

# Prevalence and Socioeconomic Inequalities in Eight or More Antenatal Care Contacts in Ghana: Findings from 2019 Population-Based Data

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Michael Ekholuenetale<sup>1</sup>  
Chimezie Igwegbe Nzopotam<sup>2</sup>  
Amadou Barrow<sup>3</sup>

<sup>1</sup>Department of Epidemiology and Medical Statistics, Faculty of Public Health, College of Medicine, University of Ibadan, Ibadan, Nigeria; <sup>2</sup>Department of Community Health, Center of Excellence in Reproductive Health Innovation (CERHI), College of Medical Sciences, University of Benin, Benin City, Nigeria; <sup>3</sup>Department of Public & Environmental Health, School of Medicine & Allied Health Sciences, University of the Gambia, Kanifing, The Gambia

**Background:** For the prevention of complications and death during pregnancy, adequate antenatal care (ANC) contacts are important. To achieve optimal obstetric care, the latest ANC guidance recommends eight or more ANC contacts. The aim of this analysis is to investigate the prevalence and socio-economic differences of eight or more Ghanaian ANC contacts.

**Methods:** A total sample of 1404 women of reproductive age who had given birth after eight or more ANC contacts had been initiated, taking into account 9 months of gestation, was studied. The Ghana Malaria Indicator Survey of 2019 (GMIS) was used. In the univariate analysis, percentage was used. The curve and concentration index of Lorenz were used to assess socio-economic disparities for eight or more ANC contacts. Statistical significance was set at 5%.

**Results:** The weighted prevalence of eight or more ANC contacts was 41.9% (95% CI: 37.9–45.9%). The prevalence of eight or more ANC contacts among the poorest, poorer, middle, richer and richest households was 34.0%, 36.1%, 35.8%, 42.4% and 59.6%, respectively. Similarly, 33.0%, 37.7% and 42.6% prevalence of eight or more ANC contacts were estimated among women with no formal education, primary, secondary or higher, respectively. In addition, women from rich household had greater coverage of eight or more ANC contacts (Conc. Index= 0.089; SE= 0.019) and educated women had greater coverage of eight or more ANC contacts in Ghana (Conc. Index= 0.053; SE= 0.017) (all  $p < 0.001$ ).

**Conclusion:** Eight or more ANC contacts from the WHO in 2016 have yet to be fully institutionalized in Ghana. In order to increase access to the recommended prenatal care and for a healthy pregnancy experience, measures that resolve disparities in healthcare usage need to be prioritized for the country. Efforts should be made to expand the health insurance services available, as well as to enact policies that will increase free health care particularly among the poor and uneducated women.

**Keywords:** inequality, WHO, maternal health, women, 2016 ANC guideline

## Background

The process of pregnancy and childbirth is among major events that take place in womanhood. The ability to conceive and give birth to a child brings much fulfillment to both the woman and her family. Albeit, there are many predisposing, enabling and need factors affecting healthcare during pregnancy including women's socioeconomic status.<sup>1</sup> Inadequate healthcare utilization could have put sub-Saharan Africa (SSA) among the highest contributor to the global level of maternal mortality rates, resulting from complications during pregnancy and childbirth.<sup>2</sup>

Correspondence: Amadou Barrow  
Email [abarrow@utg.edu.gm](mailto:abarrow@utg.edu.gm)

Though the causes of these deaths are often preventable through access and adequate antenatal care (ANC) services utilization, several resource-constrained countries have poor health care system and unable to prevent large number of these deaths.<sup>3</sup>

Access to health care services is disproportionately distributed among diverse socioeconomic groups in many SSA countries.<sup>1</sup> Evidence-based studies reported that women and children from low socioeconomic class have less access to health care services and are plagued with the highest number of morbidity and mortality in the society when compared to those from the high socioeconomic class.<sup>4-8</sup> Socioeconomic inequality in healthcare use has often been observed in most developing countries, including African countries and have the most worrisome reports.<sup>9-12</sup> The third and tenth Sustainable Development Goals (SDGs) are targeted to eliminate inequality “ensure healthy lives and promote well-being for all at all ages” and “reduce inequality within and among countries”.<sup>13</sup> To achieve this, particularly in resource-constrained settings, adequate and sustainable efforts are required to end several barriers that plague access to health care service utilization including socioeconomic inequality.

