

ORIGINAL RESEARCH ARTICLE

Prevalence and Factors Associated with Institutional-based Delivery in The Gambia: Further Analysis of Population-based Cross-Sectional Data

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Abstract

Institutional-based delivery could be the major strategy to avoid most maternal deaths occurring from preventable obstetric complications. The study examines the prevalence and factors associated with institutional-based delivery in The Gambia. The secondary data, from The Gambia Multiple Indicator Cluster Survey (MICS) – 2018 for 3,791 women aged 15-49 years who had given birth, were extracted for the analysis. Chi-square analysis and multivariable logistic regression model were used to determine factors associated with institutional-based delivery with statistical significance set at $p < 0.05$. About three-quarters (78.1%) of Gambian women had institutional-based delivery. The study identified that women from richer (AOR= 2.38; 95%CI: 1.49, 3.79) and richest households (4.14; 95%CI: 2.06, 8.33) were more likely to have institutional-based delivery when compared with women from poorest households. Furthermore, women with secondary or higher education (AOR= 1.66; 95%CI: 1.28, 2.16) were more likely to have institutional-based delivery, when compared with women without formal education. Conversely, rural dwellers (AOR= 0.63; 95%CI: 0.47, 0.84), women with high parity and advanced age had significant reduction in the odds of institutional-based delivery in The Gambia. There is a need for concerted efforts to improve skilled birth attendance among women of low socioeconomic status, those living in hard-to-reach communities and the multiparous women in The Gambia. (*Afr J Reprod Health* 2020; 24[2]: 176-186).

Keywords: Facility-based delivery, childbirth, intra-partum, maternal health, TBA, The Gambia

Résumé

L'accouchement en établissement pourrait être la principale stratégie pour éviter la plupart des décès maternels dus à des complications obstétricales évitables. L'étude visait à examiner la prévalence et les facteurs associés à l'accouchement en établissement en Gambie. Les données secondaires, issues de l'enquête en grappes à indicateurs multiples (MICS) de la Gambie - 2018 pour 3791 femmes âgées de 15 à 49 ans qui avaient accouché, ont été extraites pour l'analyse. Une analyse du chi carré et un modèle de régression logistique multivariable ont été utilisés pour déterminer les facteurs associés à la prestation en établissement avec une signification statistique fixée à $p < 0,05$. Environ les trois quarts (78,1%) des femmes gambiennes ont accouché en institution. L'étude a identifié les femmes des ménages les plus riches (AOR = 2,38; IC à 95%: 1,49, 3,79) et les plus riches (4,14; IC à 95%: 2,06, 8,33) étaient plus susceptibles d'avoir un accouchement en établissement par rapport aux femmes des ménages les plus pauvres. De plus, les femmes ayant fait des études secondaires ou supérieures (AOR = 1,66; IC à 95%: 1,28, 2,16) étaient plus susceptibles d'avoir un accouchement en établissement, par rapport aux femmes sans éducation formelle. Inversement, les habitants des zones rurales (AOR = 0,63; IC à 95%: 0,47, 0,84), les femmes avec une parité élevée et un âge avancé ont connu une réduction significative des chances d'accouchement en établissement en Gambie. Des efforts concertés sont nécessaires pour améliorer l'assistance à l'accouchement qualifiée chez les femmes de faible statut socioéconomique, celles vivant dans des communautés difficiles à atteindre et les femmes multipares en Gambie. (*Afr J Reprod Health* 2020; 24[2]: 176-186).

Mots-clés: Accouchement en établissement, accouchement, intra-partum, santé maternelle, à déterminer, Gambie

Introduction

Childbirth through access to skilled health attendant or health institution is a major strategy for safe motherhood. Increasing women's access to healthcare institutions and being able to provide adequate delivery care has been responsible for the reduction in maternal death¹. Reducing the global burden of preventable maternal, neonatal and child deaths is currently a major focus for the global health community. The SDGs were adopted by the United Nations (UN) member states with the view to addressing a range of health issues. World Health Organization (WHO) identified the first target of the third goal to reduce global maternal mortality ratio to less than 70 per 100,000 live births by 2030^{2,3}. Globally, maternal mortality ratio is 216 per 100,000 live births, whereas, Africa accounted for 542 per 100,000 live births, while that of Gambia is 706 deaths/100,000 live births as of 2015⁴. As a result of the large burden of maternal death, WHO, through the Every Woman Every Child movement developed the *Global Strategy for Women's, Children's, and Adolescents' Health (2016–2030)* that is aimed at abolishing all preventable causes of death in women and children and ensuring their health and well-being⁵.

