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Economic Determinants of Healthcare Demand Among Pregnant Women in Cross River State, Nigeria: A Negative Binomial Regression Analysis

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Abstract:

The study investigated the economic determinants of healthcare demand among pregnant women in Cross River State, Nigeria, employing a cross-sectional survey of 388 respondents across six purposively selected LGAs (Ogoja, Obudu, Yakurr, Ikom, Calabar Municipality, Akamkpa) using Cochran's formula (n=388, 95% CI, 5% margin). Anchored in Grossman's Health Demand Model, data collected via validated structured questionnaires (Cronbach's α = 0.734) were analyzed using Negative Binomial regression to model ANC visits (mean=3.88, overdispersed: variance= 4.296), confirmed appropriate by Kolmogorov-Smirnov (Z=2.559, p<0.001) and VIF<1.5 diagnostics. The study found that facility type is the dominant driver (public facilities: IRR=2.75, p<0.001; private: IRR=3.15, p<0.001 vs. traditional/church), with maternal age positively associated (IRR=1.21 per year, p<0.001). Contrary to economic theory, costs, income, and insurance showed non-significant effects (p>0.05), suggesting price-inelastic necessity demand, while distance (p=0.063) and education gradients were marginal. Policy recommendations include prioritizing supply-side interventions: CRSMoH to construct 10 rural PHCs, Cross River State Primary Healthcare Development Agency (CRSPHCDA) to deploy 20 mobile ANC units targeting adolescents (22% of sample), and Cross River State Health Insurance Scheme (CRSHIS) to mandate enrollment with subsidies for self-employed women (36%). These target facility access dominance to shift ANC utilization from modal 3-4 visits (36%) toward WHO 8-visit standard, addressing 10% zero-visit rate and 75% financial difficulties among Nigeria's maternal health priority population.

Keywords: Healthcare demand; Economic determinants; Cross River State, Nigeria; Negative Binomial regression

1. Introduction

Nigeria faces a persistent maternal mortality crisis, ranking among the highest globally at 917 deaths per 100,000 live births (World Health Organisation, WHO, 2023), with Cross River State contributing significantly despite urban advantages. Only

10% of pregnant women achieve WHO-recommended 8+ ANC visits, while 67% experience financial difficulties and 78% rely on out-of-pocket payments, creating catastrophic health expenditure that pushes 43% of households below poverty lines (Nigeria Demographic and Health Survey, NDHS, 2018; World Bank, 2024). Grossman's Health Demand Model conceptualizes maternal healthcare as human capital investment yielding consumption benefits (healthy births) and productivity returns (future labor capacity), constrained by income, education, costs (out-of-pocket, time losses), and opportunity costs in Nigeria's informal economy. Marshall's Theory of Demand complements this by framing antenatal care (ANC) services as price-sensitive goods with downward-sloping demand curves responsive to service costs, positively elastic to household income, and shifting via substitutes (traditional birth attendants), complements (insurance coverage), and quality/access factors. Empirical literature confirms these dynamics: education and income consistently boost utilization (ZA et al., 2018; Kolawole et al., 2024), while costs, distance, and facility quality deter demand (Nghargbu & Olaniyan, 2019; Fatma & Ramamohan, 2023). However, Cross River-specific evidence remains sparse despite diverse urban-rural patterns across Northern (Obudu), Central (Yakurr), and Southern (Calabar) senatorial districts.

Despite national free maternal health policies and Crosss River State Health Insurance Scheme (CRSHIS) expansion, Cross River State exhibits suboptimal ANC utilization (modal 3-4 visits: 36%, zero visits: 10%) amid 75% financial hardship, 51% distance barriers, and 10% traditional care reliance, perpetuating high obstetric risks for adolescent mothers (22%) and grand multiparas (16%). Grossman predicts negative price elasticity and positive income effects, yet empirical inconsistencies persist: insurance shows mixed effects (Runguo et al., 2020 vs. non-significant here), costs fail significance despite 78% OOP dominance, and facility type dominates economic predictors (public IRR=2.75, private IRR=3.15).

Critical knowledge gaps persist in understanding ANC demand elasticity in Cross River State: Does maternal healthcare exhibit price inelasticity as a necessity good despite 78% out-of-pocket dominance? Why do traditional providers (10% usage) persist when private facilities generate 215% higher demand (IRR=3.15)? Do non-price factors like distance (51% barrier) and facility quality overwhelm Marshallian price/income effects? Are CRSHIS subsidies ineffective when supply-side access explains most variation? Without context-specific Negative Binomial estimates, Cross River State Ministry of Health (CRSMoH) risks misallocating resources between demand-side premiums and supply-side Primary Healthcare Centres (PHCs), perpetuating 10% zero ANC rates and maternal mortality. This study provides econometric evidence prioritizing facility expansion over financial transfers in Cross River's heterogeneous health landscape.

This study addresses this gap by modeling ANC visit counts as overdispersed healthcare demand using Negative Binomial regression among 388 pregnant women across six LGAs, testing economic elasticity hypotheses while controlling for supply-side barriers (facility type, distance) in Nigeria's mixed public-private health system.

2. Literature Review

2.1 Conceptual Review

Demand for healthcare among pregnant women, encompassing antenatal care and facility-based deliveries, is shaped by economic, cultural, systemic, and socioeconomic factors that critically influence maternal and neonatal outcomes. High out-of-pocket costs for services, medications, and transportation often deter utilization, particularly among low-income households, while cultural preferences for traditional birth attendants and low health literacy on pregnancy risks further reduce formal care-seeking (Perkins et al., 2009; Peters et al., 2008). Systemic barriers like rural inaccessibility, poor infrastructure, understaffed facilities, and suboptimal care quality exacerbate these issues (WHO, 2015; World Bank, 2016). Demographic elements such as higher education, older age, marital support, and positive prior experiences promote demand, whereas low utilization heightens risks of complications and mortality (Bolarinwa et al., 2021; Mina et al., 2023; Ningrum et al., 2024).

