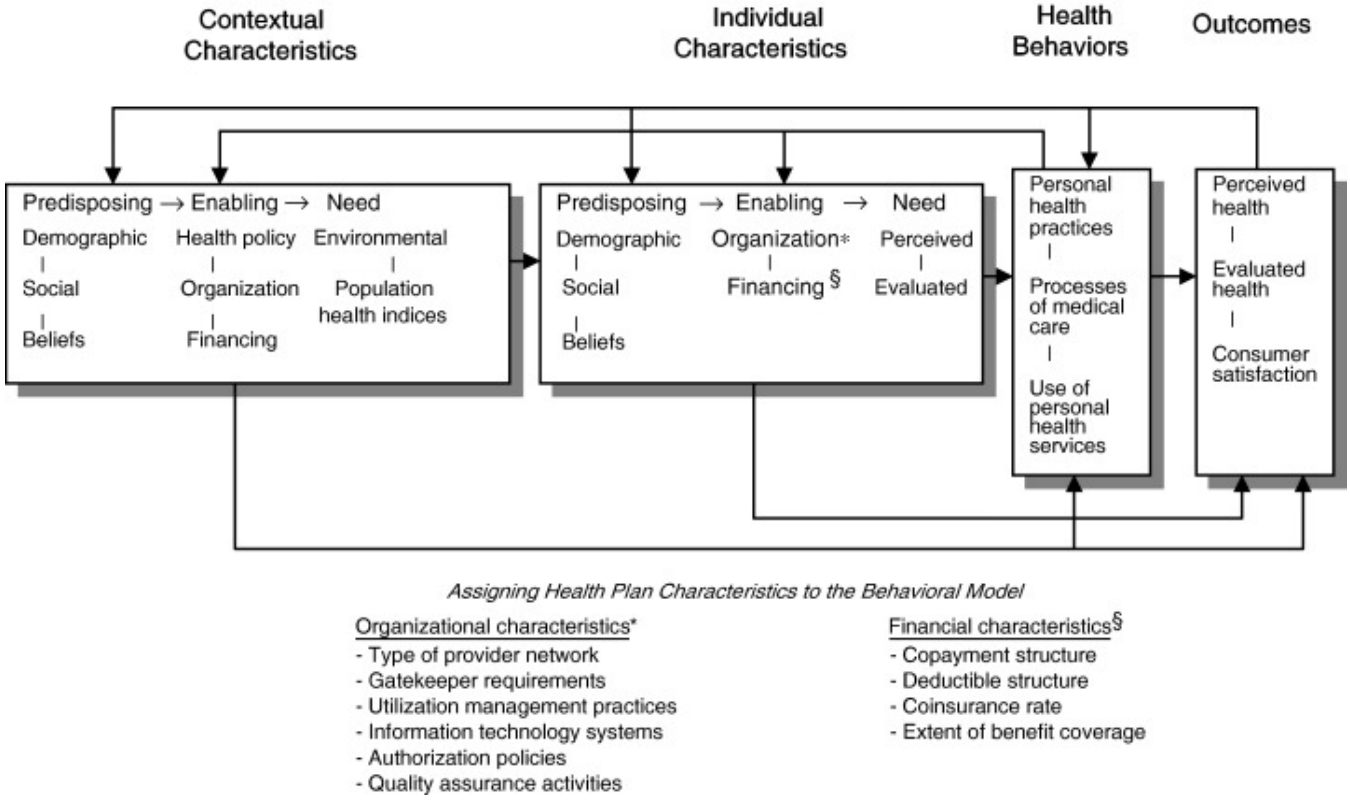
Predisposing factors according to the theory, are basically the demographic characteristics of individuals and include; sex and age as biological imperatives; social factors such as religion, occupation, education, ethnicity, attitude towards health, and social relations (such as family status); mental factors in terms of health beliefs (e.g., values, attitudes, and knowledge on health and health-related services); and contextual factors including the social and demographic composition of communities, organisational and collective values, as well as political perspectives and cultural norms, which predispose individuals to the use of health services (Andersen & Davidson, 2001).