Globally, an estimated 303,000 maternal deaths occur every year⁴; while approximately 99% of them are from resource-constrained settings such as The Gambia. WHO reported that women die from complications related to pregnancy, childbirth and postpartum every minute, somewhere in the world and especially in developing countries⁴. Despite the great public health effort, many women are still assisted in delivery either by traditional birth attendants (TBA) or their relatives⁶. Home deliveries are still common malpractices that occur in several resource-poor countries as majority of these home deliveries are conducted with lack of safety as deliveries are attended by unskilled personnel. Moreover, there is delay in referral when complications occur. During childbirth, there are about 1.02 million intra-partum stillbirths, 904,000 intra-partum related neonatal deaths and around 42% maternal deaths each year⁶.

As the delivery process can result in unexpected complications, health facility-based delivery or delivery by a skilled attendant is crucial. It is now well established that ensuring skilled attendant at birth, or health facility delivery, can avoid most maternal deaths occurring from preventable obstetric complications and thus can make a critical difference to the survival of the mother^{7,8}. An analysis of secondary data from 48 low and middle-income countries reported that in Sub Saharan Africa, South Asia, and Southeast Asia, more than 70% of all births in the lowest two wealth quintiles occurred at home⁹. Critical to improving these rates is an understanding of the factors associated with utilisation of health facility delivery services.

Every society aspires to witness a well improved and quality maternal health care as it is the engine of development through regeneration. Consequently, the provision of quality maternal health care is a top priority to all governments and stakeholders in all societies. In sub-Saharan Africa and the Gambia to be precise, quality and sustainable maternal health care is desired for development considering the roles women play in the sub-region. The levels of health care utilisation among vulnerable groups in rural areas particularly in the context of developing countries are worrisome. The situation becomes devastating when it borders on skilled maternal health care. This is the basic underpinning in the sustainable development of all societies¹⁰. In sub-Saharan Africa, poor living conditions coupled with poor nutrition and insecure health care systems with high fertility rates usually expose women of all ages to high risk of pregnancy-associated illness and deaths. The concern on the determinants of facility-based delivery has a wider spectrum that needs to be viewed critically and objectively. Several studies have attempted to identify the determinants of health facility delivery. Most studies have focused on health system factors and demonstrated a significant effect of those factors on the use of health facility delivery services^{11–13}. However, it is important to examine maternal factors associated with health facility delivery since the majority of disadvantaged women give birth at home. Prominently, multiparity, low

exposure to media use, weak ANC services, rural dwellers, far distance from the health facility, lack of formal education, low literacy and migrant status amongst other factors are independently predictive of home births¹¹⁻¹⁴. However, there is paucity of data from the Gambia on institutional and non-institutional-based deliveries. Therefore, we examined a range of maternal factors and measure their extent of influence on health institutional-based delivery in The Gambia.

Methods

Data source

Here, we utilized secondary data from The Gambia Multiple Indicator Cluster Survey (MICS) – 2018. Data from 3,791 women of reproductive age who have given birth were extracted for the analysis. The Gambia MICS carried out in 2018 provided opportunity for the strengthening of national statistical capacity by providing technical guidance on data gathering, quality of survey information, statistical tracking and analysis. MICS measures key indicators that allow countries to generate data for use in policies and programmes, and to monitor progress towards the Sustainable Development Goals (SDGs), as well as the National Development Plan (NDP) of The Gambia and other internationally agreed-upon commitments. MICS contributed to the improvement of data and monitoring systems in The Gambia and strengthened technical expertise in the design, implementation and analysis of such systems. UNICEF developed the MICS programme in the 1990s as an international household survey programme to support countries in the collection of internationally comparable data on a wide range of indicators covering the situation of children and women.

Sampling design

The Gambia MICS 2018 served as a sampling frame for The Gambia micronutrient Survey (GMNS) 2018. The GMNS is a cross-sectional stratified survey designed to produce estimates that have acceptable precision for priority indicators of nutritional status in children 0-59months of age, and non-pregnant women of

child-bearing age and pregnant women. In addition, estimates of nutrition-related non-communicable diseases in women of reproductive age were produced. A two-stage sampling procedure was conducted to randomly select households. The MICS 2018 served as a sampling frame. In the first stage, enumeration areas (EAs) or clusters within each sub-stratum were randomly selected with probability proportional to size from the 390 EAs selected in the MICS. For most LGAs, only a subsample of the households selected in the MICS in each cluster was included in the GNMS. Those households were randomly selected from the MICS household list by using simple random sampling.

