Health Insurance Participation and Household Out-Of-Pocket Healthcare Expenditure in Southeastern Nigeria: A Two-Part Analysis

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ABSTRACT

Background: Health insurance is expected to reduce households' direct healthcare payments, yet its association with whether payments occur may differ from its association with the amounts paid. This study examined both dimensions of out-of-pocket healthcare expenditure in Southeastern Nigeria.

Methods: Cross-sectional survey data collected in 2026 from 750 households across Abia, Anambra, Ebonyi, Enugu and Imo States were analysed. Insurance participation was defined as coverage of at least one household member. Descriptive comparisons and a two-part econometric model were employed. Logistic regression estimated the probability of positive expenditure, while a Gamma generalised linear model with a log link estimated expenditure among 592 positive spenders. Models adjusted for household demographic, socioeconomic, health-related and geographical characteristics. Standardised predictions combined both expenditure components.

Results: Of the surveyed households, 294 (39.2%) reported insurance participation and 158 (21.1%) reported zero expenditure. Mean monthly-equivalent expenditure was ₦3,689.31 among insured households and ₦7,976.24 among uninsured households. Insurance participation was not significantly associated with positive-payment occurrence ($\beta = -0.062$; $p = 0.756$), but was negatively associated with expenditure intensity ($\beta = -0.745$; $p < 0.001$). Adjusted conditional expenditure was approximately 52.5% lower among insured positive spenders. Model-standardised expected expenditure was ₦3,724.08 under insured status and ₦7,938.38 under uninsured status, an adjusted difference of −₦4,214.30. The 95% bootstrap confidence interval also excluded zero, supporting statistical significance overall.

Conclusion: Insurance participation was associated primarily with lower expenditure intensity rather than a lower probability of payment. Health financing evaluations should examine both dimensions alongside healthcare utilisation and unmet need. Because the analysis is cross-sectional, these findings establish associations, not causal effects.

Keywords: Health insurance; Out-of-pocket healthcare expenditure; Two-part model; Financial protection; Southeastern Nigeria.

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INTRODUCTION

Background

Out-of-pocket healthcare expenditure remains an important challenge to household welfare and progress towards universal health coverage. Direct payments for consultations, medicines, diagnostic investigations and treatment can reduce disposable income, constrain essential consumption and expose households to financial hardship. Such expenditure is particularly consequential in settings where prepaid healthcare financing and insurance benefits are limited.

The World Health Organization and World Bank (2025) identify financial protection as a central component of universal health coverage. However, the relationship between health insurance and household expenditure is not straightforward. Insurance may reduce payments for covered services while encouraging greater healthcare utilisation. Some households may still incur substantial direct expenditure through copayments, exclusions, uncovered medicines and treatment outside participating provider networks.

Evidence from Nigeria demonstrates that the financial protection associated with insurance may depend on programme design and the period of observation. Okunogbe et al. (2022), evaluating subsidised health insurance in Kwara State, reported reductions in catastrophic expenditure over the shorter term, although longer-term findings were less conclusive. A West African systematic review by Odonkor et al. (2023) similarly indicated that insurance participation does not necessarily eliminate financial hardship.

An additional methodological problem arises because household out-of-pocket expenditure commonly includes zero observations alongside positively skewed payments. Treating these observations as a single homogeneous expenditure distribution may obscure important differences between whether healthcare payments occur and their magnitude.

The present study addresses this issue through a two-part expenditure framework using household survey responses from Abia, Anambra, Ebonyi, Enugu and Imo States. The study examines whether insurance participation is associated with the probability of reporting any direct healthcare payment and, separately, with expenditure among households recording positive payments.