The World Health Organization (WHO) Universal Health Coverage (UHC) was brought to limelight to address inequality in access and use of healthcare services.<sup>8,14</sup> This was geared towards enhancing maternal and child healthcare through the elimination of barriers that limit accessibility and affordability of services among the disadvantaged and vulnerable population. The UHC sorts to give healthcare access to the most-at-risk and disadvantaged populace. This was due to large evidence of socioeconomic inequality in the utilization of healthcare services.<sup>15</sup> The need for ANC services is crucial to everyone as it presents the expectant mothers an opportunity to uptake proper care. Moreover, it helps in early detection of danger signs and health promotions.<sup>16</sup>

In 2016, WHO made a recommendation of eight ANC contacts, overriding the previous recommendation of a minimum of four ANC visits.<sup>1,16</sup> Prior to the guideline for eight or more ANC contacts, reports showed that only 60% of women worldwide had at least four ANC visits, and only about 52% of women from SSA countries had at least four ANC visits with trained health care providers.<sup>17</sup> The benefits of adequate ANC are numerous; including reduction in adverse pregnancy outcomes, promotion of women’s health, reduction in perinatal and newborn morbidity and mortality amongst others.<sup>18-20</sup> Also, it has been

found to encourage the use of skilled birth attendance as well as promote postnatal care utilization.<sup>1,21-26</sup>

It seems that Ghana has started to see some change in maternal health. Ghana’s maternal mortality ratio (MMR) has decreased gradually in the past two decades. The country’s maternal mortality ratio was calculated at 484 per 100,000 live births in 2000; 371 per 100,000 live births in 2005; 339 per 100,000 live births in 2010; 320 per 100,000 live births in 2015; and 308 per 100,000 live births in 2017, being an overall reduction in MMR of 36% between 2000 and 2017.<sup>3</sup> This is lower than the estimates from many other African countries.<sup>3</sup> This figure though seemingly low, still very high and needs to be reduced in line with the SDG-3; “by 2030 reduce the global maternal mortality ratio to less than 70 per 100,000 live births”.<sup>13</sup> Socioeconomic inequality in maternal health care utilization in Ghana is a major barrier to achieve the SDG-3, but can be brought to a barest minimum if financial barriers that exist in the health system is removed.<sup>27</sup> Exempting the pregnant women from paying out-of-pocket could be a strategy to encourage adequate ANC contacts as well as reduction in socioeconomic inequalities as per healthcare use.<sup>28</sup> Previous efforts to remove user-fee contributed to the initiation of National Health Insurance Scheme (NHIS), as a tool to eliminate barriers in accessing healthcare services in Ghana. The National Health Insurance Act (Act 650) scheme also has the aim of enhancing financial access, particularly among key population for optimal healthcare utilization.<sup>28</sup> Over the years, the use of NHIS seems to promote maternal healthcare service utilization in Ghana, though there are still reports of out-of-pocket expenditures.<sup>27-30</sup>

Evidence-based studies have reported that socioeconomic status is a key determining factor in healthcare service utilization. For instance, the economic status of a woman or her family (wealth status),<sup>31,32</sup> level of education of a woman,<sup>33</sup> level of education of the husband as well as the woman’s autonomy<sup>33-35</sup> were significant factors in healthcare utilization, respectively. To the best of our knowledge, this study is the first of its kind to examine the prevalence and socioeconomic inequalities in the uptake of eight or more ANC contacts in Ghana, after the WHO recommendation for eight or more ANC contacts with trained health care provider was launched.

## Methods

### Data Extraction

For this study, a total sample of 1404 women of reproductive age who had given birth following the criteria of eight or more ANC contacts was initiated by WHO, taking into account 9 months of gestation. The Ghana Malaria Indicator Survey (GMIS) 2019 was used. All reproductive-age women (15–49 years) who were either visitors or who lived permanently in the chosen households were eligible to be interviewed. The 2019 GMIS sample also includes key elements of maternal health data such as ANC contacts, although it was intended to provide estimates of key malaria indicators for the country and for each of the 10 administrative regions (Western, Central, Greater Accra, Volta, Eastern, Ashanti, Brong Ahafo, Northern, Upper East, and Upper West) as identified in the 2010 Population and Housing Census of Ghana. The sampling method used for the 2019 GMIS is the 2010 PHC framework carried out by the Ghana Statistical Service in Ghana (GSS). A full list of all census enumeration areas (EAs) created for the PHC is the frame. An EA is the smallest geographic region that can be easily surveyed during an enumeration exercise by an enumerator. Details on the EA area, type of residence (rural or urban), the estimated number of residential households and the estimated population are included in the sampling frame.