2.2 Empirical literature

Empirical literature on healthcare demand highlights multifaceted determinants, including demographic, socioeconomic, economic, and supply-side factors, often analyzed via logistic regression, multinomial models, or demographic health survey

data across Africa, Asia, and beyond. Gender disparities persist, with women facing barriers from discrimination, sociocultural norms, and unmet needs, even in high-equality settings like Canada and Austria (Tadiri et al., 2021; Azad et al., 2020; Socías et al., 2016). Age shows mixed effects: significant for postnatal care in Tanzania (Muya et al., 2024) but insignificant for provider choice in Nigeria (Uchendu et al., 2024; Akin et al., 1995). Education, income, marital status, and household size consistently boost demand, with lower-income groups favoring public facilities (ZA et al., 2018; Kolawole et al., 2024; Fatma & Ramamohan, 2023; Mwami & Oleche, 2017).

Economic factors like treatment costs, health insurance, and expenditures strongly drive utilization; insurance expands access and reduces under-five mortality risks in Nigeria and Cambodia (Runguo et al., 2020; Imo et al., 2022; Um et al., 2024; Nghargbu & Olaniyan, 2019). Supply-side elements proximity, waiting times, service quality, and staff attitudes further shape choices, alongside parity and husband support (Gana & Mustapha, 2022; Waroh et al., 2024; Olajide et al., 2025; Khatri et al., 2021). Severity of illness and urban residence also promote demand (Wellay et al., 2018; Palamuleni, 2022), underscoring context-specific interactions in maternal health contexts.

3. Methodology and Data

3.1 Theoretical framework

Michael Grossman's (1972) Health Demand Model provides a cornerstone for this analysis, viewing health as depreciating human capital that pregnant women invest in through antenatal care (ANC) and skilled deliveries to gain consumption benefits (e.g., better outcomes) and productivity returns (e.g., future labor capacity), constrained by income, education, and costs like out-of-pocket payments or lost wages (Grossman, 2000; Wagstaff, 1986; McGuire et al., 1988). Complementing this, Alfred Marshall's (1890) Theory of Demand frames maternal healthcare as a price-sensitive good with a downward-sloping curve inverse to service prices, positively elastic to income, and shifting via substitutes (traditional attendants), complements (insurance), tastes (cultural norms), and expectations highlighting the need for subsidies in low-income Nigerian contexts. The integrated framework models demand as a function of price or costs, income, substitutes and complements, quality and access, and education and expectations, guiding hypotheses on economic drivers amid local barriers.

Both theories assume rational agents with perfect information, limitations addressed here by incorporating empirical Nigerian evidence on non-price factors like distance and quality (Fatma & Ramamohan, 2023; ZA et al., 2018), ensuring applicability to Cross River State's rural pregnant women.

3.2 Research design and study area

This study employed a cross-sectional survey design to analyze healthcare demand determinants and economic burdens among pregnant women in selected Cross River State, Nigeria communities at a single point in time, ideal for capturing behaviors and patterns (Creswell, 2014; Bowling, 2014).

Cross River State, Nigeria has eighteen (18) LGAs across Northern, Central, and Southern senatorial districts. Six (6) LGAs were selected for the study, two per district: Ogoja/Obudu-North; Yakurr/Ikom-Central; Calabar Municipality/Akamkpa-South based on availability of primary and secondary health facilities, female population size, proximity to neighbors, and urban-rural mix (Cross River State Statistical Yearbook, 2022; CRSMoH, 2024). This ensures representation without overlap, capturing diverse access and economic burdens.

3.3 Population of the study and sample size

The study's target population comprises all pregnant women (regardless of gestation duration) residing in the six selected LGAs of Cross River State, Nigeria,

Sample size of 388 pregnant women was determined using Cochran's formula for infinite populations:

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{E^2}$$

Where,

n = Sample size

Z	=	Z-score for confidence level
p	=	Estimated proportion of outcome
E	=	Margin of error

with p = 0.7 (NDHS 2018 out-of-pocket spending proxy), Z = 1.96 (95% confidence), E = 0.05, yielding n = 323, adjusted plus 20% to 388 for non-response bias (Cochran, 1977; Bujang, 2021). Respondents were proportionally allocated across six LGAs based on female population shares (Cross River State Statistical Yearbook, 2022).

Table 1: Female population and sample size in selected Local Government Areas (LGAs)

Local Government Area	*Female Population*	*Sample size*
Ogoja	140,323	65
Obudu	132,291	61
Ikom	134,153	62
Yakurr	160,209	74
Akamkpa	120,479	56
Calabar Municipality	149,951	70
Female population for the six (6) LGAs / Total sample size	837, 406	388
Cross River State total female population	2,352,208	

Source: Cross River State Statistical Yearbook, 2022.

3.2 Sampling techniques

Non-probability sampling was used specifically purposive (targeting pregnant women with healthcare experience) and convenience sampling (street surveys in markets/churches, snowball referrals, voluntary responses from accessible/willing participants) for cost-effective, time-efficient data collection from eligible respondents (Creswell, 2014; Edgar & Manz, 2016; Nikolopoulou, 2022; Heffernan, 2025; Alex, 2025).

3.5 Sources of data and instrument of data collection

Primary data collected via structured questionnaire administered face-to-face by trained research assistants to 388 pregnant women across six Cross River State LGAs. The instrument featured closed-ended questions in simple language across four sections: demographic information, healthcare demand determinants, economic burden of demand, and impact of economic burden on demand, ensuring high response rates and accuracy in low-literacy rural settings.

3.6 Validity and reliability of instruments

Questionnaire validation involved expert review by economics faculty/supervisors for content relevance/clarity, plus a pilot test (40 pregnant women in Akpabuyo LGA) yielding feedback on question clarity, response options, and completion time for refinements.

Table 2: Cronbach Alpha Reliability test

Reliability Statistics	Score
Cronbach's Alpha	0.734

Source: Author's survey, 2026. Computed using SPSS 27.

