Effect of Socioeconomic Characteristics on Eight Antenatal Care Contacts Among Reproductive Aged Women in Nigeria

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Abstract

In November 2016 the World Health Organisation launched the eight antenatal care (ANC) model to supplant the four ANC models. No previous Nigerian study used population-based data to examine the prevalence and determinants of a minimum of eight ANC among Nigerian women. The objective of the study is to explore the socioeconomic characteristics that are determinants of a minimum of eight ANC among Nigerian women. The specified model was estimated using binary logistic regression admissible in Stata version 13.0. Also, descriptive statistics and Chi-square tests were used to analyse the data at univariate and bivariate levels respectively. Secondary data was obtained from the National Demographic and Health Survey of 2018. The study included 8,006 women who had complete responses on variables of interest. The result showed that women who had higher educational qualifications, those from wealthy homes, women who resided in urban parts of the country and those in the Southern region had better privilege to use modern pregnancy care. The report makes several recommendations, including expanding educational possibilities for Nigerian women, implementing multifaceted strategies to raise household socioeconomic status, and addressing contextual barriers that prevent pregnant women in rural and southern Nigeria from accessing ANC.

Keywords: Socioeconomic characteristics, eight antenatal care, Nigerian women, Demographic and Health Survey.

JEL Codes: C4, C3, I1, I2, I3.

1. Introduction

Maternal mortality remains one of the causes of public health problems in developing nations (Ahuru, 2021). Over 300,000 women die each year from pregnancy-related problems, and nations with little resources account for more than 99% of these deaths. (Adewoyin, Odimegwu, Alabi, Akinyemi et al., 2022). In Nigeria, there is an estimate of over 58,000 maternal deaths annually and that puts the maternal mortality ratio (MMR) at 976 per 100,000 live births (Zhang, Anser, Ahuru, Zhang et al., 2022). The high maternal mortality burden in Nigeria is due to poor uptake of pregnancy care (Feng, Ahuru, Anser, Osabohien et al., 2020).

The World Health Organization (2000) advocated that pregnant women should utilize pregnancy-related care by ensuring early visits at antenatal care (ANC) delivery of their babies in health facilities and use post-partum care (PPC). Despite these recommendations, several Nigerian women do not use modern pregnancy care resulting in untimely death in the course of pregnancy **(**Okonofua, Ntoimo, Ogungbangbe, Anjorin et al., 2018**).** Research indicates that fewer than 40% of women of reproductive age undergo at least four ANC, around 31% give birth in medical facilities, and fewer than 50% use PPC (National Demographic and Health Survey, 2018).

A host of socioeconomic factors influence the uptake of ANC in Nigeria including household income, women's education level, health insurance coverage, family types, occupation types, employment status, husband education and number of living children**.** Household income influences the household's ability to pay for modern pregnancy care. Evidence revealed that people on low-income quintiles are more prone to maternal and child mortality.

ANC is the regular nursing care rendered to pregnant women during the cycle of pregnancy (Ahuru, Iseghohi, Okungbowa and Efegbere, 2021). Various models of ANC exist which include routine ANC, focused ANC and revised ANC models. Routine ANC does not place any limit on the number of times a woman should visit health service providers, focused ANC proposed a minimum of four ANC visits for pregnant women and the revised ANC a minimum of eight visits and it is the most recent model launched on November 16th, 2016 (Ossei, Nketiah-Amponsah & Lambon-Quayefo, 2020). Predictors of one and at least four (≥4) ANC have been examined by various Nigerian studies. However, to the best of my knowledge, no past study examined the various socioeconomic factors that influence the uptake of a minimum of eight ANC (≥ 8) ANC in pregnancy. Against this study, this study examined the various household socioeconomic characteristics that predict ≥ 8 ANC among Nigerian women.

2. Conceptual clarification

2.1 Antenatal care

The ANC is a type of healthcare given to expectant mothers to protect the physical and mental well-being of the developing child (Ahuru, 2021). Order to track the development of the pregnancy, detect any potential dangers or issues, and offer the required direction and support, it entails a series of medical exams, tests, and education sessions (Okonofua et al., 2018; Ahinkorah, Ameyaw, Seidu, Odusina et al (2021). Depending on the particular needs of the pregnant woman, ANC is usually given by a team of physicians, including obstetricians, midwives, nurses, and other specialists (Ahuru et al., 2021). Several factors, including the woman's health, the stage of

her pregnancy, and any known risks or difficulties frequency and duration of ANC (Ahinkorah et al., 2021).