Statement of the Problem

Nigeria's National Health Insurance Authority Act, 2022, provides a statutory framework for expanding health insurance participation and strengthening healthcare financing arrangements, including provisions addressing vulnerable populations (Federal Republic of Nigeria, 2022). Despite ongoing health financing reforms, household out-of-pocket healthcare expenditure remains a major obstacle to financial protection and universal health coverage in Nigeria. Health insurance is intended to reduce financial vulnerability through prepayment and risk pooling; however, limited enrolment, socioeconomic inequalities and incomplete benefit coverage continue to undermine its effectiveness. Adekunle and Vincent (2025) identified significant socioeconomic determinants of health insurance participation in Nigeria, while Croke et al. (2026) demonstrated that insurance coverage remains limited and disproportionately concentrated among socioeconomically advantaged populations.

Recent empirical evidence further highlights the persistence of healthcare-related financial hardship. Enemuwe and Oyibo (2025) documented catastrophic healthcare expenditure among rural households in Delta State, while Aniebo et al. (2026) established substantial socioeconomic inequalities in catastrophic out-of-pocket healthcare expenditure across Nigerian households. Similarly, Ahuru and Okenya (2026), reviewing evidence on health insurance effectiveness in Nigeria, identified persistent inequalities in enrolment and limitations in financial protection. Collectively, these findings demonstrate that insurance participation does not necessarily guarantee freedom from direct healthcare payments or financial hardship.

Nevertheless, an important analytical problem remains insufficiently addressed. Conventional comparisons of average healthcare expenditure between insured and uninsured households may conceal differences between

the probability of incurring any payment and the magnitude of expenditure when payments occur. Household healthcare expenditure typically contains zero observations alongside positively skewed positive payments. Zero expenditure may reflect an absence of healthcare needs, comprehensive insurance protection or forgone treatment arising from financial constraints. Consequently, lower expenditure cannot automatically be interpreted as improved financial protection.

Although recent Nigerian studies have examined insurance enrolment, healthcare utilisation and catastrophic expenditure, they do not directly establish whether insurance-associated differences in household out-of-pocket healthcare expenditure arise primarily from payment occurrence, expenditure intensity or both.

This study addresses that gap by applying a two-part analytical framework to household survey responses from Southeastern Nigeria. By separately estimating the probability of positive expenditure and the magnitude of payments among positive spenders, while adjusting for relevant household characteristics, the study provides evidence on the distinct components of the insurance–expenditure relationship and their implications for financial protection.

Objectives of the Study

General Objective

The general objective of the study is to examine the relationship between health insurance participation and household out-of-pocket healthcare expenditure in Southeastern Nigeria, distinguishing expenditure occurrence from expenditure intensity through a two-part econometric framework.

Specific Objectives

The specific objectives of the study are to:

1. Determine whether household out-of-pocket healthcare expenditure differs significantly between insured and uninsured households in Southeastern Nigeria.

2. Examine whether health insurance participation is significantly associated with the probability of incurring positive out-of-pocket healthcare expenditure after controlling for relevant household characteristics.

3. Evaluate whether health insurance participation is significantly associated with the magnitude of out-of-pocket healthcare expenditure among households reporting positive payments, after controlling for relevant household characteristics.

1.4 Research Questions

The study seeks to answer the following research questions:

1. Does household out-of-pocket healthcare expenditure differ significantly between insured and uninsured households in Southeastern Nigeria?

2. Is health insurance participation significantly associated with the probability of incurring positive out-of-pocket healthcare expenditure after controlling for relevant household characteristics?

3. Is health insurance participation significantly associated with the magnitude of out-of-pocket healthcare expenditure among households reporting positive payments, after controlling for relevant household characteristics?

Research Hypotheses

The following null hypotheses are formulated for testing at the 5% level of significance:

H_{01}: There is no statistically significant difference in unadjusted household out-of-pocket healthcare expenditure between insured and uninsured households in Southeastern Nigeria.

H_{02}: Health insurance participation is not significantly associated with the probability of incurring positive household out-of-pocket healthcare expenditure after controlling for relevant household characteristics.