Enabling factors are described by the model as being external to the individual, but important in influencing his/her decisions concerning the use of health services (Andersen, 2008). Organisational and financing factors are considered to serve as the conditions enabling health service utilisation (Babitsch, Gohl, & von Lengerke, 2012). They include the wealth and income at the disposal of the individual which enables him/her to pay for the utilisation of health services as well as the effective price of health care which is determined by cost-sharing requirements and the individual's health insurance status. The other factors are; access to a regular source of care and the nature of that source, distance to the nearest health facility, the means of transportation, and waiting time for healthcare (Figure 1) (Andersen & Davidson, 2001).

The need factors according to the model, refer to perceptions of the seriousness of a disease or health condition (Andersen & Newman, 1973). The model distinguishes between perceived need for health services (how people perceive and experience their own health status [self-rated health], functional state, and illness symptoms) and evaluated need (objective measurements of patients' health status and professional assessments, and need for medical care) in this tenet of the model (Andersen, 1995; Andersen & Newman, 2005).

The health care utilisation model was considered relevant to the current study and has thus been adopted because of its strength in spelling out the various factors that may influence the utilisation of SBAs at delivery by rural women in their reproductive age in Ghana. Therefore, with regards to the utilisation of SBAs among rural women, the health services utilisation model is relevant in explaining how household wealth, spatial location in relation to the site of the nearest health facility for delivery, and other variables influence the utilisation of the SBAs at delivery in Ghana (Figure 1).

Figure 1: Health Services Utilisation Model



Source: Andersen and Davidson (2001)

Materials and Methods

Source of Data

The study used data from the women's recode file of the 2014 Ghana Demographic and Health Survey (GDHS). The Ghana Demographic and Health Survey is a national study which is conducted in the ten administrative regions of Ghana and is designed to be carried out every five years. The survey focuses on maternal and child health and provides sufficient data to observe the population and health position of the country. It collects data on variables such as;

fertility, antenatal, delivery and post-natal care, contraceptive use, family planning and child health. The survey is conducted by the Ghana Health Service (GHS) and the Statistical Service (GSS) with technical support from the MEASURE DHS programme though ICF International. Even though the survey was designed to be carried out every five years, the 2014 version was conducted after six years. In this version, 9,396 women in reproductive age (15–49 years) were interviewed from 12,831 households covering 427 clusters all over the country and had a 97% response rate (GSS et al., 2015). For the purpose of this study, only women from rural areas who had given birth within five years prior to the survey were considered: 1581 women. Permission to use the data set was given us by the MEASURE DHS following the assessment of a concept note.

Measures

Since our interest was to examine the probability of utilising skilled delivery services, the outcome variable adopted was assisted skilled delivery. This was derived from the question "who assisted with the delivery of?". Responses of those who received assistance from a doctor, nurse/midwife, and community health officer /nurse were captioned as assisted skilled delivery. The outcome variable was coded as 1 = "Yes" and 0 = "No" since it was dichotomous in nature.

The principal explanatory variables used in the study were spatial location and household wealth. The choice of spatial location and household wealth was based on differences in poverty scores across the ten regions of the country. The Ghana Shared Growth and Development Agenda (2010–2013) for instance noted variations in accessibility to health care in the country, with the south benefiting more than the north. The spatial location variable was created by collapsing the ten regions into three zones: Central, Western, Greater Accra, and Volta as the Coastal zone; the Ashanti, Eastern, and Brong-Ahafo were classified as the Middle zone while the Upper East, Northern, and Upper West regions were grouped as the Northern zone. These three zones are classifications used by the Ghana Statistical Service based on the three major ecological zones in the country (coastal zone = the low, sandy coastal plains, with several rivers and streams; middle zone = the middle and western parts of the country, characterised by a heavy canopy of semideciduous rainforests, with many streams and rivers; and Northern Zone = a northern savannah, which is drained by the Black and White Volta Rivers) (GSS et al., 2015). Household wealth was created from wealth status in DHS dataset, which is an accumulation using factor analysis of various household belongings including

agricultural land, car, refrigerator, materials used in constructing houses, bicycle, television, type of household cooking fuel and radio. Household wealth was categorised as poorest, poorer, middle, richer, and richest (GSS et al., 2015).

