Modelling Preferences of women for maternal healthcare services in the Upper East Region: A stated choice experiment.

Emmanuel Amoah*
Department of Statistics and Actuarial Science
C. K. Tedam University of Technology and Applied Sciences
Navrongo, P. O. Box 24, Ghana
emmanuelamoah27@gmail.com
Dioggban Jakperik
Department of Biometry
C. K. Tedam University of Technology and Applied Sciences, Navrongo
P. O. Box 24, Ghana. , Navrongo, 0233, Accra, Ghan
jdioggban@cktutas.edu.gh
Adjabui Michael Jackson
Department of Mathematics
C. K. Tedam University of Technology and Applied Sciences, Navrongo
P. O. Box 24, Ghana. , Navrongo, 0233, Accra, Ghana.
madjabui@uds.edu.gh

July 11, 2023

Abstract

This study examined women's preferences for the choice of place for delivery in the Upper East Region of Ghana. Data was collected from 200 respondents with diverse sociodemographic characteristics. The study identified several influential attributes that influenced women's decision-making, including the availability of drugs and equipment, facility environment, provider attitude, distance to the health facility, and referrals at the health facility. Using a panel mixed logit model, the analysis revealed that all attributes, except for the cost of delivery services, significantly influenced women's choices. The model demonstrated a good fit, and the coefficients for the attributes were statistically significant at a 95% confidence level. Interestingly, the cost of delivery services did not play a significant role in women's decision-making process. Furthermore, the study explored

*Use footnote for providing further information about author (webpage, alternative address)—*not* for acknowledging funding agencies.

the interactions between sociodemographic variables and attributes, highlighting the impact of factors such as age, employment status, marital status, religion, education, and place of last delivery on women's preferences. Among these variables, the availability of drugs and equipment emerged as the most influential attribute across different sociodemographic groups. The study underscores the importance of understanding women's preferences when developing interventions for maternal healthcare. It emphasizes the significance of attributes related to the availability of drugs and equipment, facility environment, and provider attitude. Policymakers are encouraged to take these factors into consideration in order to enhance the utilization of healthcare facilities, reduce maternal mortality rates, and improve overall maternal health outcomes. In summary, this study provides valuable insights into women's preferences for the choice of place for delivery in the Upper East Region of Ghana. It emphasizes the need for high-quality, patient-centered care that aligns with women's preferences in order to promote positive maternal health outcomes.

1 Introduction

Maternal mortality remains a challenge in providing quality maternal and other reproductive health care in Ghana [1]. According to [8], Maternal mortality is defined as deaths occurring in women, while pregnant or within 42 days of termination of pregnancy irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

Maternal mortality continues to be a great concern with almost (99%) all maternal deaths occurring in developing countries with more than half in sub-Saharan Africa. 1 in 180 pregnant women die during childbirth when compared to 1 in 4,900 in developed countries. 75% of maternal deaths occur as a result of complications due to pregnancy and childbirth ([15]).

Many low-income countries still encounter high maternal mortality (MM) rates. The use of maternal healthcare services, including supervised delivery services, is one of the proven interventions that have the potential to reduce maternal death [10]. Over the last decade, improving maternal healthcare with the aim of boosting the proportion of women who receive services such as pre- and postnatal care, and skilled delivery has become a global priority ([11]).

Ghana's maternal mortality ratio declined from 760 per 100,000 live births in 1990 to 319 per 100,000 live births in 2015 ([8]; [15]). The pace of decline in maternal mortality has been slow and this led to Ghana's inability to achieve the millennium development goal target of 190 per 100,000 live births in 2015. The maternal mortality ratio remains high and requires strenuous efforts if Ghana has to achieve the sustainable development goal target of 70 per 100,000 live births in 2030 ([1]).