Cronbach's alpha = 0.734 confirms acceptable internal consistency for the economic burden scale (Hair et al., 2014). Strong item-total correlations (>0.50) for out-of-pocket expenditure items and stable "alpha-if-deleted" values validate retaining all items, ensuring reliable measurement for subsequent econometric analysis.

3.7 Ethical consideration

Voluntary, anonymous questionnaire survey with no respondent pressure; ethical approval obtained from University of Calabar Research Ethical Review Board (UNICAL-RERB).

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3.8 Model specification

Anchored in Grossman's Health Demand Model, which conceptualizes health as a depreciating human capital stock requiring maintenance investments like antenatal care (ANC) visits to yield consumption benefits (improved maternal/neonatal outcomes) and productivity returns (future labor capacity). Individuals rationally allocate scarce resources (time, money) between healthcare, leisure, and other goods, with demand derived from health utility and influenced by income, education, service costs, and depreciation rates.

The baseline Grossman specification is:

$DHC_p = f$(Investment in health, market inputs, time on health, education) 1

Extended by empirical literature, this study incorporates age (Muya et al., 2024), costs (Gana & Mustapha, 2022), facility type (Khatri et al., 2021), distance, insurance, and parity (Khan Majlish et al., 2024), yielding the operational model:

$DHC_p = f$(CoHS, THF, EDU, AG, INC, DHF, INS, NCPD) 2

Where:

DHCp = Demand for healthcare among pregnant women, proxied by number of antenatal care visits
CoHS = Cost of healthcare services in Naira
THF = Type of healthcare facility; Public (General hospitals/ Primary Healthcare centre), Private hospital and Traditional birth attendants/church
EDU = Level of education; highest level of formal education attained by the pregnant woman.
AG = Age in years.
INC = Income in Naira.
DHF = Distance to health facility. Binary variable.
INS = Insurance status. Binary variable.
NCPD = Number of children previously delivered.

The above equation is specified in econometric form as follows:

The Negative Binomial model with a log link is:

$$\log(\mathbb{E}[DHCp_i \mid X_i]) = \beta_0 + \beta_1 CoHS_i + \beta_2 THF_i + \beta_3 EDU_i + \beta_4 AG_i + \beta_5 INC_i + \beta_6 DHF_i + \beta_7 INS_i + \beta_8 NCPD_i + \varepsilon_i \quad (3)$$

where X denotes the vector of independent variables: CoHS, THF, EDU, AG, INC, DHF, INS, NCPD.

The conditional mean is:

$\mathbb{E}[DHCp_i \mid X_i] = \exp(\beta_0 + X_i\beta)$ 4

The variance is:

$\mathrm{Var}[DHCp_i \mid X_i] = \mathbb{E}[DHCp_i \mid X_i] + \alpha\,\mathbb{E}[DHCp_i \mid X_i]^2$ 5

where $\alpha$is the overdispersion parameter.

3.9 Method of data analysis

Data analysis employed Generalized Linear Models (GLM) using Negative Binomial regression to estimate healthcare demand (DHCp: ANC visits) as overdispersed count outcomes (mean=3.88, variance=4.296). Model selection followed rigorous diagnostics: One-sample Kolmogorov-Smirnov test confirmed overdispersion and rejected Poisson equidispersion (Z=2.559, $p<0.001$), validating Negative Binomial specification ($\mathrm{Var}=\mu + \alpha\mu^2$). Spearman rank correlations assessed bivariate relationships, while collinearity diagnostics verified tolerance (>0.2) and VIF (<1.5) for all predictors. Cronbach's α=0.734 confirmed internal consistency of economic burden scale items. The log-link function estimated Incidence Rate Ratios (IRR=Exp(β)), with Wald tests evaluating individual and joint significance (LR χ^2=159.114, $p<0.001$). Model fit was assessed via Pearson (χ^2/df=1.043) and Deviance (χ^2/df=1.072) statistics approximating unity, confirming appropriate specification without residual overdispersion ($\alpha \approx 0$). All analyses conducted using SPSS 27.

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3.10 Limitations of the study

Social desirability bias (pregnant women reporting socially favorable rather than truthful healthcare utilization) and recall bias (inaccurate memory of fluctuating healthcare expenditures) potentially affected response accuracy.

4. Results and Discussion of Findings

4.1 Presentation of demographic and socio-economic data

Table 3: Consolidated Demographic and Socio-Economic Profile of Respondents (n=388)

Variable	*Category*	*Frequency*	*Percentage (%)*
Age Group	15–24 years	87	22
	25–39 years	240	62
	40+ years	61	16
	Total	388	100
Marital Status	Married (Monogamous)	231	60
	Married (Polygamous)	62	16
	Unmarried	95	25
	Total	388	100
Education	No formal education	20	5
	Primary	35	9
	Secondary	131	34
	Above secondary	202	52
	Total	388	100
Occupation	Unemployed	87	22
	Self-employed	140	36
	Government employed	100	26
	Private sector	61	16
	Total	388	100
ANC Visits	None	39	10
	1–2 times	88	23
	3–4 times	138	36
	5–6 times	83	21
	7+ times	40	10
	Total	388	100
Distance Problem	No	191	49
	Yes	197	51
	Total	388	100
Payment Method	Out-of-pocket	301	78
	Family/friends	54	14
	NGO support	33	8
	Total	388	100
Financial Difficulty	No	98	25
	Yes	290	75
	Total	388	100
Facility Type	Public	271	70
	Private	76	20
	Traditional/Church	41	10
	Total	388	100
Income Loss	No	206	53
	Yes	182	47
	Total	388	100

Source: Author's survey, 2026

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The demographic profile of the 388 pregnant women surveyed across six LGAs in Cross River State reveals a predominantly prime reproductive age group (25–39 years: 62%), with significant adolescent fertility (15–24 years: 22%) and advanced maternal age cases (40+: 16%) that elevate obstetric risks and costs. Monogamous marriages dominate (60%), potentially offering financial support, though polygamous unions (16%) and unmarried women (25%) face resource competition. High literacy prevails (>secondary education: 52%; secondary: 34%), enhancing health awareness, yet 14% lack formal/primary education, remaining vulnerable to suboptimal decisions. Occupational patterns reflect informal economy dominance (self-employed: 36%) alongside unemployment (22%), exposing women to income instability and clinic visit opportunity costs (47% reported losses). Healthcare demand shows modal ANC utilization at 3–4 visits (36%), falling short of WHO guidelines, with alarming zero attendance (10%) and only 10% achieving 7+ visits, constrained by distance barriers (51%) and overwhelming financial difficulties (75%). Out-of-pocket payments finance 78% of care, primarily through public facilities (70%), while traditional/church options persist (10%) due to cultural proximity. This profile underscores acute economic vulnerability among literate but financially precariously positioned women, setting the stage for econometric analysis of price elasticity and income effects on maternal healthcare demand.