Eight other explanatory variables were used and they include maternal age, education, distance to health facility, ethnicity, parity (birth order), partner's education, getting money for treatment, and marital status. Age was grouped into, 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, and 45–49. Education was categorised into four groups; higher education, secondary education, primary education, and no education. Marital status was categorised as married, single (widowed, never married, divorced, and not living together) and cohabitation (living together). Distance to a health facility was also categorised as not a big problem and a big problem. Ethnicity was categorised as Ga/Dangme, Akan, Ewe, Mole – Dagbani, Guan, Grussi, Mande, Gruma, and Other. Parity (order of births) was categorised as four births or more, three births, two births, one birth, and zero birth. Partner's education was classified into four categories; higher education, secondary education, primary education, and no education. Getting money for treatment was captured as not big problem and a big problem.

Analysis

Frequency, percentage, Chi-square tests as well as binary and multivariate logistic regression estimation techniques were used to analyse the data. Binary logistic regression, for instance, was used to indicate how the outcome variable correlated with the explanatory variables. Binary logistic regression was used because it allows the predictions on a mixture of categorical and continuous variables. Two models of the binary logistic regression analysis were conducted. The first model was conducted for the influence of the two principal only spatial location and household wealth on the dependent variable. The second model was conducted for the effects of all ten explanatory variables included in the study. Survey weights, which are typical of nationally representative studies, were factored into both inferential and descriptive analyses conducted. The weights helped to offset the challenges of over and under sampling which normally characterise national studies. Analysis was done with STATA (version 13).

Results

Table 1 presents respondents who utilised skilled assistance at delivery based on spatial location, household wealth, education, age, distance to health facility, ethnicity, parity, partner's education, getting money for treatment and marital status, and parity. Regarding our

principal variables, it was observed that whereas majority of women in the coastal (67.8%) and middle (68.9%) zones utilised SBAs, less than 50% of those in the northern zone (37%) did same. Utilisation of SBAs at delivery was also found to increase by wealth status.

For the remaining variables, it was realised for instance that utilisation of SBAs at delivery increased by the level of formal education attained. It was only women who were in their late 40s that recorded less than 50% utilisation of SBAs at delivery. A higher proportion of those who did not consider distance to the nearest health facility as a big problem (69%) actually utilised SBAs at delivery compared to those who considered distance to the nearest health facility as a big problem (51.4%). It was observed that below 50% of respondents who were Gurmas (27.9%) utilised SBAs at delivery. Less than 50% of women whose partners had no formal education gave birth with skilled assistance. We also found that utilisation of skilled assistance at delivery was higher for those who did not consider getting money for treatment as a big problem (69.1%) than those who considered it as a big problem (56.6%). It was observed from the Chi-square tests conducted that all ten independent variables were significantly related to utilisation of SBAs at delivery.

Table 1: Skilled attendance at delivery and background characteristics

Variable	N= 1581	Proportion who utilised SBAs at delivery	P Value
Spatial location			<0.001
Coastal zone	675	67.8	
Middle zone	579	68.9	
Northern zone	327	48.1	
Household wealth			<0.001
Poorest	424	47.8	
Poorer	490	61.1	
Middle	397	73.1	
Richer	235	95.0	
Richest	35	95.9	
Education			<0.001
No education	431	47.9	
Primary	354	60.9	
Secondary	756	76.1	
Higher	44	94.0	
Age			0.003
15 – 19	91	72.0	
20 – 24	308	64.1	
25 – 29	395	65.4	
30 – 34	290	56.9	
35 – 39	298	65.3	
40 – 44	155	62.7	
45 – 49	43	47.9	
Distance to health facility			<0.001
Big problem	452	51.4	
Not a big problem	1129	69.0	

Table 1: skilled attendance at delivery and background characteristics (Continued)

Ethnicity			<0.001
Akan	787	71.8	
Ga/Dangme	63	59.2	
Ewe	204	64.4	
Guan	35	65.3	
Mole – Dagbani	313	63.6	
Grusi	53	65.3	
Gurma	85	27.9	
Mande	28	85.2	
Other	13	39.6	
Parity			<0.001
One birth	365	75.2	
Two births	277	64.9	
Three births	287	66.6	
Four births or more	651	55.6	
Partners education			<0.001
No education	319	44.8	
Primary	195	61.5	
Secondary	788	69.6	
Higher	110	87.1	
Getting money for treatment			<0.001
Big problem	711	56.6	
Not a big problem	870	69.1	
Marital status			0.002
Single	278	68.5	
Married	960	62.6	
Cohabitation	343	59.5	

Table 2 presents results of the binary logistic regression for the utilisation of skilled birth attendants among the rural women surveyed. In the first model, it was realised that women in the middle (OR=1.45, 95% CI=1.15–1.81) and northern zones (OR=1.16, 95% CI=0.91–1.49) were more likely to utilise skilled births attendants at delivery than those in the coastal zone. These effects did not differ much when the other variables were added in the second model, as the computed odds of utilising SBAs at delivery were 24% and 13% more likely for the middle and northern zones respectively.