Several other factors have been implicated as major contributory factors to maternal deaths in Ghana. Low antenatal coverage, socio-cultural factors, lack of logistics, equipment, and blood at healthcare facilities has been largely blamed

as reasons for high maternal mortality in Ghana ([6];[9]).
The healthcare system in Ghana is structured in five levels. The tertiary hospitals which are also teaching hospitals are at the apex of the healthcare delivery ladder. This is followed by the regional hospitals which provide specialist care for patients and also serve as referral points for district hospitals ([3]).
The district hospital provides care at the district level and also serves as referral points for the sub-district facilities (facilities at the community level). The lowest facilities in the healthcare delivery ladder are the community clinics or community-based health planning and services (CHPS) [3].
Interventions, such as the Ghana Essential Health Intervention Program has contributed in reducing maternal deaths by strengthening the CHPS, which makes healthcare more accessible to the people especially in rural communities ([2]).
Although many other interventions have been implemented at national, regional, and community levels to reduce maternal mortality, its high ratio still remains a major concern in Ghana ([13]).
The upper east region (UER) of Ghana is not spared in this predicament. The 2013 annual report revealed that maternal mortality is a major public health issue as the region recorded 34 maternal deaths.
The limited evidence from well-designed studies on women's choices of places for delivery needs urgent attention if strategies are to be implemented. The understanding of women's preference for delivery and the associated factors will provide evidence upon which to develop health policies for women's safety and reduction to maternal mortality rate. Hence, It is therefore necessary that a study be conducted among women of reproductive age in the Upper East Region of Ghana to assess the determinants of the choice of place for delivery by women.

2 Methodology

2.0.1 Identification of attributes and attribute levels

The attributes and attribute levels for the SCE are identified through a comprehensive literature review on facility-based delivery and skilled birth attendance in Ghana and sub-Saharan Africa. Additionally, focus group discussions and in-depth interviews are conducted with women who have recently delivered and healthcare workers. The selected attributes include provider type, provider attitude, availability of drugs and equipment, distance to health facility, referral services, cost of delivery services, and facility environment.Table 1 shows the attributes and attribute levels selected for the stated choice experiment.

2.1 Experimental design

The attributes for this intervention and their assigned levels are combined using experimental designs that produce a set of hypothetical choice alternatives. Respondents were asked to choose which alternatives they prefer, the attribute levels determine the utility of respondents attached to a particular characteristic

Table 1: **Attribute and attribute levels included for the SCE.**

Attribute	Attribute Levels
Provider type	Doctor
	Nurse
Provider attitude	Kind and supportive
	Unkind and unsupportive
Availability of drugs and equipment's	Always available
	Not always available
Distance to health facility	Health facility is close to home
	Health facility is far from home
Referral at health facility	Referrals services available
	Referrals services not available
Cost of delivery services	GH¢100.00 below
	GH¢100.00 above
Facility environment	Clean
	Not clean

of an intervention and hence their preferences ([7]). To reduce the number of choices presented to the respondents, a Blocked Fractional Factorial Design (BFFD) is employed. The SCE scenarios are designed as unlabelled choice sets, with eight choice tasks presented to the respondents. Each choice task includes five alternatives: four health facilities (A, B, C, and D) and an opt-out alternative representing a preference for home delivery.Table 2 shows an example of the attributes and their corresponding plausible levels included in the SC experiment design.

2.2 Data collection

A team of trained data collectors conducts the data collection using the Kobo Collect platform. Randomly sampled women are interviewed, and their preferences for the choice of delivery health facility are recorded. The data collection process also includes gathering information on sociodemographic and maternal health utilization variables.

2.2.1 Model specification

The data collected from the SCE is analyzed using choice set models in Stata 18. Descriptive statistics are calculated for non-SCE variables. The panel mixed logit model is used to estimate the utility function, considering the interactions between the attributes and sociodemographic variables. The model incorporates a constant term, attribute parameters, and an error term to represent preferences and choices. The utility function will be estimated for the following model:

Table 2: **A choice set presented to the women**

ATTRIBUTES	facility A	facility B	facility C
Provider type	Doctor	Nurse	Doctor
Provider attitude	Kind/Support	Unkind/Unsupport	Kind/Support
Availability of drugs and Equip.	Available	Not available	Available
Distance from Home	close	close	not close
Referral at health facility	Available	Available	Not available
Cost of delivery service	GHS 100 below	GHS 100 below	GHS 100 above
Facility Environment	clean	clean	Not clean
Which option do you prefer?	()	()	()
ATTRIBUTES	facility D	optout	
Provider type	Nurse		
Provider attitude	Unkind/Unsupport		
Availability of drugs and Equip.	Not available		
Distance from Home	not close		
Referral at health facility	Not available		
Cost of delivery service	100 above		
Facility Environment	Not clean		
Which option do you prefer?	()	()	

$$U_i = \alpha_i + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \epsilon. \quad (1)$$