Frequent ANC is essential to a successful pregnancy and a happy delivery. It enables medical personnel to keep an eye on the mother's and the unborn child's health, identify any possible problems early on, and offer support and interventions as needed. It is advised that all expectant mothers seek antenatal care (ANC) as soon as they learn they are expecting and that they attend all of their planned appointments during the pregnancy (Akinyemi et al., 2022).

2.2 Theoretical Review

A handful of theories have connected health to household socioeconomic status (Zhang et al., 2022). The type of family structures, income and women empowerment have all featured in relevant theories as predictors of maternal care uptake. The Anderson health utilisation model (2005) identified three predictors that influence health-seeking behaviours which are predisposing, enabling and need-based characteristics (Ahuru et al., 2021). The predisposing factors include various sociodemographic factors that predispose pregnant women to use pregnancy care including age, education, occupation and education attainment (Okonofua et al., 2018). Enabling factors include resources at the household level and community level that empower women to use modern pregnancy care (Sui, Ahuru, Huang, Anser et al., 2021). Enabling factors include household income, health insurance coverage and physician density ratio. The need-based characteristics are the subjective evaluation of the needs for health care and it almost rated the most significant predictors of maternal care uptake.

2.3 Empirical Review

In recent times, few Nigerian studies examined the impact of household socioeconomic characteristics on various maternal care indicators. For instance, Feng et al (2021) investigated the impact of household socioeconomic characteristics on a minimum of four ANCs. According to the results, those on the highest wealth quintiles were 2.6 times more likely to meet the recommended number of ≥ 4 ANC contacts.

In a study, Sui et al (2021) in rural parts of Delta State, Southern Nigeria examined the factors associated with ≥ 4 and ≥ 8 ANC contacts. The study used a representative sample of 819 women of reproductive age. The results confirmed that media exposure and those under health insurance were more likely to undertake a minimum of four and eight ANCs. However, it is an institution-based study covering a few communities in Delta State, Southern Nigeria.

Ekholuenetale, Nzoputam, Barrow & Onikan (2020) in a study in the Benin Republic explored the prevalence, determinants and socioeconomic inequalities of ≥ 8 ANC. Drawing secondary data from the Benin Demographic and Health Survey (BDHS)-2017-2018 and Lorenz curve, the study found out that the prevalence of ≥ 8 ANC was 8.0 per cent. Furthermore, enlightened women and those who commenced ANC early are more likely to undertake a minimum of ≥ 8 ANC. The analyses show that ≥ 8 concentrates on wealthy households.

Ahinkorah et al (2021) examined the barriers to ≥ 8 ANC for Nigeria, Mali, Guinea and Zambia drawing on data from their most recent demographic and health survey. A total sample of 6761 from Nigeria, 1973 from Mali, 1690 from Guinea and 1570 from Zambia was deployed for the analyses. The study identified various barriers to ≥ 8 ANC and the mentioned barriers include lack of money for treatment, spousal disapproval and transport costs as the hindrance to the utilisation of ANC among reproductive-age women.

Etokidem, Agbor, Isika, Ago et al (2022) in a rural community in the Cross River state of Nigeria examined the predictors of ANC among 370 pregnant women in 2021. According to the results, women without formal education and full-time housewives were less likely to attend ANC in clinics, while those that are civil servants were more likely to attend ANC.

2.4 Theoretical Framework

The theoretical framework adopted follows the micro-econometric model for health production and demand for health by Rosenzweig and Schultz (1983). The Rosenzweig and Schultz (1983) model proposes that health inputs result in health outputs or outcomes. These health inputs are selected by individuals, which results in heterogeneity. Assuming that a person is a rational entity who will strive to maximize his or her utility while being constrained by health production and financial considerations is a good place to start. This utility is a function of health status (H), the consumption of health-related goods (Y) and health-neutral goods (Z) as shown in equation (1).

$$U = u(H, Y, Z) \quad \text{- - - - - - - (1)}$$

Where:

H is the person's current state of health. The products relating to health are Y. Z stands for the health-neutral items that directly improve utility but not health. As stated by Grossman (1972), investing in one's health will enhance the number of healthy days that can be produced. Depreciation is also applied to the health stock. Thus, the following definition applies to a health production function:

$H = h(M, Y, G, \mu)$ - - - - - - - (2)

Where:

H = the individual's health; M = medical care services; Y = health-related goods; G = geographical and socioeconomic qualities of an individual; μ = Heterogeneity is produced by the unique health input of each person.