For household wealth, the first model showed that the odds of utilising SBAs at delivery increased with wealth, with those in the richest wealth quintile for instance, being more than 14 times more likely to utilise skilled attendance at delivery (OR=14.76, 95% CI=1.92–113.70). It was, however, observed that when the other variables were added, even though women with the poorer, middle, richer, and richest household wealth were still more likely to utilise SBAs at delivery, the odds of doing so decreased for all the categories.

For the other variables in the second model, it was realized that Guans (OR=1.46, 95% CI=0.77–2.80), Mole-Dagbanis (OR=1.79, 95% CI=1.22–2.63), Grusis (OR=1.48, 95% CI=0.89–2.44) and Mandes (OR=4.43, 95% CI=0.25–1.27) were all more likely to utilise SBAs at delivery than rural Akan women (Table 2). Women who had two births (OR=0.71, 95% CI=0.48–1.03), three births (OR=0.65, 95% CI=0.43 – 0.98) and four or more births (OR=0.43, 95% CI=0.28 – 0.65) were all less likely to utilise SBA at delivery than those who had just one birth. Women who considered money needed for treatment as a big problem were also less likely to utilise skilled assistance at birth than those who did not consider money as a big problem (OR=0.93, 95% CI=0.75–1.16). The results in the second model also revealed significant effects of spatial location (middle zone), household wealth, education, age (35-39, 40-44), ethnicity (Mole-Dagbani, Gurma, Mande), parity, partner's education, and distance to health facility on skilled assistance at delivery (Table 2).

Table 2: Binary logistic regression on skilled attendance at delivery among women in rural Ghana

Independent variable	Model 1	95% CI	Model 2	95% CI
Spatial location				
Coastal zone	[1]	[1,1]	[1]	[1,1]
Middle zone	1.45**	[1.15–1.81]	1.24*	[0.96–1.60]
Northern zone	1.16	[0.91–1.49]	1.13	[0.78–1.63]
Household wealth				
Poorest	[1]	[1,1]	[1]	[1,1]
Poorer	1.55***	[1.24–1.95]	1.17	[0.90–1.51]
Middle	2.74***	[2.05–3.66]	1.65**	[1.18–2.33]
Richer	13.26***	[6.76–26.04]	5.06***	[2.40–10.65]
Richest	14.76**	[1.92–113.70]	2.22	[0.26–19.14]
Education				
No education			[1]	[1,1]
Primary			1.28*	[0.99–1.65]
Secondary			1.89***	[1.41–2.50]
Higher			1	1
Age				
15 – 19			[1]	[1,1]
20 – 24			0.88	[0.41–1.18]
25 – 29			1.09	[0.79–1.51]
30 – 34			1.34	[0.91–1.95]
35 – 39			1.58**	[1.06–2.37]
40 – 44			1.95**	[1.24–3.08]
45 – 49			1.41	[0.81–2.36]

Table 2: Binary logistic regression on skilled attendance at delivery among women in rural Ghana (Continued)

Ethnicity		
Akan	[1]	[1,1]
Ga/Dangme	0.70	[0.41–1.18]
Ewe	0.87	[0.62–122]
Guan	1.46	[0.77–2.80]
Mole–Dagbani	1.79**	[1.22–2.63]
Grusi	1.48	[0.89–2.44]
Gurma	0.51**	[0.33–0.78]
Mande	4.43**	[1.71–11.4]
Other	0.56	[0.25–1.27]
Parity		
One birth	[1]	[1,1]
Two births	0.71*	[0.48–1.03]
Three births	0.65**	[0.43–0.98]
Four or more births	0.43***	[0.28–0.65]
Marital status		
Single	[1]	[1,1]
Married	1.08	[0.75–1.55]
Cohabitation	0.79	[0.53–1.17]
Partners education		
No education	[1]	[1,1]
Primary	1.63**	[1.22–2.19]
Secondary	1.68***	[1.28–2.19]
Higher	2.21**	[1.15–4.25]
Distance to health facility		
Not a big problem	[1]	[1,1]
Big problem	0.68***	[0.55–0.84]
Money needed for treatment		
Not a big problem	[1]	[1,1]
Big problem	0.93	[0.75–1.16]