The Gambia MICS 2018 was designed to provide estimates for a large number of indicators on the situation of children and women at the national level, for urban and rural areas, and for the eight Local Government Areas (LGAs): Banjul, Kanifing, Brikama, Mansakonko, Kerewan, Kuntaur, Janjanbureh, and Basse. The urban and rural areas within each LGA were identified as the main sampling strata and the sample of households was selected in two stages. Within each stratum, a specified number of census enumeration areas were selected systematically with probability proportional to size. After a household listing was carried out within the selected enumeration areas, a systematic sample of 20 households was drawn in each sample enumeration area. All enumeration areas selected were visited during the fieldwork period.

Variables selection and measurement

Outcome variable

The place of delivery was measured dichotomously. This was classified as “1” if institution-based and “0” if a woman delivered home.

Explanatory variables

Independent variables: household wealth quintile: poorest, poorer, middle, richer and richest, was computed by MICS in a conventional approach from population-based data using a set of household assets^{15,16}; child sex: male vs. female;

ethnicity: Mandinka, Wollof, Fula, Jola, Sarahule, other groups and non-Gambians; health insurance coverage: covered vs. not covered; educational level: pre-primary or none, primary, secondary+, functionality difficulty: has functional difficulty vs. has no functional difficulty; total children ever born: 1-2, 3-4, 5+; marital status: currently married/in union, formerly married/in union, never married/in union; residential status: urban vs. rural; age at first marriage/union: <18 years, 18-20 years, 20+ years; estimation of overall happiness: very happy, somewhat happy, neither happy nor unhappy, somewhat unhappy, very unhappy; duration in residence: internal immigrant (lived in community < 5years) vs. native (lived in community for 5+ years); maternal age (years): 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49; frequency of listening to radio or watching TV: not at all, less than once a week, at least once a week, almost every day; received prenatal care: yes vs. no; antenatal care visit initiation: early booking (within 1st trimester) vs. late booking (after 1st trimester); place of delivery: home vs. health facility; Local Government Area (LGA): Banjul, Kanifing, Brikama, Mansakonko, Kerewan, Kuntaur, Janjanbureh, Basse. These factors were selected as used by previous authors¹⁷.

Statistical analysis plan

Stata survey ('svy') module was used to adjust for stratification, clustering and sampling weights to compute the estimates of institutional-based delivery. The collinearity testing approach adopted the correlation analysis to detect interdependence between variables. A cut-off of 0.7 was used to examine the multicollinearity known to cause major concerns¹⁸. No variable from the correlation matrix was removed in the model due to a lack of multicollinearity. Percentages and chi-square test were used for univariate and bivariate analyses. All significant variables from chi-square analysis were included in the multivariable logistic regression model to calculate the adjusted odds ratios (with corresponding 95%CI) of the factors associated with institutional-based delivery. Statistical significance was determined at $p < 0.05$. Data analysis was conducted using Stata Version 14 (StataCorp., College Station, TX, USA).

Results

Based on the results of this study, about three-quarters of Gambian women had institutional-based delivery. In contrast, approximately one-fifth of the study sample delivered at home. See the details in Figure 1:

Based on the results from Table 1, the percentage of institutional-based delivery in Banjul was 95.2%, about 96.4% among women of richest household wealth index, 88.1% among urban dwellers, 97.3% among women who have health insurance coverage, 88.1% among women with secondary or higher educational attainment, 78.8% among women who had early antenatal care visit initiation. See Table 1 for the details.

Based on the results, ethnicity was significantly associated with institutional-based delivery. The adjusted odds ratio (AOR) for women from richer and richest households in institutional-based delivery had an increase in the odds of institutional-based delivery (AOR= 2.38; 95%CI: 1.49, 3.79 and AOR= 4.14; 95%CI: 2.06, 8.33) compared with women from the poorest household after adjusting for other covariates respectively. In addition, rural dwellers had a significant reduction in the odds of institutional-based delivery (AOR= 0.63; 95%CI: 0.47, 0.84) when compared with urban women. Women who had secondary or higher education had higher odds of institutional-based delivery (AOR= 1.66; 95%CI: 1.28, 2.16) when compared with women with no formal education. Higher parity and advanced maternal age had a significant reduction in institutional-based delivery.