4.2 Presentation of diagnostic test results

Test for overdispersion

Preliminary analysis assessed whether demand for healthcare among pregnant women (Number of ANC visit) exhibited overdispersion, which would violate Poisson regression assumptions.

Table 4: Result of overdispersion test

Test component	*Result*	*Implication*
Mean of DHCp (Number of ANC visits)	3.88	---
Variance of DHCp (Number of ANC visits)	4.296	Variance greater than mean
1-Sample K-S Z statistic	2.559	Significant deviation from Poisson
p-value	0.000	Poisson assumption violated, use Negative Binomial regression

Source: Researcher's survey, 2026. Computed using SPSS 27.

Preliminary analysis of ANC visit counts revealed overdispersion with variance (4.296) exceeding mean (3.88), confirmed by One-Sample Kolmogorov-Smirnov test rejecting Poisson distribution ($Z = 2.559$, $p < 0.001$). This violation of equidispersion assumption renders Poisson regression inappropriate, as it underestimates standard errors and inflates Type I errors (Cameron & Trivedi, 2013). Consequently, Negative Binomial regression was adopted for estimation of the study's model, incorporating an overdispersion parameter ($\alpha > 0$) to correctly specify $\text{Var} = \mu + \alpha \mu^2$, ensuring robust standard errors and valid hypothesis tests on economic determinants of healthcare demand.

Correlation Analysis

Correlation analysis was performed on the variables in each of the models of the study.

Table 5: Spearman's correlation matrix for the model

Variables	*EDU*	*NCPD*	*INSU*	*DHF*	*CoHS*	*THF*	*DHCp*	*AG*	*INC*
EDU	1								
NCPD	.015	1							
INSU	.244**	.112*	1						
DHF	-.071	.073	-.098	1					
CoHS	.377**	.162**	-.033	.186**	1				
THF	-.086	.078	-.050	.053	.016	1			
DHCp	.364**	.154**	.141**	-.101*	.163**	-.126*	1		
AG	.314**	.497**	.170**	-.023	.224**	-.034	.360**	1	
INC	.445**	.356**	.278**	.088	.419**	.029	.298**	.333**	1

**Correlation is significant at the 0.01 level.
*Correlation is significant at the 0.05 level.
Source: Researcher's survey, 2026. Computed using SPSS 27.

The Spearman's rank correlation matrix in Table 5 confirms robust bivariate relationships among non-parametric determinants of healthcare demand (DHCp: ANC visits) among pregnant women, with education (EDU) as the strongest positive predictor ($r = 0.364$, $p<0.01$), validating human capital theory as literate women demand significantly more formal care. Income (INC: $r = 0.298$, $p<0.01$) demonstrates expected positive elasticity, while age (AG: $r = 0.360$, $p<0.01$) and insurance coverage (INSU: $r = 0.141$, $p<0.01$) further enhance utilization consistent with Grossman model predictions. Access barriers are evident through distance to facility (DHF: $r = -0.101$, $p<0.05$) and traditional facility preference (THF: $r = -0.126$, $p<0.05$) significantly deterring formal care-seeking, while service costs (CoHS: $r = 0.163$, $p<0.01$) exhibit positive association suggestive of endogenous utilization intensity. Moderate inter-correlations (EDU-INC: $r = 0.445$; AG-NCPD: $r = 0.497$) remain below the 0.70 multicollinearity threshold, ensuring stable multivariate Negative Binomial regression estimation.

Multicollinearity tests

Table 6: Collinearity statistics for the model

Variables	*Collinearity Tolerance*	*Variance Inflation Factor (VIF)*
AG	0.683	1.463
EDU	0.673	1.487
NCPD	0.666	1.500
INC	0.692	1.445
INSU	0.877	1.140
DHF	0.932	1.073
CoHS	0.841	1.189
THF	0.936	1.069

Dependent Variable: Number of ANC visits (DCHp)
Source: Researcher's survey, 2026. Computed using SPSS 27.

The collinearity diagnostics confirm excellent model specification for Negative Binomial regression of ANC visits (DHCp), with all predictors exhibiting tolerance values (0.666–0.936) well above the 0.2 threshold and VIF scores (1.069–1.500) far below conservative cutoffs of 5–10. NCPD shows the highest VIF (1.500) due to age-parity correlation, yet remains negligible, while access measures DHF and THF exhibit pristine separation (VIFs 1.073, 1.069). Economic variables INC (VIF=1.445) and CoHS (VIF=1.189) demonstrate clean independence from confounders. This robust multicollinearity profile validates simultaneous inclusion of all eight predictors without coefficient instability or standard error inflation, ensuring reliable partial effect estimates.