The individual maximizes utility subject to a budget constraint as stated in equation (3):

$I = M P_M + Y P_Y + Z P_Z$ - - - - - - - (3)

Where:

I = individual's or household's income; P_M = Price of medical goods; P_Y = Price of health-related goods; P_Z = price of health-neutral goods

A Lagrangian function can be used to solve the health maximization problem, as demonstrated below.

$L M, Y, Z, \lambda = U \{Y, Z, h(M, Y, G, \mu\} + \lambda (I - M P_M - Y P_Y - Z P_Z)$ - - - - (4)

The first order necessary condition for utility maximization of M, Y, and Z can be represented as follows:

$LM = UM \{Y, Z, h(M, Y, G, \mu\} \times \lambda P_M = 0$ - - - - (5)

$LY = UY \{Y, Z, h(M, Y, G, \mu\} \times \lambda P_Y = 0$ - - - - - - (6)

$LZ = UZ \{Y, Z, h(M, Y, G, \mu\} \times \lambda P_Z = 0$ - - - - - - (7)

$L\lambda = I - M P_M - Y P_Y - Z P_Z = 0$ - - - - - - - (8)

Solving for the optimal solutions yields the health inputs demand functions for M, Y, and Z as follows:

$Y^* = DY (P_M, P_Y, P_Z, I, G, \mu)$ - - - - (9)

$Z^* = DZ (P_M, P_Y, P_Z, I, G, \mu)$ - - - - -(10)

$M^* = DM (P_M, P_Y, P_Z, I, G, \mu)$ - - - - - - (11)

Equation (11) above gives the demand function for medical care services, which is the theoretical model for this study. In the study, 'M', which represents medical care services, is a minimum of eight ANC and is also the dependent variable. While the other variables on the right-hand side of equation (11) above are the independent variables.

3.1 Model Specification

An empirical model is specified to attain the objectives of the study. The model is adapted from Zhang et al (2022) with slight modifications. The aforementioned authors used the model to explore the socioeconomic determinants of a minimum of four ANCs. This study incorporates the independent variables while the dependent variable is a minimum of eight ANC.

Logit (≥ eight ANC) = $\beta_0 + \beta_1 MA_{it} + \beta_2 ME_{it} + \beta_3 ES_{it} + \beta_4 FLR_{it} + \beta_5 FWT_{it} + \beta_6 AIN_{it} + \beta_7 HWQ_{it} + \beta_8 RESD_{it} + \beta_9 HIC_{it} + \beta_{10} HE_{it} \mu_{it}$------- (12)

Where: MA= maternal age; ME = maternal education; HE= Husband/partner Education; ES = Employment Status; FLR = frequency of listening to Radio; FWT = frequency of watching television; AIN= Initiation of Antenatal care; RESD= Residence; HWQ = Household wealth quintiles; HIC= Health Insurance Enrolment; β_1- β_{10} = estimated coefficients; μ = Error; disturbance term; i^{th}= the ith women

3.2 Techniques of Data Analyses

The entire statistical analysis was performed using Stata version 13.0 software. Due to the categorical nature of the dependent variable, binary logistic regression was used for the analysis. Descriptive statistics involving frequency and percentage were used at the univariate level and the chi-square test was used to examine the factors that are associated with a minimum of eight ANC.

3.3 Sources and Description of Data

Using information from the 2018 NDHS, a retrospective cross-sectional study was conducted to address the aforementioned research goal. This can be found for free online from the Demographic and Health Surveys (DHS) upon request. There was no need for another ethical clearance. The survey's report includes specifics regarding the sampling methodology and data-gathering techniques used by the DHS (National Demographic and Health Survey, 2018). The 2018 NDHS surveyed 38, 948 eligible women between the ages of 15 and 49. However all of the women who made up the study sample for the publication provided complete answers for each of the study's variables. The study recruited 8,006 women who had complete responses on variables of interests.

4. Empirical Analysis

4.1 Descriptive Statistics

In Table 1, the summary statistics are presented. From the data, the majority of the women were ≥ 35 years old. A large proportion of respondents and their husbands had no formal education. While majority of the women reside in rural areas and a large percentage of them fall within the average wealth quintiles.