Discussion

This paper has become one of the foremost studies to explore the prevalence and determinants of institutional-based delivery in the Gambia. In this study, we found that about three-quarters of women utilized institutional-based delivery and this result is comparable with previous findings¹⁹. Several factors hinder access to maternal health and reproductive health services in resource-constrained settings. These include affordability of services, availability of services, distance to services, lack of transportation, sociocultural factors and the lack of knowledge.

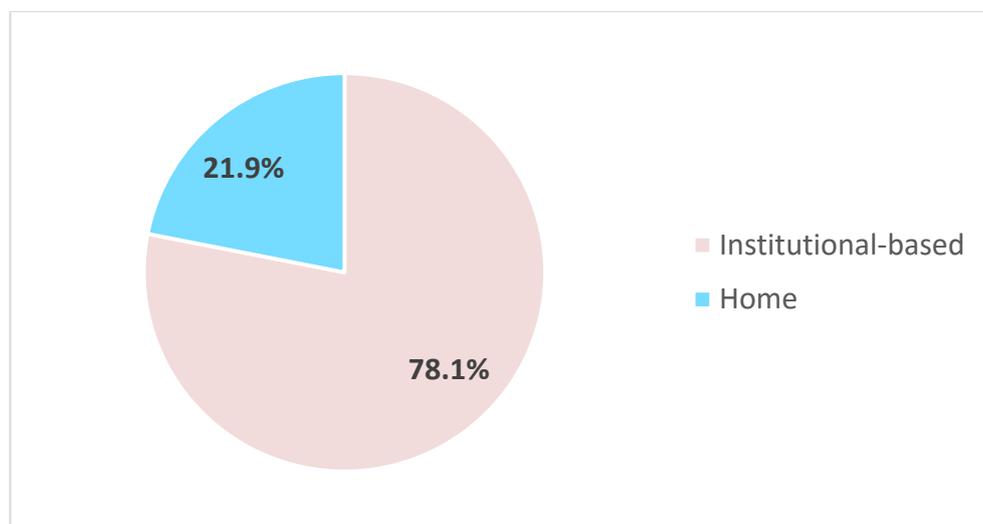


Figure 1: Prevalence of the place of delivery in The Gambia

Table 1: Distribution of institutional-based delivery in The Gambia

Variable	n (%)	Institutional-based delivery		P
		% healthcare facility	% home	
LGA				<0.001*
Banjul	188 (5.0)	95.2	4.8	
Kanifing	350 (9.2)	92.9	7.1	
Brikama	488 (12.9)	84.8	15.2	
Mansakonko	412 (10.9)	72.3	27.7	
Kerewan	515 (13.6)	87.8	12.2	
Kuntaur	614 (16.2)	67.1	32.9	
Janjanbureh	517 (13.6)	70.6	29.4	
Basse	707 (18.6)	72.8	27.2	
Ethnicity				<0.001*
Mandinka	1075 (28.4)	80.9	19.1	
Wollof	695 (18.3)	74.5	25.5	
Fula	937 (24.7)	73.4	26.6	
Jola	158 (4.2)	84.8	15.2	
Sarahule	401 (10.6)	78.6	21.4	
Other groups	247 (6.5)	87.4	12.6	
Non-Gambia	278 (7.3)	78.8	21.2	
Household wealth quintile				<0.001*
Poorest	1360 (35.9)	69.7	30.3	
Second	883 (23.3)	75.9	24.1	
Middle	684 (18.0)	78.4	21.6	
Fourth	472 (12.5)	90.7	9.3	
Richest	392 (10.3)	96.4	3.6	
Residential area				<0.001*
Urban	1415 (37.3)	88.1	11.9	
Rural	2376 (62.7)	72.1	27.9	
Marital status				0.034*
Currently married/in union	3613 (95.3)	77.7	22.3	
Formerly married/in union	83 (2.2)	84.3	15.7	
Never married/in union	94 (2.5)	87.2	12.8	
Health insurance coverage				0.005*
Insured	37 (1.0)	97.3	2.7	
Not insured	3750 (99.0)	77.9	22.1	