Exponentiated coefficients; 95% confidence intervals in brackets

p<0.05* p<0.01** p<0.001***

Discussion

Our study showed that spatial location and household wealth play significant roles in the utilisation of SBAs at delivery. Thus, we found that there were spatial differences in the use of SBAs at delivery among women in rural Ghana with those in the coastal zone being the most likely not to utilise skilled delivery services. Similarly, the poorest women in rural Ghana have the highest likelihood of not utilising SBAs at delivery.

We found for instance that utilisation of SBAs at delivery mainly favoured the rural rich both in the descriptive and the inferential analyses conducted. This finding sits appropriately with postulations of the conceptual framework that health financing which is dependent on wealth status, is essential to the utilisation of health services (Andersen, 2008). The rural rich were, therefore, motivated by the fact that they had the financial capability, to access SBA services. The finding regarding the rural rich being more likely to utilise SBAs is also in line with previous studies conducted with respect to utilisation of health services by women (Letamo & Rakgoasi, 2003; Say & Raine, 2007; Amu, Kumi-Kyereme, & Darteh, 2017; Dickson & Amu, 2017). For instance, in a study which made use of data compiled from 30 studies in 23 countries, Say and Raine (2007) argued that wealthier women were more likely to deliver with skilled assistance in health facility settings. In Botswana, Letamo and Rakgoasi (2003) noted that women of lower wealth status were more likely to have a non-health facility delivery.

We found that rural women in the coastal zone had the least probability of utilising skilled assistance at delivery while those in the northern zone had the highest probability. The implication, therefore, is that women in rural areas of the coastal zone were most likely not to utilise SBAs at delivery. This finding contradicts many non-rural based studies which have found utilisation of health care services to be more prevalent in Coastal Ghana than in Northern Ghana (Annim, Mariwah, & Sebu, 2012; Asamoah, Agardh, & Cromley, 2014). Our finding may be as a result of the fact that women in the coastal zone usually experience a multiplicity of healthcare facilities and services (Annim et al., 2012; Dickson, Adde, & Amu, 2016). As posited by the conceptual framework in relation to the need factors (Andersen & Newman, 1973), their perception of the quality of maternal care services provided to them, therefore, becomes negative due to negative attitude of health professionals (nurses, midwives, and doctors) towards them, and lack of essential logistics such as resuscitation materials and drugs (eg. ergometrine, hydralazine, oxytocin, and pethidine) essential for handling emergency obstetric care as argued in previous studies (Annim et al., 2012; Amu & Dickson, 2016).

Our results point to class dimensions in the utilisation of SBAs at delivery. Women whose partners are better educated and wealthier were more likely to have delivered with skilled attendance compared with those having less educated partners. These findings are in conformity with other studies (Rempel and Rempel, 2004; Nyarko & Amu, 2015; Sialubanje, Massar, van der Pijl, Kirch, Hamer, & Ruiter, 2015; Amu & Nyarko, 2016) on determinants of health care service utilisation among women. The fact that partner's education predicted SBAs utilisation at delivery better than an individuals' own education points to the significant umpire roles men play in women's health decision making. This finding is largely consistent with some preceding studies on influences of partners' characteristics on women's health decision-making (Jehu-Appiah, Aryeetey, Spaan, De Hoop, Agyepong, & Baltussen, 2011; Kumi-Kyereme & Amo-Adjei, 2013).

Even though the odds of utilising SBAs at delivery were same for both women with the highest level of education and those who had none, the descriptive data showed that the proportion of utilisation was higher for the highly educated women than those with no education. Coupled with this was the fact that the chi-square test conducted indicated a significant relationship between education and utilisation of SBAs at delivery. These findings, therefore, reflect the fact that level of education is an important influence on the utilisation of health care services as opined by Chakraborty, Islam, Chowdhury, Bari, and Akhter (2003) and Alemayehu and Mekonnen (2015).