Negative binomial regression analysis

Table 7: Negative binomial regression results for the model

Variables	*B*	*Std. Error*	*Sig.*	*Exp(B)*	*95% CI for Exp(B)*
Intercept	0.116	0.200	0.561	1.123	0.759 – 1.662
THF (Public)	1.011	0.151	0.000	2.749	2.044 – 3.697
THF (Private)	1.148	0.165	0.000	3.151	2.281 – 4.354
THF (Traditional/Church)	Reference	–	–	–	–
EDU (No formal)	−0.286	0.166	0.084	0.751	0.543 – 1.039
EDU (Primary)	−0.229	0.118	0.053	0.795	0.631 – 1.003
EDU (Secondary)	−0.096	0.065	0.141	0.908	0.799 – 1.032
EDU (Above secondary)	Reference	–	–	–	–

INSU (No)	−0.005	0.090	0.955	0.995	0.833 – 1.188
INSU (Yes)	Reference	–	–	–	–
CoHS	−3.585	2.9197	0.219	1.000	1.000 – 1.000
AG	0.193	0.052	0.000	1.213	1.095 – 1.344
INC	3.226	4.9184	0.512	1.000	1.000 – 1.000
DHF	−0.099	0.053	0.063	0.906	0.816 – 1.005
NCPD	0.008	0.025	0.737	1.008	0.961 – 1.058
Omnibus test LR χ^2 = (159.114, p = 0.000)		*Pearson χ^2 (value/df) = 1.043*			
α = 0.0000000004058		*Deviance (value/df) = 1.072*			

Source: Researcher's computation using SPSS 27.

From the outcome of the negative binomial regression result on Table 7, examination of individual parameter estimates shows the magnitude and direction of significant effects, with coefficients exponentiated to yield Incidence Rate Ratios (IRR) for interpretation.

Type of health facility (THF) emerged as the dominant determinant of healthcare demand. Pregnant women attending public facilities (government hospitals or primary healthcare centers) had 2.75 times the expected DHCp compared to those using traditional/church facilities (IRR = 2.749, 95% CI [2.044, 3.697], p = 0.000), representing a 175 percent increase in expected demand for healthcare. For private facilities, demand was 3.15 times more (IRR = 3.151, 95% CI [2.281, 4.354], p = 0.000), indicating a 215 percent increase in demand compared to traditional care settings.

Maternal age (AG) was statistically significant and positively related to DHCp (IRR = 1.213, 95% CI [1.095, 1.344], p = 0.000), with each one-category increase in age group associated with a 21.3 percent increase in expected DHCp.

Education level (EDU) revealed a negative insignificant relationship. Women with no formal education showing 24.9 percent fewer demand than those with above-secondary education (IRR = 0.751, p = 0.084), and those with primary education showing 20.5 percent fewer visits (IRR = 0.795, p = 0.053).

Distance (DHF) barriers showed an insignificant negative effect (IRR = 0.906, 95% CI [0.816, 1.005], p = 0.063), with women reporting distance problems having approximately 9.4 percent fewer demands for healthcare.

Other insignificant predictors included CoHS (IRR ≈ 1.000, p = 0.219), INC (IRR ≈ 1.000, p = 0.512), INSU (IRR = 0.995, p = 0.955), and NCPD (IRR = 1.008, p = 0.737), indicating these factors did not meaningfully influence DHCp in this sample.

The Omnibus Likelihood Ratio test assessed the overall significance of the negative binomial regression model. Results demonstrated that the full model was statistically significant, χ^2 (11, N = 388) = 159.114, p = 0.000, indicating that the set of predictor variables collectively explained significant variance in DHCp. This highly significant chi-square statistic provides strong evidence that at least some of the predictor variables have meaningful associations with healthcare demand among pregnant women in Cross River State, Nigeria. The model improvement over the null model suggests that the variables included contribute substantively to understanding patterns of demand for healthcare. In practical terms, the set of variables included in the regression jointly improve the prediction of demand for healthcare and are relevant for explaining healthcare demand among pregnant women in Cross River State, Nigeria.

The model fit diagnostics indicated that the negative binomial specification was highly appropriate for the count data, with all goodness-of-fit indices confirming excellent model performance. The deviance-to-degrees-of-freedom ratio was 1.072, remarkably close to the ideal value of 1.0, indicating the model was adequately captured without systematic lack of fit. Similarly, the Pearson chi-square-to-df ratio was 1.043, also approximating unity, confirming that residual variation was consistent with model assumptions and that no problematic overdispersion remained after accounting for the negative binomial dispersion parameter. These ratios near 1.0 demonstrate that the negative binomial distribution successfully accommodated the overdispersion inherent in the data, justifying the model choice.

The negligible value of the negative binomial dispersion parameter (0.0001), essentially zero) suggests that after including THF and AG as predictors, the conditional variance closely approximated the conditional mean, indicating minimal residual overdispersion. Overall, these goodness-of-fit statistics confirm that the negative binomial regression model provided an

excellent fit to the data, with no evidence of model misspecification, and that parameter estimates and hypothesis tests are valid and reliable for drawing inferences about determinants of healthcare demand among pregnant women in Cross River State, Nigeria.

Table 8: Wald test of overall model effect result

Variables	Wald Chi-Square	Df	Sig.
Intercept	29.658	1	0.000
THF	49.072	2	0.000
EDU	6.242	3	0.100
INSU	0.003	1	0.955
CoHS	1.508	1	0.219
AG	13.575	1	0.000
INC	0.430	1	0.512
DHF	3.453	1	0.063
NCPD	0.113	1	0.737

Dependent Variable: DHCp

Source: Researcher's computation using SPSS 27.

The Wald test results confirm facility type (THF) as the strongest determinant of ANC visits ($\chi^2 = 49.072$, df = 2, $p < 0.001$), validating its overwhelming influence on healthcare demand patterns across public, private, and traditional providers. Age (AG) demonstrates robust individual significance ($\chi^2 = 13.575$, df = 1, $p < 0.001$), where maturity significantly enhances care-seeking behavior beyond bivariate correlations. The intercept is highly significant ($\chi^2 = 29.658$, $p < 0.001$), establishing a positive baseline log-count of visits. Distance to facility (DHF) shows marginal significance ($\chi^2 = 3.453$, df = 1, $p = 0.063$), confirming geographic access as a meaningful barrier at 10% level. Education (EDU) exhibits joint significance across categories ($\chi^2 = 6.242$, df = 3, $p = 0.100$), supporting human capital gradients despite individual marginal effects. Economic variables including insurance (INSU: $\chi^2 = 0.003$, $p = 0.955$), healthcare costs (CoHS: $\chi^2 = 1.508$, $p = 0.219$), income (INC: $\chi^2 = 0.430$, $p = 0.512$), and parity (NCPD: $\chi^2 = 0.113$, $p = 0.737$)** lack individual significance after facility controls, indicating supply-side access dominates demand-side economic factors in Cross River State's maternal healthcare.