Education				<0.001*
Pre-primary or none	2083 (54.9)	73.1	26.9	
Primary	705 (18.6)	78.6	21.4	
Secondary+	1003 (26.5)	88.1	11.9	
Functional difficulty				0.797
Has functional difficulty	86 (2.3)	76.7	23.3	
Has no functional difficulty	3649 (97.7)	77.9	22.1	
Total children ever born				<0.001*
1-2	1394 (36.8)	84.8	15.2	
3-4	1142 (30.1)	74.3	25.7	
5+	1255 (33.1)	74.0	26.0	
Maternal age				0.015*
15-19	293 (7.7)	86.7	13.3	
20-24	938 (24.7)	78.4	21.6	
25-29	990 (26.1)	76.1	23.9	
30-34	823 (21.7)	77.4	22.6	
35-39	524 (13.8)	78.4	21.6	
40-44	179 (4.7)	76.5	23.5	
45-49	44 (1.2)	75.0	25.0	
Age at first marriage/union				<0.001*
<18years	1743 (47.2)	74.4	25.6	
18-20years	1031 (27.9)	80.3	19.7	
20+years	922 (24.9)	81.8	18.2	
Estimation of overall happiness				0.302
Very happy	1551 (40.9)	78.3	21.7	
Somewhat happy	1333 (35.2)	79.1	20.9	
Neither happy nor unhappy	721 (19.0)	77.1	22.9	
Somewhat unhappy	132 (3.5)	71.2	28.8	
Very unhappy	51 (1.3)	78.4	21.6	
Duration in residence				<0.001*
Internal immigrant (<5years)	984 (26.0)	84.0	16.0	
Native (5+years)	2807 (74.0)	76.0	24.0	
Frequency of reading newspaper				<0.001*
Not at all	3585 (94.6)	77.3	22.7	
Less than once a week	138 (3.6)	90.6	9.4	
At least once a week	55 (1.5)	90.9	9.1	
Almost everyday	13 (0.3)	100.0	0.0	
Frequency of listening to the radio				0.038*
Not at all	782 (20.6)	76.0	24.0	
Less than once a week	686 (18.1)	81.6	18.4	
At least once a week	1028 (27.1)	78.8	21.2	
Almost everyday	1295 (34.2)	76.9	23.1	
Frequency of watching TV				<0.001*
Not at all	1730 (45.7)	71.3	28.7	
Less than once a week	396 (10.5)	77.0	23.0	
At least once a week	466 (12.3)	80.9	19.1	
Almost everyday	1197 (31.6)	87.1	12.9	
Received prenatal care				0.222
Yes	3766 (99.3)	78.1	21.9	
No	25 (0.7)	68.0	32.0	
Antenatal care visit initiation				0.430
Early booking	1907 (50.7)	78.8	21.2	
Late booking	1852 (49.3)	77.7	22.3	
Child wanted				0.743
No	850 (22.4)	77.6	22.4	
Yes	2937 (77.6)	78.2	21.8	

*Significant at p<0.05

Table 2: Factors associated with institutional-based delivery among women in The Gambia

Variable	Adjusted Odds Ratio	95% Confidence Interval	P
LGA			
Banjul	1.00 (reference)		
Kanifing	0.69	0.31-1.57	0.382
Brikama	0.49	0.22-1.08	0.078
Mansakonko	0.52	0.22-1.19	0.119
Kerewan	1.53	0.65-3.57	0.327
Kuntaur	0.51	0.22-1.17	0.112
Janjanbureh	0.52	0.23-1.18	0.118
Basse	0.47	0.21-1.08	0.074
Ethnicity			
Mandinka	1.00 (reference)		
Wollof	0.78	0.58-0.99	0.046*
Fula	0.87	0.69-1.10	0.252
Jola	0.85	0.48-1.51	0.586
Sarahule	1.06	0.76-1.47	0.741
Other groups	0.96	0.61-1.50	0.857
Non-Gambia	0.55	0.38-0.81	0.002*
Household wealth quintile			
Poorest	1.00 (reference)		
Second	1.16	0.94-1.44	0.167
Middle	1.18	0.88-1.58	0.263
Fourth	2.38	1.49-3.79	<0.001*
Richest	4.14	2.06-8.33	<0.001*
Residential area			
Urban	1.00 (reference)		
Rural	0.63	0.47-0.84	0.002*
Marital status			
Currently married/in union	1.00 (reference)		
Formerly married/in union	1.37	0.73-2.56	0.325
Health insurance coverage			
Insured	1.00 (reference)		
Not insured	0.43	0.05-3.33	0.416
Education			
Pre-primary or none	1.00 (reference)		
Primary	1.18	0.95-1.47	0.144
Secondary+	1.66	1.28-2.16	<0.001*
Total children ever born			
1-2	1.00 (reference)		
3-4	0.61	0.47-0.78	<0.001*
5+	0.68	0.49-0.93	0.016*
Maternal age			
15-19	1.00 (reference)		
20-24	0.53	0.35-0.80	0.002*
25-29	0.49	0.31-0.77	0.002*
30-34	0.59	0.36-0.96	0.033*
35-39	0.70	0.41-1.19	0.191
40-44	0.65	0.35-1.19	0.167
45-49	0.54	0.22-1.29	0.165
Age at first marriage/union			
<18years	1.00 (reference)		
18-20years	1.20	0.98-1.47	0.079
20+years	1.15	0.91-1.45	0.257
Duration in residence			
Internal immigrant (<5years)	1.00 (reference)		
Native (5+years)	0.89	0.71-1.11	0.302
Frequency of reading newspaper			
Not at all	1.00 (reference)		