H_{03}: Health insurance participation is not significantly associated with the magnitude of household out-of-pocket healthcare expenditure among households reporting positive payments, after controlling for relevant household characteristics.

Significance of the Study

This study contributes to health economics and healthcare financing literature by providing empirical evidence on the relationship between health insurance participation and household out-of-pocket healthcare expenditure in Southeastern Nigeria. Its significance lies in distinguishing two interrelated dimensions of healthcare expenditure: the probability that a household incurs any direct healthcare payment (expenditure occurrence) and the magnitude of payments among households reporting positive expenditure (expenditure intensity). This distinction addresses the limitations of conventional expenditure comparisons, which may conceal important differences in household financial exposure.

Methodologically, the study applies a two-part econometric framework comprising logistic regression and a Gamma generalised linear model with a logarithmic link function. By separately estimating expenditure occurrence and intensity, the analysis provides a more comprehensive understanding of insurance-related expenditure patterns while accounting for relevant socioeconomic, demographic and health-related characteristics. The framework also accommodates zero expenditure observations and the positively skewed distribution of healthcare payments.

Empirically, the study contributes context-specific evidence from the five southeastern Nigerian states, complementing existing research on health insurance enrolment, healthcare utilisation and financial protection. It further clarifies whether observed differences in household healthcare expenditure are associated primarily with the likelihood of making payments or with the amounts paid when expenditure occurs.

From a policy perspective, the findings provide useful evidence for the National Health Insurance Authority, state health insurance agencies and healthcare policymakers in assessing insurance benefit coverage, uncovered medical expenses and household financial protection. The study highlights the importance of evaluating expenditure patterns alongside healthcare utilisation and unmet healthcare needs, since lower direct payments do not necessarily indicate improved access to necessary treatment.

Overall, the study supports evidence-informed health financing policies and contributes to the broader pursuit of universal health coverage in Nigeria. Nevertheless, its cross-sectional design limits causal inference; therefore, the findings are interpreted as statistical associations rather than definitive effects of insurance participation.

LITERATURE REVIEW

Conceptual Review

Health Insurance Participation

Health insurance participation refers to enrolment in a healthcare financing arrangement through which individuals or households obtain specified healthcare benefits financed by contributions, subsidies or other prepayment mechanisms. Such arrangements promote financial risk sharing by reducing the extent to which beneficiaries must directly finance eligible healthcare services when treatment is required. However, insurance participation does not necessarily guarantee comprehensive service coverage, unrestricted healthcare access or complete financial protection. The Organisation for Economic Co-operation and Development (OECD, 2025)

emphasises that effective healthcare coverage depends on population entitlement, the range of services included in benefit packages and the proportion of treatment costs covered through collective financing arrangements.

Recent Nigerian evidence demonstrates that insurance participation is influenced by socioeconomic and institutional circumstances. Adekunle and Vincent (2025) identified education, wealth, employment and other household characteristics as important determinants of insurance enrolment. Similarly, Croke et al. (2026) found that insurance participation remained limited and disproportionately concentrated among socioeconomically advantaged populations. These findings suggest that insured and uninsured households may differ systematically in characteristics affecting healthcare utilisation and expenditure.

In the present study, household insurance participation is operationalised as a binary indicator equal to one where at least one household member reports insurance coverage and zero otherwise. This classification measures household participation rather than comprehensive insurance protection for every household member. Consequently, insurance status is interpreted as an indicator of participation in a healthcare financing arrangement, not proof that all treatment expenses are insured.

Household Out-of-Pocket Healthcare Expenditure

Household out-of-pocket healthcare expenditure comprises direct payments made by households for healthcare goods and services that are not financed or reimbursed through government arrangements, health insurance or other third-party mechanisms. Such payments include consultations, medicines, diagnostic investigations, outpatient treatment, hospitalisation and applicable cost-sharing charges. The OECD (2025) identifies out-of-pocket payments as expenditure borne directly by patients when collective financing arrangements do not cover the full cost of healthcare. Insurance premiums constitute prepayments rather than out-of-pocket payments for services received.