### Sampling Design

In two separate steps, the 2019 GMIS sample was stratified and selected from the sampling frame. Each region was split into rural and urban areas, resulting in 20 sampling layers. In two steps, samples of EAs were selected separately in each stratum. Approximately 200 EAs (103 in rural areas and 97 in urban areas) were selected in the first level, with a probability proportional to EA size and in-depth, respectively. In all of the selected EAs, a household listing procedure was conducted from 24 June to 10 August 2019. A fixed number of 30 households were chosen from each cluster in the second stage of selection to make up a total sample size of 6000 households. Details of the sampling method have already been published.<sup>36</sup>

### Selection Criteria

We included women who had given birth after WHO launched the guideline of eight or more ANC contacts, considering 9 months of gestation. ANC models with

a minimum of eight contacts are recommended in the Guideline to minimize perinatal mortality and enhance the experience of women in treatment.<sup>16</sup>

### Variable Selection and Measurement Outcome

Dichotomous measurements were taken of the frequency of ANC encounters with physicians, nurses and midwives. In order to derive this variable, the GMIS asked the question “Number of antenatal visits during pregnancy?” The answers to this question were classified as  $<8$  or  $\geq 8$  contacts. A review structure for the 2016 WHO ANC is provided in the WHO ANC guideline recommendations mapped to the eight suggested contacts.<sup>16,37,38</sup>

### Independent Variables

In order to assess socioeconomic status in line with previous research, women’s educational achievement and income quintiles were used.<sup>39–41</sup> The achievement of women’s education was classified as no formal education, primary, secondary or higher. The wealth indicator weights were determined using the principal component analysis (PCA) technique to assign the wealth indicator weights. Wealth indicator variable scores were allocated and standardized using household assets such as wall type, floor type, roof type, water supply, sanitation facilities, radio, electricity, television, refrigerator, cooking fuel, furniture, number of persons per room. The factor loadings and z-scores have then been determined. The indicator values were multiplied by the factor loadings for each household and summarized to generate the wealth index value of the household. To categorize the overall scores into wealth quintiles, the standardized z-score was used; poorest, poorer, middle, richest and richest.<sup>42</sup>

Other explanatory variables include respondent age (year): 15–24, 25–34, 35+; residential status: urban, rural; religion: Christianity, Islam, traditional/no religion; timing to antenatal care booking: late (after 1st trimester), early (within 1st trimester); health insurance coverage: not covered, covered; household headship: male, female; preceding birth interval: first born,  $<2$ years, 2–3years, 4+years; parity: 1–2, 3–4, 5+; region: Western, Central, Greater Accra, Volta, Eastern, Ashanti, Brong Ahafo, Northern, Upper East, Upper West; ethnicity: Akan, Ga/Dangme, Ewe, Guan, Mole-Dagbani, Grusi, Gurma, Mande, Other.

## Statistical Analysis

For sampling design, the survey module (“svy”) command was used. In univariate analysis, percentage was used. The Lorenz curve and concentration index for eight or more ANC contacts were used to analyze socio-economic disparities. When eight or more ANC contacts are higher among high socioeconomic classes, the concentration index value is positive. Conversely, when the concentration index value is negative, it indicates that among low socioeconomic classes, eight or more ANC contacts are higher. The explanatory variables for stratified analyses were used. The concentration index was used in eight or more ANC contacts to compute the contrast.<sup>43,44</sup> Statistical significance was determined at  $p < 0.05$ . Stata version 14 (StataCorp., College Station, TX, USA) was used for data analysis.

## Ethical Consideration

In the public domain, we used the secondary data available. The ICF Institutional Review Board and the Ghana Health Service Ethical Review Committee have approved the procedure for the 2019 GMIS. The advantages and risks of participating in the survey have been explained to participants. Prior to administration of the Household or Women’s Questionnaire, informed consent was obtained directly from qualified respondents. Participation was voluntary in the survey. The names and identification numbers of the respondents were omitted from the final data sets.