Less than once a week	0.97	0.50-1.87	0.918
At least once a week	0.61	0.22-1.69	0.346
Frequency of listening to the radio			
Not at all	1.00 (reference)		
Less than once a week	1.26	0.96-1.66	0.100
At least once a week	1.12	0.88-1.43	0.345
Almost everyday	1.13	0.86-1.37	0.492
Frequency of watching TV			
Not at all	1.00 (reference)		
Less than once a week	1.09	0.82-1.44	0.566
At least once a week	1.12	0.84-1.48	0.438
Almost everyday	1.13	0.87-1.48	0.352

*Significant at $p < 0.05$

Here, we found maternal age to be associated with institutional-based delivery. Younger women are more likely to practice institutional-based delivery in the Gambia. In a previous study, maternal age was found to be associated with facility-based delivery. The study reported that older mothers are less likely to give birth in a health facility^{20,21}.

Furthermore, there was a significant reduction in the odds of institutional-based delivery among rural dwellers. This is consistent with previous studies conducted in sub-Saharan Africa¹⁹. The reduction in the odds of institutional-based delivery among rural dwellers could be attributed to physical inaccessibility to health facilities which can be due to bad terrains, poor transport channels, delivery cost especially women who are not covered by health insurance, lack of health information regarding the advantages in delivering at the health institution. Urban-rural differentials in maternal care utilization could also be explained by the concentration of health infrastructure and better quality services in urban areas. To handle inequality in the utilization of maternal health services, strategies that encompass both demand and supply-side interventions, especially to reach those living in remote areas or with limited resources, are a necessity. Such interventions should go beyond any targeted intervention for maternal health to accommodate a broader development agenda, including human capital development.

In addition, this study also showed that mothers with secondary or higher educational level were more likely to utilize institutional-based delivery services. This finding is similar to reports from previous studies¹⁹. Educated mothers are empowered and are able to make their own decisions in matters related to their place of

delivery and health care in general. Education enables women to communicate and understand information concerning their health and probable danger signs earlier on. Having formal education could influence women's knowledge about delivery risks and the availability of maternal health care services. Furthermore, ethnic diversity was associated with health facility delivery. The nature of this relationship is unclear but could reflect the heterogeneity and social and ecological settings in the Gambia. This is similar to the findings of a previous study²².

Furthermore, women with higher parity and those from higher household wealth status had a significant increase in the odds of institutional-based delivery. This finding is consistent with previous studies¹¹⁻¹⁴. Women from higher household wealth status will have the capacity to afford health care services, especially in the absence of robust health insurance. Explaining wealth-based inequality in accessing maternal and reproductive care services is complex, because many factors, such as cost versus affordability, distance and availability of services, sociocultural factors, and demand for services must be considered. Lack of affordability can be seen as a factor that explains rich-poor inequalities for facility-based delivery. Demand for services influenced by cultural factors negatively affects poorer women to seek maternal care and reproductive health services, this may be because they are less educated, they prefer to deliver at home or do not want to see a male doctor amongst other reasons. Though the utilization of women's healthcare services including facility-based delivery is speculated to have improved in many resource-constrained settings²³, albeit large wealth-related inequalities in the use of women's

services continue to remain a major public health issue.