α_i is the constant term that shows the preference for place of delivery (either a health facility or home), β_1˘β_7 are the parameters for each of the attribute levels and is the error term, x_1= providertype, x_2=providerattitude, x_3=availabilityofdrugsandEquipment's, x_4=distancefromHome, x_5=referralathealthfacility, x_6=costofdeliveryservice, x_7=facilityenvironment

Table 3: **Sociodemographic characteristics of women in Upper East Region of Ghana**

Sociodemographic variables	n (%)
Age, n (mean (SD))	29.55 (5.82)
Marital status	
Married	146 (81.0%)
Single	31 (15.5%)
Window	07 (3.5%)
Cohabiting	16 (8.0%)
Educational status	
Primary	46 (23.0%)
Secondary	66 (33.0%)
Tertiary	40 (20.0%)
Non-formal	48 (24.0%)
Religion	
Christian	140 (70.0%)
Muslims	60 (30.0%)
Employment Status	
Employed	146 (73.0%)
Unemployed	54 (27.0%)
Place of last delivery	
Public	157 (78.5%)
Private	43 (21.5%)
Household size, n (mean (SD))	4.35 (2.00)

Table 4: **Panel Mixed Logit model showing interactions between sociodemographic variables and attributes to explain preference heterogeneity in choices made.**

Attributes	With age	With employment	With marital status
Provider type	-0.63073	-0.55272	-0.63058
	(0.000)	(0.000)	(0.000)
Provider Attitude	-0.2281	-0.22881	-0.22851
	(0.000)	(0.000)	(0.000)
Availability of drugs and equip.	0.48537	0.50236	0.48374
	(0.009)	(0.007)	
Distance from home	0.6955	-0.23098	-0.22993
	(0.001)	(0.001)	(0.000)
Referral at health facility	-0.59285	-0.58283	-0.59487
	(0.000)	(0.000)	(0.000)
Cost of delivery services	0.03826	0.03841	0.03835
	(0.576)	(0.575)	(0.516)
Facility Environment	-0.18365	-0.1850	-0.18359
	(0.011)	(0.011)	(0.011)
Attributes	With Religion	With Place of last deliv.	With Educ.
Provider type	-0.62177	-0.63501	-0.63149
	(0.000)	(0.000)	(0.000)
Provider Attitude	-0.23064	-0.22892	-0.22838
	(0.000)	(0.000)	(0.000)
Availability of drugs and equip.	0.47861	0.49516	0.48504
	(0.010)	(0.008)	(0.009)
Distance from home	-0.22882	-0.2284	-0.22951
	(0.000)	(0.001)	(0.001)
Referral at health facility	-0.60361	-0.59869	-0.59291
	(0.000)	(0.000)	(0.000)
Cost of delivery services	0.03891	0.03906	0.03871
	(0.511)	(0.509)	(0.512)
Facility Environment	-0.1846969	-0.18580	-0.18288
	(0.011)	(0.010)	(0.011)
Number of observations (n)	=	200	
Wald chi2(21)	=	223.10	
Log simulated-likelihood	=	-1483.3428	
Prob >chi2	=	0.0000	

3 Discussions and conclusions

The study collected data from 200 respondents in the Upper East Region of Ghana to explore women's preferences for the choice of place for delivery. The participants had various sociodemographic characteristics, with an average age of 29 years. The majority were married, had attained primary or secondary education, and were employed, see Table 3 . The study found that availability of drugs and equipment, facility environment, provider attitude, distance to the health facility, and referrals at the health facility were the most influential attributes for women when choosing a delivery facility. The panel mixed logit model analysis indicated that all attributes, except cost of delivery services, were statistically significant in influencing women's choices. The model showed goodness-of-fit, and the coefficients for the attributes were significant at a 95% confidence level. However, the cost of delivery services did not play a significant role in women's decision-making process which affirms that of [12]. Further analysis considered the interactions between sociodemographic variables and attributes to explore preference heterogeneity. The results revealed that sociodemographic characteristics such as age, employment status, marital status, religion, education, and place of last delivery influenced women's preferences. Availability of drugs and equipment was found to be the most influential attribute across various sociodemographic groups, see Table 4. The study highlights the importance of understanding women's preferences when designing maternal healthcare interventions. It emphasizes the significance of attributes related to the quality of care. Women also showed a high preference for provider attitude.[14]; [4]; [5] have reported with recent evidence as identified that the attitude of health workers during labor and delivery presents huge challenge with reports in diverse settings within Sub-Saharan African. Policy makers should consider these factors to improve the utilization of healthcare facilities, reduce maternal mortality, and enhance maternal health outcomes. In conclusion, this study provides insights into women's preferences for the choice of place for delivery in the Upper East Region of Ghana. The findings underscore the importance of ensuring high-quality and patient-centered care to meet women's preferences and improve maternal health.