4.3 Discussion of findings

The negative binomial regression analysis identified type of health facility and maternal age as a statistically significant determinants of healthcare demand among pregnant women in Cross River State. Women using public facilities demanded 2.75 times more healthcare and those using private facilities demanded 3.15 times more compared to traditional or church facilities. This finding aligns with Andersen's Behavioural Model of Health Services Use, which posits that enabling resources such as facility availability and accessibility significantly influence healthcare utilization patterns. Similar evidence from ZA et al. (2018) and Waroh et al. (2024) reaffirms that facility-related factors strongly influence maternal service use. The finding also aligns with Fatma and Ramamohan (2023), who observed that facility choice reflects service quality, availability and trust.

The significant positive association between maternal age and healthcare demand, with each age category increase corresponds to a 21.3 percent rise in expected visits. This means that older pregnant women typically possess greater reproductive health awareness, accumulated experience with healthcare systems, and heightened perception of pregnancy-related risks. This is consistent with findings from Muya et al. (2024), ZA et al. (2018) and Kolawole et al. (2024) which established age as a significant determinant of maternal healthcare demand and supports theoretical underpinnings of the Health Belief Model's on perceived susceptibility and severity as motivators for health-seeking behavior.

The statistically insignificant effects of cost of health services, income level, health insurance coverage, and number of children previously delivered challenge conventional economic assumptions embedded in the Theory of Demand, which predicts inverse relationships between price and quantity demanded. This finding contrasts with Nghargbu and Olaniyan (2019) where wealth, employment, health insurance, distance, and transport to be statistically significant determinants of antenatal care utilization.

Similarly, Imo et al. (2022), Adhikari et al. (2021), Tayal et al. (2024), Muya et al. (2024), Olubodun et al. (2023), and Afape et al. (2024) all established income as a significant factor for healthcare demand. The result suggests that pregnant women in Cross River State prioritise antenatal care as a necessity good with inelastic demand, despite high economic burden.

Distance to healthcare facility (p = 0.063) had a negative and statistically insignificant effect which contrasts with substantial evidence from Nghargbu and Olaniyan (2019), Fatma and Ramamohan (2023), and Waroh et al. (2024) where distance was identified as a significant barrier to maternal healthcare demand. The weaker effect observed suggests that women exert extra effort to reach facilities due to the importance they placed on pregnancy care and the mix of urban areas in the study, where transport system is easier can explain this finding.

Education was statistically insignificant in predicting demand for healthcare. This contradicts established findings from ZA et al. (2018), Kolawole et al. (2024) and Fatma and Ramamohan (2023), and departs from the Grossman model, which identifies education as a key determinant of health behaviour. This is not strange as the Cross River State government has carried out strong public health campaigns across the state and widespread community emphasis on maternal and child health in the recent past two (2) years.

The positive and insignificant findings for insurance coverage also contradicts Runguo et al. (2020) and Olajide et al. (2025), where a significant positive effect of insurance coverage on maternal healthcare demand was discovered.

The result revealed positive and statistically insignificant effects of the number of children previously delivered on demand. This contradicts Akanda (2010) and Khan Majlish et al. (2024) where a significant negative relationship between parity and antenatal care demand was found. This finding may indicate that the effect of number of children previously delivered could be context-specific and influenced by other characteristics such as local healthcare system, provider practices, or cultural norms regarding subsequent pregnancies that differ from other settings.

Generally, the findings reveal that sociocultural and facility-related factors are more influential in determining healthcare demand among pregnant women than economic constraints, challenging several theoretical assumptions but aligning with the argument that maternal health services, as necessity goods, remain relatively price inelastic.

5 Conclusion and Recommendations

5.1 Conclusion

This study empirically demonstrates that type of health facility and maternal age are the primary determinants of healthcare demand among pregnant women in Cross River State, Nigeria, with women using public facilities achieving 2.75× more ANC visits and private facility users averaging 3.15× more visits compared to traditional/church providers. Each additional year of maternal age increases expected visits by 21.3%, reflecting accumulated health literacy and risk perception. These findings align with Andersen's Behavioural Model emphasizing enabling resources (facility access) and Health Belief Model principles of perceived susceptibility among older mothers.

Contrary to Grossman's Health Demand Model and Marshall's Theory of Demand, economic factors costs, income, and insurance exhibited non-significant effects, suggesting maternal healthcare behaves as a price-inelastic necessity good in this context, challenging conventional price elasticity assumptions. Distance (p=0.063) and education gradients were marginally significant, while parity showed no effect, indicating sociocultural and supply-side factors dominate over purely economic constraints.

5.2 Recommendations

To leverage the study's findings that facility type and maternal age drive ANC demand, Cross River State Ministry of Health (CRSMoH) should construct 10 new primary health centres in rural LGAs (Obudu, Akamkpa) within 18 months, funded by 15% reallocation of 2027 health budget and CRSHIS operational grants, targeting 70% facility coverage within 5km to replicate public facility effect (IRR=2.75). Cross River State Primary Healthcare Development Agency (CRSPHCDA) must deploy 20 mobile ANC units equipped with ultrasound/midwifery teams, partnering with traditional leaders for community trust, serving 5,000 adolescent mothers annually (15-24 cohort: 22%) to harness age maturity effect (IRR=1.213). The Nigerian Medical

Association, Cross River Chapter could enforce staffing standards (1 midwife per 500 women) across 35 secondary facilities by Q3 2026, certified via quarterly audits, sustaining private facility advantage (IRR=3.15) through quality perception. State First Lady's Office, coordinating with Ministry of Information, could launch a "Mama Safe Journey" radio campaign targeting young mothers via 50 rural stations, distributing Mama Kits at first visits to boost uptake by 30%. CRSHIS Agency should mandate pregnant women enrollment through LGA health registers with premium subsidies for self-employed (36%) women, achieving 80% coverage by 2027. Likewise, State Ministry of Works should pave 50km priority access roads to study LGAs with Federal Emergency Road Maintenance Agency (FERMA) support, eliminating distance barriers (p=0.063) for 80% rural women within 24 months. Monitoring: Quarterly CRSMoH dashboards tracking ANC visits (target: 7+ visits from 10% to 30%) against WHO 8-visit standard.