The conceptual framework recognises that distance to a health facility is a major factor influencing the health service utilisation of an individual (Andersen & Davidson, 2001). In this regard, our descriptive analysis indicates that a lower proportion of women who considered distance to health facilities as a big problem actually utilised SBAs at delivery compared to those who did not consider distance as a big problem. Our inferential (binary logistic regression) analysis also indicated that the odds of using SBAs at delivery were lower for women who considered distance as a big problem as compared to those who did not consider distance to health facilities as a big problem. This finding also points to the fact that people in rural areas still travel long distances to health centres and hospitals for delivery care as found by Sialubanje et al. (2015). This is coupled with the fact that roads in the rural areas are mainly in deplorable states as noted by Dickson et al. (2016) and the Ghana Statistical Service (2014). The implication is that many of the women get discouraged by the distance and decide to rather give birth at home as found in a previous study by Esena and Sappor (2013). Onta et al. (2014)

also noted in a previous study that distance and poor conditions of roads in rural areas make it virtually impossible for many women to reach health facilities for skilled attendance at delivery.

Our findings where primiparous were more likely to utilise SBAs at delivery than multiparous women, are consistent with Umurungi's (2010) argument that primiparous women are usually more likely to use health services for delivery than multiparous women. This finding may be due to the fact that primiparous women are considered to be at greater risk of experiencing complications if maternal services are not adequately utilised than those who had been pregnant a few times as opined by Ntambue, Malonga, Dramaix-Wilmet and Donnen (2012) and Dickson et al. (2016). As such, they were encouraged by their partners and health professionals not to neglect skilled assistance at delivery as found in the study by Esena and Sappor (2013). It was therefore not surprising that in our findings, we realized that they actually utilised SBAs at delivery than other women. We also observed that household wealth and spatial location, as well as the other variables, were associated with utilisation of SBAs at delivery. This gives an indication of conceivable significant differences among the respective groupings of the variables.

Despite the important findings we made in this study, the limitations of the study are equally worth noting. Because we relied on data which was collected cross-sectionally, it was impossible for us to account for unobserved heterogeneity. Also, the relationships which we found between the explanatory and dependent may vary over time.

Conclusion

There are spatial differences in the use of SBAs at delivery among women in rural Ghana with those in the coastal zone being the most likely not to utilise skilled delivery services. Similarly, the poorest women in rural Ghana have the highest likelihood of not utilising SBAs at delivery. A perpetuation of the current spatial and wealth variations in the utilisation of SBAs among women in the rural parts of the country implies that Ghana may not be able to meet her SDG target of reducing the maternal mortality ratio to less than 70 maternal deaths per 100,000 live births by the year 2030. To forestall this, the study underscores the need for geographical and income vulnerability considerations in identifying rural populations for special skilled delivery care interventions as part of efforts by the Ministry of Health and the Ghana Health Service in improving maternal health outcomes. Specifically, construction of Community-based Health

Planning and Services (CHPS) compounds in all rural areas by the Ministry of Health to improve skilled attendance at delivery, and placing midwives in these facilities by the Ghana Health Service could help promote skilled attendance at delivery in the most vulnerable rural settings of the country, particularly in the coastal zone. The Livelihood Empowerment against Poverty (LEAP) initiative should also be extended by the government to include more households in order to address the income variations which influence the non-utilisation of skilled birth attendants at delivery among women in the lowest wealth quintiles.

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Contribution of Authors

HA conceived the study. KSD performed the analysis. HA reviewed the relevant literature and wrote the first draft of the manuscript. Both authors proof-read the final manuscript and approved it.

References

Abera M., Gebremariam, A., & Belachew, T. (2011). Predictors of safe delivery service utilization in Arsi Zone, South-East Ethiopia. *Ethiopian Journal of Health Sciences, 21*(1), 95–106.

Aday, L. A., Andersen, R. M., & Fleming, G. V. (1980). *Health care in the US: Equitable for whom?* Beverly Hills, CA: Sage.

Adegoke, A., & Broek, N. (2009). Skilled birth attendance-lessons learnt. *International Journal of Obstetrics and Gynaecology, 116*, 33-40.

Alemayehu, M., & Mekonnen, W. (2015). The prevalence of skilled birth attendant utilization and its correlates in North West Ethiopia. *BioMed Research International,* 1–8.