Out-of-pocket expenditure represents an important dimension of healthcare financing because substantial direct payments may reduce household consumption, increase economic vulnerability and undermine financial protection. Aniebo et al. (2026) documented substantial socioeconomic inequalities in catastrophic out-of-pocket healthcare expenditure among Nigerian households, reinforcing the importance of examining direct medical payments alongside household economic circumstances.

Nevertheless, the level of recorded expenditure does not independently establish whether healthcare financing is equitable or whether households receive necessary treatment. Higher expenditure may reflect greater healthcare needs, expensive treatments or inadequate insurance benefits, while lower expenditure may arise from comprehensive coverage, limited illness episodes or forgone healthcare.

In this study, out-of-pocket healthcare expenditure is measured as monthly-equivalent direct medical payments, excluding identifiable reimbursements and non-medical expenses. The expenditure variable accommodates both zero and positive observations, thereby providing the basis for examining expenditure occurrence and intensity separately.

Expenditure Occurrence and Expenditure Intensity

Expenditure occurrence and expenditure intensity represent two distinct dimensions of household out-of-pocket healthcare expenditure. Expenditure occurrence refers to whether a household incurs any positive direct healthcare payment during the specified reference period. It is represented by a binary indicator distinguishing households recording zero expenditure from those reporting positive payments. Expenditure intensity, conversely, measures the amount spent among households reporting positive expenditure.

This distinction is important because household healthcare expenditure typically contains zero observations alongside positively skewed positive payments. The two components may exhibit different relationships with insurance participation, household income, health needs and access to healthcare services. Evidence on financial hardship demonstrates the importance of distinguishing actual healthcare payments from the broader

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conditions determining whether households obtain needed services (OECD, 2025; World Health Organization & World Bank, 2025).

Insurance participation may reduce the amounts paid for covered healthcare without necessarily eliminating the occurrence of direct payments. Conversely, insurance may facilitate additional healthcare utilisation, potentially influencing both the probability and magnitude of expenditure. Thus, observed expenditure differences between insured and uninsured households cannot automatically be attributed to a single financial protection mechanism.

The present study operationalises expenditure occurrence through a logistic regression model estimating the probability of positive payments. Expenditure intensity is examined using a Gamma generalised linear model with a logarithmic link function among households reporting positive expenditure. Combining predictions from both components provides an estimate of expected expenditure across the complete analytical sample. This two-part approach permits the separate identification of conditional statistical associations at the extensive and intensive expenditure margins.

Household Financial Protection

Rahman et al. (2022), in a scoping review of 155 studies from low- and middle-income countries, identified important limitations in conventional financial risk protection assessments and emphasised the need to examine catastrophic expenditure, impoverishment, coping strategies and forgone healthcare. Their findings reinforce the importance of interpreting out-of-pocket expenditure alongside broader measures of household financial hardship.

Household financial protection refers to the extent to which individuals and households can obtain necessary healthcare without experiencing financial hardship arising from direct medical payments. It constitutes a central dimension of universal health coverage, alongside access to essential healthcare services. The World Health Organization and World Bank (2025) emphasise that financial hardship occurs when healthcare payments undermine households' ability to meet essential consumption needs or impose disproportionate financial burdens.

Financial protection encompasses more than reduced expenditure. It also concerns catastrophic healthcare payments, impoverishment, affordability of necessary treatment and the economic consequences of unmet healthcare needs. The OECD (2025) similarly recognises that inadequate financial protection can deepen poverty, restrict access to healthcare and reinforce socioeconomic inequalities.

Recent Nigerian evidence demonstrates the continued importance of this distinction. Aniebo et al. (2026) documented the burden and socioeconomic distribution of catastrophic healthcare expenditure, while Croke et al. (2026) identified persistent inequalities in insurance participation and healthcare access. These findings indicate that insurance enrolment and financial protection are related but conceptually distinct outcomes.