## Results

The weighted prevalence of eight or more ANC contacts was 41.9% (95% CI: 37.9–45.9%). The prevalence of eight or more ANC contacts among the poorest, poorer, middle, richer and richest households was 34.0%, 36.1%, 35.8%, 42.4% and 59.6%, respectively. Similarly, 33.0%, 37.7% and 42.6% prevalence of eight or more ANC contacts were estimated among women with no formal education, primary, secondary+, respectively. Overall, women aged 35+, urban dweller, Christianity belief, initiated ANC contact within first trimester, covered by health insurance, primiparous, Western or Upper East region and Grusi ethnic background had the highest prevalence of eight or more ANC contacts, respectively. See Table 1 for the details.

Figures 1 and 2 show household wealth and women’s education inequalities for eight or more ANC contacts in

Ghana. A higher degree of inequalities is confirmed by how far away the curves sag away from the line of equality. Figures 1 and 2 show that women from rich households and those educated had greater coverage of eight or more ANC contacts in Ghana as the line of equality sags below the diagonal line, respectively.

Table 2 shows results of household wealth and mothers’ education inequalities for eight or more ANC contacts in Ghana. Overall, women from rich household had greater coverage of eight or more ANC contacts (Conc. Index= 0.089; SE= 0.019) and educated women had greater coverage of eight or more ANC contacts in Ghana (Conc. Index= 0.053; SE= 0.017). See Table 2 for the details.

## Discussion

This is the foremost study in Ghana to examine the socio-economic inequalities in eight or more ANC contacts. Based on the WHO recommendations, a minimum number of eight ANC contacts should be made with a trained health care provider by the 40th gestation week. This was necessary as the minimum of four ANC visits earlier proposed or recommended was seen to be inadequate to enhance the survival of mothers and children alike, especially in developing countries. This new recommendation requires a woman to visit trained health care provider at least once in her first trimester, twice in her second trimester (weeks 20 and 26) and five times in her third and final trimester (weeks 30, 34, 36, 38 and 40, respectively).<sup>16,45</sup>

This study estimated a weighted 41.9% prevalence of eight or more ANC contacts among Ghanaian women of reproductive age. This prevalence is higher than the findings from previous studies from Nigeria (17.4%)<sup>46</sup> and Benin Republic (8.0%).<sup>47</sup> The higher prevalence of eight ANC or more contacts observed among Ghanaian women may be as a result of the improvement in maternal and child health seen in Ghana in recent years.<sup>48</sup> It has been reported that since the policy that sought a complete removal of financial burden barriers from pregnant women who registered with the Ghanaian NHIS, many rural women and those from poor and less privileged backgrounds could seek for maternal and child health care without barriers.<sup>49</sup> A report showed that this policy has positively imparted the use of maternal health care in Ghana.<sup>49</sup> Prior to implementation of the policy on maternal health care utilization, it was a norm that prenatal and postnatal mothers were required to pay out-of-pocket or

**Table 1** Distribution of Eight or More Antenatal Care Contacts Across Socioeconomic Status and by Women's Characteristics