Amu, H., & Dickson, S. K. (2016). Health insurance subscription among women in reproductive age in Ghana: Do socio-demographics matter? *Health Economics Review, 6*(24), 1–8.

Amu, H., & Nyarko, S. H. (2016). Preparedness of health care professionals in preventing maternal mortality at a public health facility in Ghana: a qualitative study. *BMC Health Services Research, 16*(252), 1-7.

Amu, H., Kumi-Kyereme, A., & Darteh, E. K. M. (2017). Trends in Health Insurance Subscription at Cape Coast, Ghana: A Retrospective Study from 2005–2014. *Ghana Journal of Geography, 9*(3), 97-111.

Andersen, R. M. (1968). *Families' use of health services: A behavioural model of predisposing, enabling and need components.* West Lafayette, IN: Purdue University.

Andersen, R. M. (1995). Revisiting the behavioral model and access to medical care: Does it matter? *Journal of Health and Social Behavior, 36,* 1-10.

Andersen, R. M. (2008). National health surveys and the behavioural model of health services use. *Medical Care, 46*(7), 647-53.

Andersen, R. M., & Davidson, P. L. (2001). Improving access to care in America: Individual and contextual indicators. In RM Andersen, TH Rice, and EF Kominski (Eds.) *Changing the U.S. health care system: Key issues in health services, policy, and management* (pp. 3-30). San Francisco, CA: Jossey-Bass.

Andersen, R., & Newman, J. F. (1973). Societal and individual determinants of medical care utilization in the United States. The Milbank Memorial Fund Quarterly. Health and Society, 95-124.

Andersen, R. M. & Newman, J. F. (2005). Societal and individual determinants of medical care utilization in the United States. *The Milbank Quarterly, 83,* 1–28.

Annim, S. K., Mariwah, S., & Sebu, J. (2012). Spatial inequality and household poverty in Ghana. Economic Systems, 36(4), 487-505.

Asamoah, B. O., Agardh, A., & Cromley, E. K. (2014). Spatial analysis of skilled birth attendant utilization in Ghana. *Global Journal of Health Science, 6*(4), 117–127.

Babitsch, B., Gohl, D., & von Lengerke, T. (2012). Re-revisiting Andersen's Behavioral Model of Health Services Use: A systematic review of studies from 1998–2011. *GMS Psycho-Social-Medicine, 9,* 1–15.

Chakraborty, N., Islam, M. A., Chowdhury, R. I., Bari, W., & Akhter, H. H. (2003). Determinants of the use of maternal health services in rural Bangladesh. *Health Promotion International*, *18*(4), 327-337.

Choulagai, B., Onta, S., Subedi, N., Mehata, S., Bhandari, G. P., Poudyal, A., ... & Krettek, A. (2013). Barriers to using skilled birth attendants' services in mid-and far-western Nepal: A cross-sectional study. *BMC International Health and Human Rights, 13*(49), 1–9.

Daniels, A. A., Ahenkan, A., & Poku, K. A. (2013). Factors influencing the utilisation of maternal health services: The perspective of rural women in Ghana. *Journal of Public Administration and Governance, 3*(2), 121-141.

Dickson, K. S., & Amu, H. (2017). Determinants of skilled birth attendance in the Northern Parts of Ghana. *Advances in Public Health,* 1–8.

Dickson, K. S., Adde, K. S., & Amu, H. (2016). What influences where they give birth? Determinants of place of delivery among women in rural Ghana. *International Journal of Reproductive Medicine, 1,* 1–8.

Esena, R. K., & Sappor, M. M. (2013). Factors associated with the utilization of skilled delivery services in the Ga East Municipality of Ghana part 2: Barriers to skilled delivery. *International Journal of Scientific & Technology Research, 2*(8),195–207.

Family Care International (2007). *Testing approaches for increasing skilled care during childbirth: the skilled care initiative.* New York: Author.

Ghana Statistical Service (GSS) (2013). *2010 population and housing census: National analytical report.* Accra: Author.

Ghana Statistical Service (GSS) (2014). *2010 population and housing census: District analytical report: Sagnarigu District.* Accra: Author.

Ghana Statistical Service (GSS), Ghana Health Service (GHS), & ICF International (2015). *Ghana Demographic and Health Survey 2014: Key indicators report.* Maryland: Authors.