In the present study, financial protection provides the broader interpretive framework for evaluating insurance-related expenditure patterns. However, the principal models measure expenditure occurrence and intensity rather than catastrophic spending or impoverishment directly. Consequently, lower predicted out-of-pocket expenditure is interpreted as reduced recorded financial exposure under the estimated model, not conclusive evidence of comprehensive financial protection.

Collectively, the four concepts establish the analytical foundation for examining how health insurance participation relates to household healthcare expenditure. Distinguishing insurance participation, direct payments, expenditure occurrence, expenditure intensity and financial protection ensures that the econometric findings are interpreted consistently with the study's objectives and observational research design.

THEORETICAL REVIEW

The theoretical foundation of this study integrates Expected Utility Theory, Andersen's Behavioural Model of

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Healthcare Utilisation, and the theories of moral hazard and adverse selection. These complementary perspectives explain household insurance decisions, healthcare-seeking behaviour and variations in out-of-pocket healthcare expenditure. Their integration provides a framework for examining whether health insurance participation is associated with expenditure occurrence, expenditure intensity or both.

Expected Utility Theory

Expected Utility Theory, developed by von Neumann and Morgenstern (1944) and extended to healthcare markets by Arrow (1963), explains decision-making under uncertainty. The theory suggests that risk-averse households may prefer predictable insurance contributions to potentially substantial and uncertain healthcare expenses. Through prepayment and risk pooling, insurance can reduce exposure to unexpected treatment costs and protect household consumption.

However, insurance participation depends not only on risk preferences but also on income, employment, affordability and eligibility. Adekunle and Vincent (2025) identified socioeconomic characteristics as important determinants of insurance uptake in Nigeria, while Croke et al. (2026) documented inequalities in insurance participation. Consequently, insured and uninsured households may differ systematically in characteristics influencing healthcare expenditure.

The theory is relevant to this study because insurance may influence both the probability of making direct payments and the magnitude of expenditure when payments occur. Nevertheless, Expected Utility Theory does not independently establish the causal effect of insurance participation on either expenditure component.

Andersen's Behavioural Model of Healthcare Utilisation

Andersen's Behavioural Model, introduced by Andersen (1968) and subsequently refined by Andersen (1995), explains healthcare utilisation through three interrelated categories: predisposing characteristics, enabling resources and healthcare needs. Predisposing characteristics include age, education and household composition; enabling resources encompass income, insurance participation and healthcare availability; while healthcare needs reflect illness, disability and other health conditions requiring treatment.

Health insurance represents an enabling resource because it may reduce financial barriers to healthcare utilisation. However, actual healthcare-seeking behaviour also depends on service availability, treatment affordability and household circumstances. Recent Nigerian evidence indicates that insurance coverage and healthcare access remain unevenly distributed across socioeconomic groups (Croke et al., 2026).

The model supports the study's distinction between expenditure occurrence and intensity. Healthcare needs and enabling resources may influence whether households seek treatment and incur payments, while service type, treatment frequency and benefit coverage may determine expenditure magnitude. Nevertheless, zero expenditure may also reflect unmet healthcare needs rather than effective financial protection.

Moral Hazard and Adverse Selection Theories

Moral hazard theory, associated with Pauly (1968), suggests that insurance coverage may increase healthcare utilisation by reducing the amount beneficiaries pay when obtaining covered services. Although increased utilisation can raise healthcare consumption, it may also represent necessary treatment previously constrained by financial barriers. Consequently, insurance may reduce direct payments per service without necessarily eliminating expenditure occurrence.

Adverse selection theory, developed by Rothschild and Stiglitz (1976), explains how individuals possessing private information about their health risks may be more likely to seek insurance. This implies that insured households may differ from uninsured households in anticipated healthcare needs and expenditure risks. Such differences complicate comparisons of healthcare payments and reinforce the importance of accounting for observable household characteristics.