Table 1: Summary Statistics

Variables	Number	(%)
Maternal age (MA):		
< 35	3,257	40.7
≥ 35	4,749	59.3
Maternal education (ME):		
No formal Education	3962	49.5
Primary	2165	27.0
Secondary/higher	1879	23.5
Husband/partner education (HE):		
No formal Education	3867	48.3
Primary	2289	28.6
Secondary/higher	1 850	23.1
Employment status (ES):		
Working	6805	85.0
Not Working	1,201	15.0
Frequency of listening to the radio (FLR):		
Not at all	860	10.7
Less than once a week	1,030	12.9
At least once a week	4,072	50.9
Almost everyday	2,044	25.5
Frequency of watching television (FWT):		
Not at all	750	9.4
Less than once a week	1,000	12.5
At least once a week	4,021	50.2
Almost everyday	2,235	27.9
Antenatal care initiation (AIN):		
Early booking	2,002	25.0
Late booking	6,004	75.0
Household wealth quintile (HWQ):		
Poorest	1,980	24.7
Poorer	1,723	21.5
Average	2,008	25. 1
Wealthy	1,295	16.2
Wealthiest	1,000	12.4
Place of residence (RESD) :		
Urban	3184	39.8
Rural	4822	60.2
Geopolitical regions (REGN):		
Northern region	4406	55.0
Southern region	3,600	45.0

Health insurance coverage (HIC) :		
No	7,838	97.9
Yes	168	2.1

4.2 Correlation analyses

In Table 2, the correlation result is presented. At a 5 % level of significance, the factors that are associated with ≥ 8 ANC visits are maternal age, region, place of residence, education attainment, husband education, household wealth and health insurance ($p < 0.05$).

Table 2: Chi-square Tests

Variables	**≥ 8 visits**		
	No	Yes	**p-value**
Maternal age:			
< 35	2,457(75.4)	800 (24.6)	$p < 0.001$
≥ 35	4,500(94.8)	249(5.2)	
Maternal education:			
No formal Education	3,900(98.4)	62(1.6)	$p < 0.001$
Primary	1,678(77.5)	487(22.5)	
Secondary/higher	1,379(73.4)	500(26.6)	
Husband/partner education:			
No formal Education	3789(97.9)	78 (2.2)	$p < 0.001$
Primary	1789(78.2)	500(21.8)	
Secondary/higher	1,379(74.5)	471(25.5)	
Employment status:			
Working	5,885(86.5)	920(13.5)	$p = 0.21$
Not Working	1072(89.3)	129(10.7)	
Frequency of listening to the radio:			
Not at all	831(96.6)	29(3.4)	
Less than once a week	930(90.3)	100(9.7)	$p < 0.001$
At least once a week	3,652(89.7)	420(10.3)	
Almost everyday	1,544(75.5)	500(24.5)	
Frequency of watching television:			
Not at all	711(94.8)	39(5.2)	
Less than once a week	900(90.0)	100(10.0)	$p < 0.001$
At least once a week	3,601(89.6)	420(10.4)	

Almost everyday	1,745(78.1)	490(21.9)	
Antenatal care initiation:			
Early booking	1,024(51.1)	978(48.9)	
Late booking	5,933(98.8)	71(12.3)	p< 0.001
Household wealth quintile:			
Poorest	1,930(97.5)	50(2.5)	
Poorer	1,673(97.1)	50(2.9)	p< 0.001
Average	1,959(97.6)	49(2.4)	
Wealthy	1,045(80.7)	250(19.3)	
Wealthiest	350(35.0)	650(65.0)	
Place of residence :			
Urban	2204(69.2)	980 (30.8)	p< 0.001
Rural	4753(98.6)	69 (1.4)	
Geopolitical regions:			
Northern region	4,375(99.3)	31(0.7)	p< 0.001
Southern region	2,582(71.7)	1018(28.3)	
Health insurance coverage :			
No	6,955(88.7)	883(11.3)	
Yes	02(1.2)	166(98.8)	

Significant at p< 0.10

4.3 Logistic Regression

Table 3 presents the determinants of eight ANC among the women. The results showed that eight ANCs are determined by maternal age, maternal education, husband education, household wealth index, place of residence and region of origin. The coefficient of maternal age is 0.4567 which is statistically significant at 5%. The result showed that a unit rise in maternal age will cause a minimum of eight ANC uptake to rise by 0.4567 units. The coefficient of maternal education is 0.6508 which is statistically significant at 5%. The result showed that a unit rise in maternal education will cause a 0.6508 unit rise in a minimum of eight ANC. The coefficient of husband/partner education is 0.3501 which is statistically significant at 5%. The result showed that higher husband education is associated with increased uptake of a minimum of eight ANC.