Jehu-Appiah, C., Aryeetey, G., Spaan, E., De Hoop, T., Agyepong, I., & Baltussen, R. (2011). Equity aspects of the National Health Insurance Scheme in Ghana: Who is enrolling, who is not and why? *Social Science & Medicine, 72*(2), 157-165.

Kumi-Kyereme, A., & Amo-Adjei, J. (2013). Effects of spatial location and household wealth on health insurance subscription among women in Ghana. *BMC Health Services Research, 13,* 221.

Letamo, G., & Rakgoasi, S. D. (2003). Factors associated with the non–use of maternal health services in Botswana. *Journal of Health Population and Nutrition, 21,* 40–47.

Lule, E., Ramana, G. N. V., Ooman, N., Epp, J., Huntington, D., & Rosen, J. E. (2005). (2005). *Achieving the millennium development goal of improving maternal health: Determinants, interventions and challenges: HNP discussion paper.* Washington, DC: The International Bank for Reconstruction and Development.

National Health Insurance Authority (NHIA) (2012). 2012 annual report. Accra: Author.

Ntambue, A. M. L., & Malonga, F. K., & Dramaix-Wilmet, M., & Donnen, P. (2012). Determinants of maternal health services utilization in urban settings of the Democratic Republic of Congo – a case study of Lubumbashi City. *BMC Pregnancy Childbirth*, *12*(66), 1–13.

Nyarko, S. H., & Amu, H. (2015). Self-reported effects of infertility on marital relationships among fertility clients at a public health facility in Accra, Ghana. *Fertility Research and Practice, 1*(10), 1–6.

Onta, S., Choulagai, B., Shrestha, B., Subedi, N., Bhandari, G. P., & Krettek, A. (2014). Perceptions of users and providers on barriers to utilizing skilled birth care in mid-and far-western Nepal: A qualitative study. *Global Health Action, 7*(1), 24580.

Rempel, L. A., & Rempel, J. K. (2004). Partner influence on health behavior decision-making: Increasing breastfeeding duration. *Journal of Social and Personal Relationships*, *21*(1), 92-111.

Say, L., & Raine, R. (2007). A systematic review of inequalities in the use of maternal health care in developing countries: examining the scale of the problem and the importance of context. *Bulletin of the World Health Organisation, 85*, 812–819.

Sialubanje, C., Massar, K., van der Pijl, M. S., Kirch, E. M., Hamer, D. H., & Ruiter, R. A. (2015). Improving access to skilled facility-based delivery services: Women's beliefs on facilitators and barriers to the utilisation of maternity waiting homes in rural Zambia. Reproductive health, 12(1), 61.

Teferra, A. S., Alemu, F. M., & Woldeyohannes, S. M. (2012). Institutional delivery service utilization and associated factors among mothers who gave birth in the last 12 months

in Sekela District, North West of Ethiopia: a community–based cross sectional study. *BMC Pregnancy Childbirth, 12*(74), 1–11.

The Guardian (2015). *Sustainable development goals: Changing the world in 17 steps – interactive.* Retrieved from http://www.theguardian.com/global-development/ng-interactive/2015/jan/19/sustainable-development-goals-changing-world-17-steps-interactive On 20/05/2016.

Umurungi, Y. S. (2010). *Determinants of the utilisation of delivery services by pregnant women in Rwanda.* (Unpublished master's thesis), University of the Witwatersrand, Johannesburg, South Africa.

United Nations Population Fund (UNFPA) (2012). *Trends in maternal health in Ethiopia: challenges in achieving the MDG for maternal mortality*. Addis Ababa: Author.

World Health Organisation (WHO) (2016). *Maternal mortality*. Retrieved from http://www.who.int/mediacentre/factsheets/fs348/en/ On 20/05/2017.

World Health Organisation (WHO). (2004). *Reviewing maternal deaths and complications to make pregnancy safer: beyond the numbers.* Geneva: Department of Reproductive Health and Research.

Zere, E., Oluwole, D., Kirigia, J. M., Mwikisa, C. N., & Mbeeli, T. (2011). Inequities in skilled attendance at birth in Namibia: a decomposition analysis. *BMC Pregnancy and Childbirth, 11*(34), 1–10.