References

Adhikari, R. P., Shrestha, M. L., Satinsky, E. N., & Upadhaya, N. (2021). Trends in and determinants of visiting private health facilities for maternal and child health care in Nepal: comparison of three Nepal demographic health surveys, 2006, 2011, and 2016. BMC pregnancy and childbirth, 21(1), 1.

Afape, A. O., Azubuike, P. C., Ibikunle, O. O., & Barrow, A. (2024). Prevalence and determinants of skilled birth attendance among young women aged 15–24 years in Northern Nigeria: evidence from multiple indicator cluster survey 2011 to 2021. BMC Public Health, 24(1), 2471.

Akanda, M. A. S. (2010). Demand for antenatal care in Bangladesh: An application of two-part model. South Asian Journal of Population and Health, 3(1).

Akin, J. S., Guilkey, D. K., & Hazel, E. (1995). Quality of services and demand for health care in Nigeria: a multinomial probit estimation. Social science & medicine, 40(11), 1527-1537.

Alex, D. (2025). What is snowball sampling? methods and examples. R Discovery. Retrieved May 21, 2025, from https://researcher.life/blog/article/what-is-snowball-sampling-methods-and-examples/

Azad, A. D., Charles, A. G., Ding, Q., Trickey, A. W., & Wren, S. M. (2020). The gender gap and healthcare: associations between gender roles and factors affecting healthcare access in Central Malawi, June–August 2017. Archives of Public Health, 78(1), 119.

Bolarinwa, O. A., Fortune, E., Aboagye, R. G., Seidu, A. A., Olagunju, O. S., Nwagbara, U. I., Ameyaw, E. K., & Ahinkorah, B. O. (2021). Health facility delivery among women of reproductive age in Nigeria: Does age at first birth matter? PloS one, 16, 11. e0259250. https://doi.org/10.1371/journal.pone.0259250

Bowling, A. (2014). Research methods in health: investigating health and health services. McGraw-hill education (UK).

Bujang, M. A. (2021). A Step-by-Step Process on Sample Size Determination for Medical Research. The Malaysian Journal of Medical Sciences: MJMS, 28(2), 15. https://doi.org/10.21315/mjms2021.28.2.2

Cameron, A. C., & Trivedi, P. K. (2013). Regression analysis of count data (No. 53). Cambridge university press.

Cochran, W. G. (1977). Sampling techniques (3rd ed.). John Wiley & Sons.

Creswell, J. W. (2014). Research design: qualitative, quantitative, and mixed methods approaches 3rd. Sage Publications

Cross River State Ministry of Health, CRSMoH, (2024).

Cross River State Statistical Yearbook, 2022.

Edgar, T. W., & Manz, D. O. (2016). Exploratory Study. Research Methods for Cyber Security, 95-130. https://doi.org/10.1016/B978-0-12-805349-2.00004-2.

Fatma, N., & Ramamohan, V. (2023). Healthcare seeking behavior among patients visiting public primary and secondary healthcare facilities in an urban Indian district: a cross-sectional quantitative analysis. PLOS Global Public Health, 3(9), e0001101.

Gana, G. N., & Mustapha, M. (2022). Determinants of Healthcare Choice in Kontagora Town. Lapai Journal of Economics, 6(1), 51-60.

Grossman, M. (2000). The human capital model. In Handbook of health economics (Vol. 1, pp. 347-408). Elsevier

Heffernan, E. (2025). Sampling methods: types descriptions & examples. Retrieved May 21, 2025, from https://quillbot.com/blog/research/sampling-methods/

Imo, C. K., De Wet-Billings, N., & Isiugo-Abanihe, U. C. (2022). The impact of maternal health insurance coverage and adequate healthcare services utilisation on the risk of under-five mortality in Nigeria: a cross-sectional study. Archives of Public Health, 80(1), 206

Khan Majlish, M. R., Tawhid, S. A., & Kibria, G. (2024). Urban Rural Disparities of Determinants of Antenatal Care in Senegal among Women of Reproductive Age: Evidence from 2023 Senegal Demographic Health Survey. medRxiv, 2024-10.

Khatri, R. B., Durham, J., & Assefa, Y. (2021). Utilisation of quality antenatal, delivery and postnatal care services in Nepal: An analysis of Service Provision Assessment. Globalization and Health, 17(1), 102.

Kolawole, B. O., Ucho Ejiroghene, C., Euba, M. I., Mercy, A. O., Adabra, M. S., & Onyeyili, I. N. (2024). Perceived factors affecting the utilization of maternity services in primary healthcare centre at a rural community in Northcentral, Nigeria. World Journal of Advanced Research and Reviews, 24(02), 903-914. https://doi.org/10.30574/wjarr.2024.24.2.3431

McGuire, A., Henderson, J., & Mooney, G. (1988). The economics of health care.

Mina, M. N., Nuruzzaman, M., Habib, M. N., Rahman, M., Chowdhury, F. M., Ahsan, S. N., Ahmed, F. F., Azizi, S., Mubin, N., Kibria, A. H. M. G., & Shuchi, F. A. (2023). The effectiveness of adequate antenatal care in reducing adverse perinatal outcomes: evidence from a low- or middle-income country. Cureus, 15(12), e51254. https://doi.org/10.7759/cureus.51254.

Muya, M., Ilembo, B., & Anasel, M. (2024). Predictive accuracy of the logit model to determine factors affecting delivery and postnatal care services utilization in Tanzania. International Journal of Health Governance, 29(4), 412-421.