Ethical Consideration

In this study, we used dataset available in the public domain. The survey protocol was approved by The Gambia Government and Medical Research Council Scientific Coordinating Committee (SCC) in March 2017. During the survey, verbal consent was obtained for each respondent participating and, for children less than 18 years of age to be individually interviewed, adult consent was obtained in advance to the child's assent. All respondents were informed of the voluntary nature of participation and the confidentiality and anonymity of information.

Strengths and Limitations

This is one of the foremost studies to be conducted using a nationally representative sample of women in the Gambia to investigate maternal factors associated with health facility delivery. However, as the study is based on a secondary dataset, the researcher has limited control over the type of data available. Multiple confounding variables, such as the presence of transportation challenges, geographical distance to the health facility, cost of childbirth services and prevalence of traditional practices in the region is difficult to achieve in this study. Also, only the association and not causality could be achieved in this study.

Conclusion

This study indicated that the overall utilization of institutional delivery was found to be approximately three-quarters, while residence, wealth index, mother's education, ethnicity, maternal age and parity were independently associated with institutional-based delivery service utilization in The Gambia. Our study findings demonstrate the importance of reducing inequalities in determinants of health facility-based delivery in order to promote the survival of women at delivery. Strategies to increase the number of health facilities alone may not be enough to ensure access to all populations. The disadvantaged will continue to use comparatively

less facility delivery services if timely and viable intervention is not implemented. The evidence gathered can be useful to enhance the relevance of delivery care services. More so, the factors of facility-based delivery are brought to bear and to contribute to the existing body of knowledge and inform the Gambian health care system in its policy making processes to improve delivery care utilisation.

Declarations

Availability of data and materials

Unique identifiers such as location and names collected during interviews were removed from datasets to ensure privacy. These anonymised data files are made available on; www.gbosdata.org and on the MICS website and can be freely downloaded for legitimate research purposes.

Competing Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Authors' Contributions

AB conceived and designed the study, performed data analysis and wrote the results. All authors discussed the results, reviewed and approved the final manuscript.

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References

1. Wildman K and Bouvier-Colle M-H. Maternal mortality as an indicator of obstetric care in Europe. *BJOG: An International Journal of Obstetrics &*