Variable	n (%)	Eight or More ANC Contacts, %	Eight or More Antenatal Care Contacts							
			Household Wealth Quintile					Mothers' Educational Attainment		
			Lowest (Poorest)	Second Level	Middle	Fourth Level	Highest (Richest)	No Education	Primary	Secondary or Higher
<b>Age</b>										
15–24	435 (31.0)	33.8	34.9	27.9	35.6	31.5	51.7	26.3	33.0	35.6
25–34	670 (47.7)	40.0	28.8	38.5	34.6	47.2	62.6	30.3	35.5	46.1
35+	299 (21.3)	45.5	42.7	44.8	40.0	45.5	58.5	40.2	50.0	48.3
<b>Residential status</b>										
Urban	551 (39.3)	43.4	32.7	43.6	40.7	48.1	64.3	29.6	42.6	46.6
Rural	853 (60.7)	36.6	34.8	31.2	32.9	38.4	56.0	34.1	35.3	38.8
<b>Religion</b>										
Christianity	1019 (72.6)	41.5	37.0	39.9	34.8	44.1	56.6	37.4	40.6	42.9
Islam	329 (23.4)	34.7	30.0	31.6	38.2	32.1	87.5	30.0	30.9	44.2
Traditional/ no religion	56 (4.0)	25.0	25.9	8.3	40.0	28.6	–	24.1	33.3	20.0
<b>Timing to antenatal care booking</b>										
Late (after 1st trimester)	457 (33.5)	19.7	15.0	20.6	19.1	23.1	31.3	15.8	13.0	24.1
Early (within 1st trimester)	905 (66.5)	50.4	47.7	43.9	45.9	54.1	67.2	46.0	50.3	52.2
<b>Health insurance coverage</b>										
Not covered	489 (37.6)	39.3	33.1	44.1	31.6	40.2	58.5	35.6	36.4	42.2
Covered	811 (62.4)	40.7	36.7	34.4	39.6	41.5	61.4	32.8	43.1	42.9
<b>Household headship</b>										
Male	1010 (71.9)	39.1	35.1	34.0	35.8	44.5	59.6	32.1	38.3	43.4
Female	394 (28.1)	39.6	31.0	43.1	35.7	37.8	59.7	37.3	35.4	41.1
<b>Preceding birth interval</b>										
First born	708 (50.4)	41.5	35.6	39.3	37.7	43.8	59.8	39.3	37.8	43.2
<2 years	116 (8.3)	28.5	30.0	36.0	14.3	22.2	46.2	30.8	29.0	27.1
2–3 years	474 (33.8)	38.8	33.0	33.3	34.9	47.9	66.0	28.3	38.7	47.1
4+ years	106 (7.6)	37.7	34.4	29.2	47.6	40.0	44.4	34.5	42.9	36.7
<b>Parity</b>										
1–2	684 (48.7)	41.1	36.6	33.6	40.5	42.3	62.1	27.8	38.1	43.7
3–4	432 (30.8)	36.1	30.2	34.9	27.6	40.3	56.1	32.2	34.3	39.3
5+	288 (20.5)	39.6	33.9	43.8	35.9	46.3	58.8	36.3	41.8	44.4

(Continued)



Table 1 (Continued).

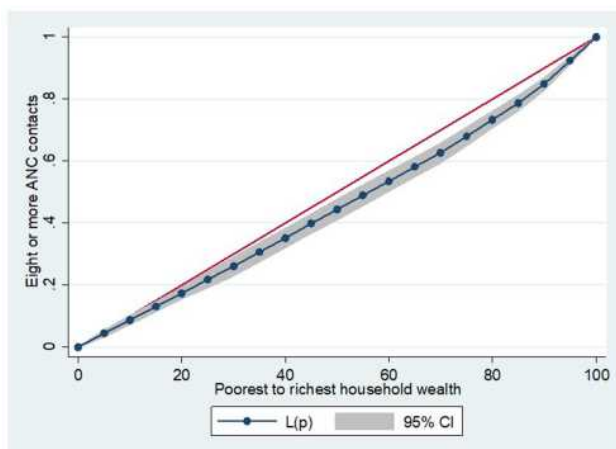
Variable	n (%)	Eight or More ANC Contacts, %	Eight or More Antenatal Care Contacts							
			Household Wealth Quintile					Mothers' Educational Attainment		
			Lowest (Poorest)	Second Level	Middle	Fourth Level	Highest (Richest)	No Education	Primary	Secondary or Higher
<b>Region</b>										
Western	134 (9.5)	61.2	55.6	73.1	52.2	58.3	68.4	55.6	62.5	62.0
Central	139 (9.9)	28.8	15.8	44.4	22.6	21.4	45.0	57.1	37.0	24.8
Greater Accra	118 (8.4)	56.8	36.4	50.0	45.8	59.0	70.6	33.3	35.0	63.0
Volta	121 (8.6)	23.1	8.3	20.7	15.6	26.1	69.2	10.0	24.3	26.6
Eastern	107 (7.6)	35.5	11.8	29.4	31.3	46.2	45.2	31.3	33.3	37.0
Ashanti	141 (10.0)	44.7	23.8	33.3	60.6	43.2	51.7	46.7	51.6	42.1
Brong Ahafo	130 (9.3)	42.3	45.2	35.1	35.7	40.0	87.5	50.0	34.2	44.8
Northern	213 (15.2)	24.4	23.8	25.3	25.8	16.7	–	24.2	13.9	32.7
Upper East	147 (10.5)	64.6	62.9	84.0	50.0	50.0	66.7	61.4	74.3	61.8
Upper West	154 (11.0)	20.1	20.3	13.0	25.0	22.2	75.0	20.0	19.4	20.7
<b>Ethnicity</b>										
Akan	469 (33.4)	45.0	33.3	50.0	41.6	44.3	53.6	60.7	50.8	42.9
Ga/Dangme	67 (4.8)	40.3	30.0	10.0	35.7	38.5	65.0	0.0	26.3	51.2
Ewe	180 (12.8)	32.2	24.2	34.2	16.3	41.5	52.0	23.5	32.1	33.6
Guan	32 (2.3)	46.9	33.3	58.3	60.0	20.0	50.0	50.0	36.4	54.6
Mole-Dagbani	454 (32.3)	35.2	36.2	27.6	36.5	36.7	75.0	30.2	37.5	40.5
Grusi	60 (4.3)	60.0	68.2	53.3	50.0	44.4	100.0	46.7	62.5	64.9
Gurma	82 (5.8)	19.5	10.4	25.0	18.2	75.0	66.7	20.0	17.9	21.4
Mande	16 (1.1)	56.3	50.0	40.0	75.0	0.0	100.0	25.0	85.7	40.0
Other	44 (3.1)	43.2	45.0	33.3	33.3	33.3	100.0	53.3	16.7	52.9
Total estimates	1404	41.9	34.0	36.1	35.8	42.4	59.6	33.0	37.7	42.6