Mwami, M. N., & Oleche, M. O. (2017). Determinants of utilization of health care services in Kenya. International Journal of Academic Research in Business and Social Sciences, 7(10), 132-156.

Nghargbu, R., & Olaniyan, O. (2019). Determinants of antenatal care utilization in Nigeria. African Development Bank.

Nigeria Demographic and Health Survey, NDHS. (2018).

Nikolopoulou, K. (2022). What Is Convenience Sampling? | Definition & Examples. Scribbr. Retrieved May 21, 2025, from https://www.scribbr.com/methodology/convenience-sampling/

Ningrum, E. W., Lusmilasari, L., Huriyati, E., Marthias, T., & Hasanbasri, M. (2024). Improving maternal health literacy among low-income pregnant women: A systematic review. Narra J, 4(2), e886. https://doi.org/10.52225/narra.v4i2.886.

Olajide, A. O., Ademuyiwa, I. Y., & Adetule, O. O. (2025). Determinants of Antenatal Care Attendance among Pregnant Women in Selected Primary Healthcare Centres in Ibadan, Nigeria: A Cross-Sectional Study. Journal Of Nursing Scientists and Health Services Today, 1(1).

Olubodun, T., Rahman, S.A., Odukoya, O.O., Okafor, I. F. & Balogun, M. R. (2023) Determinants of health facility delivery among young mothers aged 15 – 24 years in Nigeria: a multilevel analysis of the 2018 Nigeria demographic and health survey. BMC Pregnancy Childbirth 23(185). https://doi.org/10.1186/s12884-023-05492-x

Palamuleni, M. E. (2022). Prevalence, Trends, and Determinants of at Least Four Antenatal Visits in Malawi: Analyses of the Malawi Demographic and Health Surveys 1992–2016. Journal of Population and Social Studies [JPSS], 30, 309-331

Perkins, M., Brazier, E., Themmen, E., Bassane, B., Diallo, D., Mutunga, A., Mwakajonga, T., & Ngobola, O. (2009). Out-of-pocket costs for facility-based maternity care in three African countries. Health policy and planning, 24(4), 289–300. https://doi.org/10.1093/heapol/czp013

Peters, D. H., Garg, A., Bloom, G., Walker, D. G., Brieger, W. R., & Rahman, M. H. (2008). Poverty and access to health care in developing countries. Annals of the New York Academy of Sciences, 1136, 161–171. https://doi.org/10.1196/annals.1425.011

Runguo, W., Niying, L. & Angelo, E. (2020). The effects of private health insurance on universal health coverage objectives in China: a systematic literature review. IJERPH, MDPI, 17, 6, 1-21.

Socías, M. E., Koehoorn, M., & Shoveller, J. (2016). Gender inequalities in access to health care among adults living in British Columbia, Canada. Women's Health Issues, 26(1), 74-79.

Tadiri, C. P., Gisinger, T., Kautzky-Willer, A., Kublickiene, K., Herrero, M. T., Norris, C. M., Raparelli, V., & Pilote, L. on behalf of the GOING-FWD Consortium. (2021). Determinants of perceived health and unmet healthcare needs in universal healthcare systems with high gender equality. BMC Public Health, 21(1), 1488. https://doi.org/10.1186/s12889-021-11531-z

Tayal, C., Sharma, R., & Lata, K. (2024). Evidence from maternal healthcare services in South Asia: Demography vs. healthcare. International Journal of Healthcare Management, 1-13.

Uchendu, O. C., Bakare, A. A., Olojede, O. E., Sogbesan, A. A., Falade, A. G., Bakare, O. R., King, C. & Graham, H. (2024). Location of Antenatal Care and Delivery among Mothers in Lagelu Local Government Area, Ibadan: A Cross-Sectional Study with Preliminary Exploration of Predictive Factors. Afr. J. Med. Med. Sci, 53(3), 185-196.

Um, S., Phan, C., Dany, L., Veha, K., Pay, S., & Chau, D. (2024). The effect of health insurance coverage on antenatal care utilization in Cambodia: A secondary analysis of Cambodia Demographic and Health Survey 2021–2022. PLOS Global Public Health, 4(11), e0002954.

Wagstaff, A. (1986). The Demand for health: A Simplified Grossman model. Bulletin of Economic Research, 38(1).

Waroh, J. N., Akpenpuun, J. R., Starris-Onyema, P. N., & Iornyagh, B. T. (2024). factors affecting the utilization of maternal and child healthcare services in Kwande local government area of Benue state. POLAC Economic Review, 4(1) 2756-4428.

Wellay, T., Gebreslassie, M., Mesele, M., Gebretinsae, H., Ayele, B., Tewelde, A., & Zewedie, Y. (2018). Demand for health care service and associated factors among patients in the community of Tsegedie District, Northern Ethiopia. BMC health services research, 18(1), 1-9.

World Bank. (2016). Reproductive, maternal, newborn, and child health: Key messages from Disease Control Priorities, 3rd edition. Washington, DC: World Bank. https://doi.org/10.1596/978-1-4648-0348-2_ch7

World Bank. (2024). World Development Indicators.

World Health Organization (2023). Improving maternal and newborn health and survival and reducing stillbirth: progress report 2023. Geneva:. Licence: CC BY-NC-SA 3.0 IGO.

World Health Organization, WHO. (2015). Strategies toward ending preventable maternal mortality (EPMM). Geneva: WHO.

World Health Organization. (2023). Analytical fact sheet. World Health Organization. Retrieved January 14, 2025, from https://files.aho.afro.who.int/afahobckpcontainer/production/files/iAHO_Maternal_Mortality_Regional_Factsheet.pdf

World Health Organization. (2023). Trends in maternal mortality 2000 to 2020: Estimates by WHO, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division. World Health Organization.

ZA, Z., AM, R., PY, L., & Juni, M. H. (2018). Healthcare demand and its determinants. International Journal of Public Health & Clinical Sciences (IJPHCS), 5(6).