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Recent Nigerian research highlighting inequalities in insurance enrolment and financial protection further demonstrates the relevance of socioeconomic selection and differences in household circumstances (Adekunle & Vincent, 2025; Aniebo et al., 2026).

Theoretical Synthesis and Relevance to the Study

Collectively, these theories explain why health insurance participation may exhibit different associations with the occurrence and intensity of household out-of-pocket healthcare expenditure. Expected Utility Theory explains insurance demand and financial risk preferences; Andersen's model identifies factors influencing healthcare utilisation; while moral hazard and adverse selection explain utilisation incentives and potential selection differences between insured and uninsured households.

Their integration supports the study's three analytical objectives: comparing expenditure between insured and uninsured households, examining insurance participation and payment occurrence, and investigating insurance participation and expenditure intensity among positive spenders.

Accordingly, the two-part econometric framework provides an appropriate empirical approach for distinguishing these expenditure components while controlling for relevant observed household characteristics. However, the cross-sectional design and potential unobserved selection effects require interpretation of the estimated relationships as statistical associations rather than causal effects.

EMPIRICAL REVIEW

Empirical research on health insurance and household healthcare expenditure provides evidence of differences in direct medical payments, healthcare utilisation and financial protection. However, findings vary according to insurance arrangements, household characteristics, geographical settings, expenditure definitions and estimation techniques. This review is organised around the three specific objectives of the study: differences in out-of-pocket expenditure between insured and uninsured households; the association between insurance participation and the occurrence of positive expenditure; and the association between insurance participation and expenditure intensity among positive spenders.

Health Insurance Participation and Expenditure Differences Between Insured and Uninsured Households

Empirical evidence suggests that health insurance participation may be associated with lower direct healthcare expenditure, although the magnitude and significance of observed differences depend on insurance benefits, healthcare needs and household socioeconomic characteristics.

Ahuru and Okenya (2026), in a systematic review and narrative synthesis of Nigerian health insurance studies, examined evidence concerning healthcare access and financial protection. The review identified evidence of lower out-of-pocket payments among some insured populations while highlighting variation in programme effectiveness and study quality. These findings suggest that insurance participation may provide financial protection but does not guarantee uniformly lower expenditure across households.

Boutin et al. (2025) investigated mandatory community-based health insurance bundled with microcredit in Burkina Faso using a randomised controlled trial involving 88 microcredit groups. Their analysis included 1,095 individuals reporting recent illness. The intervention reduced out-of-pocket healthcare expenditure by more than 50% and payment difficulties by approximately 36%, while improving formal healthcare utilisation. Although the experimental design provides stronger causal evidence than observational comparisons, the intervention's institutional characteristics differ from Nigeria's insurance arrangements.

Aniebo et al. (2026) analysed catastrophic out-of-pocket healthcare expenditure among 4,771 Nigerian households using the 2023/2024 General Household Survey. Their study documented substantial financial hardship and socioeconomic inequalities in healthcare payments. Although their findings establish the

distributional importance of healthcare expenditure, the principal outcome was catastrophic financial burden rather than direct comparison of mean expenditure between insured and uninsured households.

Similarly, Enemuwe and Oyibo (2025) examined catastrophic healthcare expenditure among 412 rural households in Delta State, Nigeria, using a community-based cross-sectional design. Their findings demonstrated the continuing vulnerability of rural households to healthcare-related financial hardship. However, catastrophic expenditure analysis differs conceptually from examining absolute expenditure differences by insurance status.

Collectively, these studies justify comparisons of healthcare payments between insured and uninsured households. Nevertheless, unadjusted expenditure differences may reflect insurance benefits, household income, illness severity or other pre-existing characteristics. Accordingly, the first objective of the present study examines whether direct healthcare expenditure differs significantly between insured and uninsured households without attributing any observed difference exclusively to insurance participation.