pay premiums to register for NHIS before they can have access to comprehensive maternal health care.<sup>27</sup>

Another factor that could be attributed to the improved eight or more ANC contacts as observed among the surveyed Ghanaian women as compared with other sub-Saharan African countries, could be the Community-based Health Planning and Services programme (CHPS). This programme sought to provide rural and deprived communities easy access to healthcare services in health facilities.<sup>29,50,51</sup> The CHPS have been adjured to be a significant intervention in the assistance to providing ANC services and uncomplicated vaginal deliveries in rural communities.<sup>52</sup> Though the prevalence is higher than other sub-Saharan African countries, sustaining and

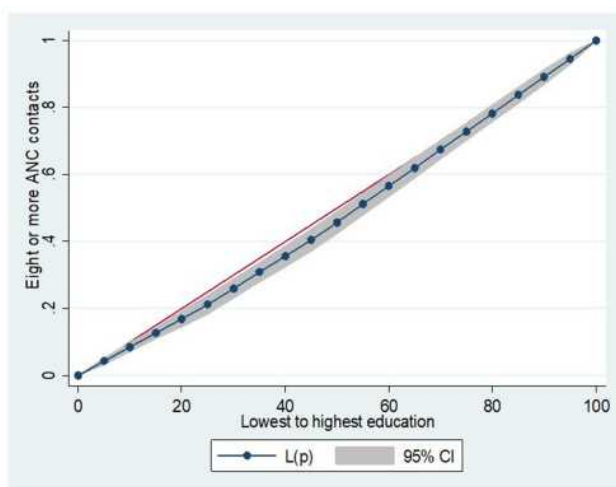
improving on this will require that improved infrastructures should be on ground and closer to women especially in the rural communities, where many women do not access health care services due to distance to health facility.

The focus of this study was towards the impact of socioeconomic status on the compliance of the WHO directive for at least eight ANC contacts. We determined the prevalence of eight or more ANC contacts among various household wealth status of the women. The results showed a progressive increase in eight or more ANC contacts with a trained health care provider from the poorest households to the richest households. The poorest, poorer, middle, richer and richest households had



**Figure 1** Lorenz curve for eight or more ANC contacts by household wealth.

prevalence of 34.0%, 36.1%, 35.8%, 42.4% and 59.6%, respectively. The residential status also showed inequality in favour of the richest households. The rural richest had higher contacts (56.0%) than the rural poorest (34.8%). We observed socioeconomic inequality in eight or more ANC contacts during the period of pregnancy, in timing to ANC booking, health insurance coverage and household headship. These showed that household wealth played a significant role in the attainment of the WHO recommended eight or more ANC contacts among Ghanaian women. It may also imply that though there is policy in Ghana that allow free maternal and child health care,<sup>27</sup> women may still be having barriers for maternal health services. Another reason may be the fact that often, poor members of the society live in rural areas where access to health facility is difficult or non-existent. On the other



**Figure 2** Lorenz curve for eight or more ANC contacts by women's education.

hand, where the poor live in the cities or urban areas, they often live in the slum or poor neighbourhoods, where good infrastructures such as hospitals and schools are often unavailable or in poor state. These urban-poor women may not be privileged to access good health care. The pro-rich and pro-educated eight or more ANC contacts were observed across certain levels of women's age, religion, parity, preceding birth interval, region and ethnicity amongst others.