- Gynaecology*. 2004;111(2):164-169. doi:10.1046/j.1471-0528.2003.00034.x-i1
2. Rosa W, ed. Transforming Our World: The 2030 Agenda for Sustainable Development. In: *A New Era in Global Health*. New York, NY: Springer Publishing Company; 2017. doi:10.1891/9780826190123.ap02
 3. Kumar S, Kumar N and Vivekadhish S. Millennium Development Goals (MDGs) to Sustainable Development Goals (SDGs): Addressing Unfinished Agenda and Strengthening Sustainable Development and Partnership. *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine*. 2016;41(1):1. doi:10.4103/0970-0218.170955
 4. World Health Organization, UNICEF, United Nations, Department of Economic and Social Affairs, Population Division, World Bank. *Trends in Maternal Mortality: 1990 to 2015: Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division.*; 2015. <http://www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-2015/en/>. Accessed April 3, 2019.
 5. World Health Organization. Every Woman Every Child. Global Strategy for Women's, Children's and Adolescents' Health, 2016–2030. 2015. <https://www.who.int/life-course/partners/global-strategy/ewec-globalstrategyreport-200915.pdf?ua>.
 6. Montagu D, Yamey G, Visconti A, Harding A and Yoong J. Where Do Poor Women in Developing Countries Give Birth? A Multi-Country Analysis of Demographic and Health Survey Data. Mock N, ed. *PLoS ONE*. 2011;6(2):e17155. doi:10.1371/journal.pone.0017155
 7. Koblinsky M, Matthews Z, Hussein J, Mavalankar D, Mridha MK, Anwar I, Achadi E, Adjei S, Padmanabhan P, Marchal B, De Brouwere V and van Lerberghe W. Going to scale with professional skilled care. *Lancet*. 2006;368(9544):1377-1386. doi:10.1016/S0140-6736(06)69382-3
 8. Campbell OMR and Graham WJ, Lancet Maternal Survival Series steering group. Strategies for reducing maternal mortality: getting on with what works. *Lancet*. 2006;368(9543):1284-1299. doi:10.1016/S0140-6736(06)69381-1
 9. Montagu D, Yamey G, Visconti A, Harding A and Yoong J. Where Do Poor Women in Developing Countries Give Birth? A Multi-Country Analysis of Demographic and Health Survey Data. Mock N, ed. *PLoS ONE*. 2011;6(2):e17155. doi:10.1371/journal.pone.0017155
 10. Witter S, Adjei S, Armar-Klemesu M and Graham W. Providing free maternal health care: ten lessons from an evaluation of the national delivery exemption policy in Ghana. *Glob Health Action*. 2009;2. doi:10.3402/gha.v2i0.1881
 11. Enameh YA, Okawa S, Asante KP, Kikuchi K, Mahama E, Ansah E, Tawiah C, Adjei K, Shibanuma A, Nanishi K, Yeji F, Agyekum EO, Yasuoka J, Gyapong M, Oduro AR, Quansah Asare G, Hodgson A, Jimba M, Owusu-Agyei S and Ghana EMBRACE Implementation Research Project Team.. Factors Influencing Health Facility Delivery in Predominantly Rural Communities across the Three Ecological Zones in Ghana: A Cross-Sectional Study. Ciccozzi M, ed. *PLoS ONE*. 2016;11(3):e0152235. doi:10.1371/journal.pone.0152235
 12. Kruk ME, Rockers PC, Mbaruku G, Paczkowski MM and Galea S. Community and health system factors associated with facility delivery in rural Tanzania: a multilevel analysis. *Health Policy*. 2010;97(2-3):209-216. doi:10.1016/j.healthpol.2010.05.002
 13. Kruk ME, Hermosilla S, Larson E, Vail D, Chen Q, Mazuguni F, Byalugaba B and Mbaruku G. Who is left behind on the road to universal facility delivery? A cross-sectional multilevel analysis in rural Tanzania. *Trop Med Int Health*. 2015;20(8):1057-1066. doi:10.1111/tmi.12518
 14. Devasenapathy N, George MS, Ghosh Jerath S, Singh A, Negandhi H, Alagh G, Shankar AH and Zodpey S. Why women choose to give birth at home: a situational analysis from urban slums of Delhi. *BMJ Open*. 2014;4(5). doi:10.1136/bmjopen-2013-004401
 15. Hruschka DJ, Gerkey D and Hadley C. Estimating the absolute wealth of households. *Bulletin of the World Health Organization*. 2015;93(7):483-490. doi:10.2471/BLT.14.147082
 16. Rutstein SO and Staveteig S. Making the Demographic and Health Surveys Wealth Index Comparable. 2014; DHS Methodological Reports No. 9. Rockville, Maryland, USA: ICF International.
 17. Bedaso A, Kebede E and Adamu T. Assessment of skin-to-skin contact (SSC) during the postpartum stay and its determinant factors among mothers at public health institutions in Ethiopia. *BMC Res Notes*. 2019;12(1):136. doi:10.1186/s13104-019-4176-5
 18. Midi H, Sarkar SK and Rana S. Collinearity diagnostics of binary logistic regression model. *Journal of Interdisciplinary Mathematics*. 2010;13(3):253-267. doi:10.1080/09720502.2010.10700699
 19. Moyer CA and Mustafa A. Drivers and deterrents of facility delivery in sub-Saharan Africa: a systematic review. *Reprod Health*. 2013;10(1):40. doi:10.1186/1742-4755-10-40
 20. Kebede A, Hassen K and Teklehaymanot AN. Factors associated with institutional delivery service utilization in Ethiopia. *Int J Womens Health*. 2016;8:463-475. doi:10.2147/IJWH.S109498
 21. Sprague DA, Jeffery C, Crossland N, House T, Roberts GO, Vargas W, Ouma J, Lwanga SK and Valadez JJ. Assessing delivery practices of mothers over time and over space in Uganda, 2003–2012. *Emerg Themes Epidemiol*. 2016;13(1):9. doi:10.1186/s12982-016-0049-8
 22. Ononokpono DN and Odimegwu CO. Determinants of

Barrow et al.

- Maternal Health Care Utilization in Nigeria: a multilevel approach. *Pan African Medical Journal*.:6.
23. Alam N, Hajizadeh M, Dumont A and Fournier P. Inequalities in Maternal Health Care Utilization in

Institutional-based Delivery in Gambia

Sub-Saharan African Countries: A Multiyear and Multi-Country Analysis. Carpenter DO, ed. *PLoS ONE*. 2015; 10(4): e0120922. doi:10.1371/journal.pone.0120922.