The coefficient of early initiation has a positive coefficient of 0.9850 which is statistically significant at the moderate of 10%. This implies that initiating ANC in the first trimester of pregnancy is associated with the uptake of a minimum of eight ANC. The coefficient of household wealth quintile is 1.2508 units with a probability value of 0.0453 which shows that improvement

in household wealth will improve the chances to uptake a minimum of eight ANC. The place of residence has a positive coefficient of 1.0989 which is statistically significant at 5%. Furthermore, the region has a positive coefficient of 0.3508 and it is statistically significant at 5%. The coefficient of the region is 0.3508. Since the Southern region is coded 2 and the Northern region coded 1show that residing in the Southern region is associated with improved uptake of a minimum of eight ANC. The health insurance has a positive coefficient of 0.9876 which is statistically significant at 10%. This shows that enrolment in health insurance increases the chances to undertake a minimum of eight ANC.

Table 3: Logistic regression showing the predictors of ≥ 8 ANC contacts among reproductive age

Variable s	Coefficients	Std. Error	T-calculated	Probability
Maternal age	0.4567	0.1505	3.0352	0.0453**
Maternal education	0.6508	0.1855	3.5082	0.0389**
Husband/ partner education	0.3501	0.0864	4.0543	0.0239**
Household wealth quintile	1.2508	0.3565	3.5082	0.0453**
Antenatal care initiation	0.9850	0.3305	2.9806	0.0689***
Frequency of listening to the radio	1.2505	4.9900	0.2506	0.6568
Frequency of watching television:	0.9508	1.0005	0.9503	0.8976
P**lace of residence** :	1.0989	0.3132	3.5083	0.0350**
Geopolitical regions:	0.3508	0.0926	3.7865	0.0456**
Health insurance coverage :	0.9876	0.2899	3.4056	0.0567***

**Significant at 1% significance level.*
*** Significant at 5% significance level.*
**** significant at a 10% significance level*

4.4 Discussion of the results

The findings indicate that there is a considerable increase in the likelihood for women from Southern regions to have at least ANC care encounters with healthcare professionals. The results support those of earlier Nigerian investigations (Akinyemi et al., 2022). The difference in the availability of maternal care services between Nigeria's northern and southern regions points to contextual variables such as gender norms, cultural traditions, and the northern region's lack of access to health care (Ahuru, 2021). The findings showed that having an urban location benefits at least eight ANC interactions. According to earlier research conducted in Nigeria, urban Nigerian

women are more likely to have at least four ANC visits (Zhang et al., 2022). Encouraging health education and promotion initiatives in the rural areas of the nation can help close the gap between urban and rural women's access to contemporary maternal care. Additionally, more medical facilities must be located in the nation's rural areas.

Educated mother and husband greatly increases the likelihood of having at least eight ANC interactions. The findings shown by Adewoyin et al. (2022), Ekholuenetale et al. (2020), and Ndugga, Namiyonga and Sebuwufu (2020) are comparable to this one. When combined with other factors, such as living in an urban area, having access to employment possibilities, having health insurance, and being aware of the advantages of maternal care services, education has a synergistic effect on the utilisation of maternal care services.

The results of the study demonstrated a strong positive correlation between the time of ANC and at least eight ANC encounters with medical professionals. Traditionally, moms receive health education and counselling during ANC visits, which is one of the biggest advantages of prenatal care. Increasing the appropriate use of prenatal care is facilitated by health education. Therefore, it is not surprising that moms who booked their prenatal care after the deadline had a lower likelihood of making at least eight ANC interactions with medical professionals. A higher likelihood of having appropriate prenatal care contacts is said to be correlated with improved ANC visits (Barrow & Jobe, 2020).

5. Conclusion and recommendations

The study investigated the household socioeconomic characteristics that influence women's decisions to attend ANC up to eight times during pregnancy. Secondary data from Demographic and Health Survey of 2018 was used for the analyses. The study included 8,006 women in the analyses. Descriptive and inferential statistics were used for the analyses. From the binary logistic regression, it can be deduced that uptake of ≥ 8 ANC were commonly practiced among women with formal education, those from wealthy homes, residing in urban parts of the country, Southern parts of the country and those who enrolled into health insurance scheme.

Based on the findings of the study, the following suggestions are made. Efforts should be made to encourage female education using various strategies such as scholarships, using special-cut off marks for female students. Also, efforts should be made to improve access to facilities in rural parts of Nigeria through provision of more health facilities and health personnel, mitigate the effects of poverty on healthcare use through implementing health insurance, conditional cash transfers and free maternal care scheme. To reduce the negative effects of costs of pregnancy care on women, Nigerian government should broaden the scope of maternal health insurance through

extending the formal arm of the National Health Insurance Scheme (NHIS) or strengthening Community-based Health Insurance Scheme (CBHIS).

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