Furthermore, this study also found mothers' educational attainment to influence eight or more ANC contacts among Ghanaian women. Those with secondary or higher education, irrespective of age, residence, timing to ANC booking, health insurance coverage and parity, had greater uptake of eight or more ANC contacts. Over the years, it has been argued that socioeconomic inequalities leading to out-of-pocket expenditure, poor access to well-equipped and functional health facilities, lack of women's enlightenment and poor or lack of decision-making power are barriers to maternal healthcare utilization.<sup>53-56</sup> These observations are in agreement with many other reports on the analysis of socioeconomic inequalities, where women with higher educational levels and those from rich households had greater uptake for maternal health care services when compared to the less educated and disadvantaged.<sup>27,46,47,57-59</sup>

Based on the results from Lorenz curve, it is observed that there are household wealth and women's education inequalities for eight or more ANC contacts among reproductive age women in Ghana. The rich neighborhood is commonly where the members of richest class, educated, and the affluent members of a given society dwell and hence influence availability of healthcare services. The level of educational attainment is in correlation with having eight or more ANC contacts. Education is one of the major contributors to enlightenment and enhances exposure to health educational materials. Having at least secondary level of education can promote early booking for ANC and completing at least 8 ANC contacts as recommended. Studies from Nigeria,<sup>4,57</sup> Benin,<sup>47,60</sup> North Eastern Ethiopia<sup>58</sup> Ghana<sup>29</sup> and in the rural settings of Malawi<sup>61</sup> have reported that educational attainment has positive influence on optimal utilization of maternal health care services. These showed the importance of educating the girl-child as it can empower her to obtain her reproductive health needs. Education or enlightenment is a factor that has shown to be a protective and an enhancer for women's utilization of maternal and child health care

**Table 2** Household Wealth and Educational Attainment Inequalities in Early Initiation of Breastfeeding

Variable	Household Wealth Quintile		Mothers' Education	
	Concentration Index (SE)	P	Concentration Index (SE)	P
<b>Age</b>		0.016*		0.370
15–24	0.024 (0.037)		0.040 (0.033)	
25–34	0.138 (0.026)*		0.089 (0.024)*	
35+	0.044 (0.036)		0.043 (0.034)	
<b>Residential status</b>		0.220		0.461
Urban	0.114 (0.027)*		0.058 (0.023)*	
Rural	0.067 (0.025)*		0.031 (0.024)	
<b>Religion</b>		0.662		0.189
Christianity	0.071 (0.021)*		0.023 (0.018)	
Islam	0.108 (0.041)*		0.091 (0.041)*	
Traditional/no religion	0.042 (0.127)		–0.013 (0.124)	
<b>Timing to antenatal care booking</b>		0.281		0.039*
Late (after 1st trimester)	0.111 (0.053)*		0.112 (0.049)*	
Early (within 1st trimester)	0.062 (0.018)*		0.024 (0.017)	
<b>Health insurance coverage</b>		0.806		0.950
Not covered	0.075 (0.031)*		0.040 (0.029)	
Covered	0.084 (0.024)*		0.043 (0.022)	
<b>Household headship</b>		0.782		0.337
Male	0.085 (0.022)*		0.064 (0.021)*	
Female	0.097 (0.035)*		0.025 (0.029)	
<b>Preceding birth interval</b>		0.410		0.046*
First born	0.084 (0.025)*		0.025 (0.022)	
<2 years	–0.003 (0.084)		–0.027 (0.078)	
2–3 years	0.116 (0.032)*		0.112 (0.031)*	
4+ years	0.062 (0.070)		0.004 (0.067)	
<b>Parity</b>		0.909		0.990
1–2	0.091 (0.025)*		0.051 (0.021)*	
3–4	0.101 (0.036)*		0.046 (0.034)	
5+	0.077 (0.040)		0.046 (0.039)	
<b>Region</b>		0.034*		0.611
Western	0.003 (0.039)		0.011 (0.033)	
Central	0.040 (0.075)		–0.112 (0.057)	
Greater Accra	0.106 (0.044)*		0.086 (0.033)*	
Volta	0.304 (0.089)*		0.110 (0.087)	
Eastern	0.176 (0.072)*		0.030 (0.062)	
Ashanti	0.089 (0.053)		–0.036 (0.045)	
Brong Ahafo	0.031 (0.057)		0.010 (0.054)	
Northern	0.009 (0.064)		0.035 (0.061)	
Upper East	0.004 (0.029)		–0.006 (0.033)	
Upper West	0.057 (0.085)		0.008 (0.087)	
<b>Ethnicity</b>		0.011*		0.325
Akan	0.047 (0.029)		–0.040 (0.020)*	
Ga/Dangme	0.226 (0.080)*		0.187 (0.070)*	
Ewe	0.134 (0.061)*		0.034 (0.054)	