References

[1] Paschal Awingura Apanga and John Koku Awoonor-Williams. Maternal death in rural ghana: a case study in the upper east region of ghana. *Frontiers in public health*, 6:101, 2018.

[2] John Koku Awoonor-Williams, Ayaga A Bawah, Frank K Nyonator, Rofina Asuru, Abraham Oduro, Anthony Ofosu, and James F Phillips. The ghana essential health interventions program: a plausibility trial of the impact of health systems strengthening on maternal & child survival. *BMC health services research*, 13:1–12, 2013.

[3] John Koku Awoonor-Williams, Paulina Tindana, Philip Ayizem Dalinjong, Harry Nartey, and James Akazili. Does the operations of the national health insurance scheme (nhis) in ghana align with the goals of primary health care? perspectives of key stakeholders in northern ghana. *BMC International Health and Human Rights*, 16(1):1–11, 2016.

[4] Meghan A Bohren, Erin C Hunter, Heather M Munthe-Kaas, João Paulo Souza, Joshua P Vogel, and A Metin Gülmezoglu. Facilitators and barriers to facility-based delivery in low-and middle-income countries: a qualitative evidence synthesis. *Reproductive health*, 11(1):1–17, 2014.

[5] Meghan A Bohren, Hedieh Mehrtash, Bukola Fawole, Thae Maung Maung, Mamadou Dioulde Balde, Ernest Maya, Soe Soe Thwin, Adeniyi K Aderoba, Joshua P Vogel, Theresa Azonima Irinyenikan, et al. How women are treated during facility-based childbirth in four countries: a cross-sectional study with labour observations and community-based surveys. *The Lancet*, 394(10210):1750–1763, 2019.

[6] Jonathan Mensah Dapaah and John Onzaberigu Nachinaab. Sociocultural determinants of the utilization of maternal health care services in the tallensi district in the upper east region of ghana. *Advances in Public Health*, 2019, 2019.

[7] Esther W de Bekker-Grob, Mandy Ryan, and Karen Gerard. Discrete choice experiments in health economics: a review of the literature. *Health economics*, 21(2):145–172, 2012.

[8] EM Der, C Moyer, RK Gyasi, AB Akosa, Y Tettey, PK Akakpo, A Blankson, and JT Anim. Pregnancy related causes of deaths in ghana: a 5-year retrospective study. *Ghana medical journal*, 47(4):158, 2013.

[9] John Ditekemena, Olivier Koole, Cyril Engmann, Richard Matendo, Antoinette Tshefu, Robert Ryder, and Robert Colebunders. Determinants of male involvement in maternal and child health services in sub-saharan africa: a review. *Reproductive health*, 9(1):1–8, 2012.

[10] John Kuumuori Ganle, Mathew Loyarl Kombet, and Leonard Baatiema. Factors influencing the use of supervised delivery services in garu-tempane district, ghana. *BMC pregnancy and childbirth*, 19:1–11, 2019.

[11] John Kuumuori Ganle, Michael Parker, Raymond Fitzpatrick, and Easmon Otupiri. A qualitative study of health system barriers to accessibility and utilization of maternal and newborn healthcare services in ghana after user-fee abolition. *BMC pregnancy and childbirth*, 14(1):1–17, 2014.

[12] Sigei Jackline, Tikoko Betty J, et al. Relationship between implementation of safety standards and guidelines for physical infrastructure, and student safety in public mixed boarding secondary schools in nakuru county, kenya. 2020.

[13] Evelyn Sakeah, Lois McCloskey, Judith Bernstein, Kojo Yeboah-Antwi, Samuel Mills, and Henry V Doctor. Can community health officer-midwives effectively integrate skilled birth attendance in the community-based health planning and services program in rural ghana? *Reproductive Health*, 11(1):1–13, 2014.

[14] WHO. Standards for improving quality of maternal and newborn care in health facilities. 2016.

[15] WHO. Who recommendations on antenatal care for a positive pregnancy experience: summary: highlights and key messages from the world health organization's 2016 global recommendations for routine antenatal care. Technical report, World Health Organization, 2018.