(Continued)



**Table 2** (Continued).

Variable	Household Wealth Quintile		Mothers' Education	
	Concentration Index (SE)	P	Concentration Index (SE)	P
Guan	-0.013 (0.108)		0.025 (0.106)	
Mole-Dagbani	0.019 (0.034)		0.070 (0.034)*	
Grusi	-0.029 (0.059)		0.059 (0.053)	
Gurma	0.334 (0.110)*		-0.002 (0.120)	
Mande	0.111 (0.128)		0.028 (0.127)	
Other	0.031 (0.096)		0.008 (0.096)	
Total estimates	0.089 (0.019)*		0.053 (0.017)*	

**Notes:** \*Significant at  $p < 0.05$ .  $p =$  comparing concentration indices across the levels of a variable.

**Abbreviation:** SE, standard error.

services and in making decisions concerning their reproductive health including eight or more ANC contacts.<sup>62,63</sup>

In addition, educated women could be assumed to have good knowledge of optimal benefits of adequate ANC contacts during the period of pregnancy.<sup>64</sup> One of the effective ways to empower women is by giving them education. It has the capacity to provide them with the ability to make right choices concerning the use of modern health care services.<sup>47,63</sup> Wealth could also be a mechanism of women's empowerment. The findings from this study revealed higher uptake of eight or more ANC contacts among women of high socioeconomic status throughout selected women's characteristics. To eliminate inequality in access and use of health-care services, especially among the disadvantaged and uneducated women, universal access to uptake maternal healthcare services must be the priority of governments at national and sub-national levels.

## Strength and Limitations

The use of nationally representative high-quality data from household survey was a major strength of this study. Also, appropriate statistical adjustments for the survey designs make the results of this study dependable. Nonetheless, a major limitation of this paper is the potential for recall bias which might lead to an over-, or under-estimation of eight or more ANC contacts. GMIS also does not collect household income or expenditure data, which are the conventional metrics used for wealth calculation. The asset-based wealth index used here is merely a household economic status proxy indicator and does not always yield results that are accurate to those obtained from direct income and expenditure measurements where such data is available or can be accurately collected.

## Conclusion

While Ghana has made progress towards the recognition of eight or more ANC contacts by the WHO, there are still a lot of socio-economic disparities across women's features and overall sample. The findings from this study show that the new recommended number of eight and more ANC contacts is still far from being achieved by the government. In order for the nation to increase access to recommended treatment during pregnancy and for a healthy pregnancy experience to improve maternal health and birth outcomes, interventions that resolve health access disparities must be prioritized. Every effort must be made to enhance the health care services available, as well as to enact policies that can increase free access to maternal and child health care systems, and optimize eight or more ANC contacts among the poor and uneducated women.

## Abbreviations

ANC, Antenatal Care; CHPS, Community-based Health Planning and Services; CI, Confidence Interval; Conc., Concentration; EAs, Enumeration Areas; GMIS, Ghana Malaria Indicator Survey; ICF, Inner City Fund; NHIS, National Health Insurance Scheme; PCA, Principal Components Analysis; SDGs, Sustainable Development Goals; SE, Standard Error; TX, Texas; UHC, Universal Health Coverage; USA, United States of America; WHO, World Health Organization.

## Data Sharing Statement

Data for this study were sourced and available here: <http://dhsprogram.com/data/available-datasets.cfm>.

## Ethics Approval and Consent to Participate

This study is a secondary data analysis of the GMIS which is publicly available, and approval was granted for its use. Written consent was obtained from mothers/caregivers and data were recorded anonymously at the time of data collection during the GMIS 2019.

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## Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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