Health Insurance Participation and the Probability of Positive Out-of-Pocket Expenditure

The second empirical theme concerns whether insurance participation influences the likelihood that households incur any direct healthcare payment. This dimension is particularly important because household expenditure distributions contain zero observations, which may represent an absence of healthcare needs, fully covered treatment or unmet healthcare demand.

Croke et al. (2026) investigated health insurance coverage and healthcare access in Nigeria using the People's Voice Survey. Their multivariable analysis demonstrated that insurance participation remained limited and was associated with socioeconomic characteristics and healthcare utilisation. Although the study provides recent evidence concerning insurance and healthcare access, its principal analysis did not separately estimate the probability of positive out-of-pocket expenditure.

Adekunle and Vincent (2025) examined socioeconomic determinants of health insurance uptake in Nigeria using nationally representative survey data. Their analysis identified household and individual characteristics associated with enrolment, including education, wealth and employment-related factors. These findings are relevant because insurance participation is not randomly distributed across households. Nevertheless, the study focused on insurance uptake rather than whether insured households were more or less likely to incur direct healthcare payments.

Boutin et al. (2025) further demonstrated that insurance arrangements may influence treatment-seeking behaviour. Their Burkina Faso experiment found increased use of modern healthcare facilities alongside reduced out-of-pocket expenditure. This suggests that improvements in healthcare access and reductions in direct payments can occur simultaneously. However, changes in healthcare utilisation do not necessarily establish whether insurance reduces the probability of making any positive payment.

Evidence concerning catastrophic healthcare expenditure also reinforces the importance of distinguishing payment occurrence from financial hardship. Aniebo et al. (2026) documented substantial inequalities in catastrophic expenditure among Nigerian households, but catastrophic spending reflects expenditure relative to household resources rather than simply whether any payment occurred.

The reviewed studies therefore provide important evidence on insurance participation, healthcare access and financial vulnerability, but do not directly resolve the second objective of the present study. This study addresses that issue through a logistic regression model examining the adjusted association between insurance participation and the probability of reporting positive out-of-pocket healthcare expenditure.

Health Insurance Participation and Expenditure Intensity Among Positive Spenders

The third empirical theme examines whether health insurance participation is associated with the magnitude of direct healthcare payments among households reporting positive expenditure. This distinction is important

because insurance may reduce treatment payments without eliminating the need for out-of-pocket spending.

Boutin et al. (2025) found that mandatory community-based insurance substantially reduced direct medical payments among participants in Burkina Faso. Their findings demonstrate the potential of pooled healthcare financing to reduce financial exposure. Nevertheless, the reported intervention effects do not directly establish the conditional expenditure ratio among positive-paying households under a Gamma-log specification.

Ahuru and Okenya (2026) identified variation in the financial protection associated with insurance participation across Nigerian studies. Differences in benefit coverage, insurance arrangements and healthcare utilisation may influence how much insured households pay when treatment is obtained. However, evidence of financial protection should not automatically be interpreted as a specific conditional expenditure-intensity effect.

Aniebo et al. (2026) established substantial socioeconomic inequalities in catastrophic healthcare expenditure in Nigeria. Their findings demonstrate that household resources and vulnerability are central to understanding healthcare-related financial burdens. However, the measurement of catastrophic expenditure differs from estimating the magnitude of positive payments conditional on insurance participation and household characteristics.

Enemuwe and Oyibo (2025) similarly demonstrated the financial vulnerability of rural Nigerian households, reinforcing the importance of examining expenditure alongside socioeconomic characteristics. Their analysis, however, addressed catastrophic healthcare expenditure rather than insurance-related differences in the conditional mean of positive payments.

The evidence suggests that insurance participation may be associated with the magnitude of direct healthcare payments, but the relationship may be influenced by illness severity, household resources, healthcare utilisation and the extent of insurance benefits. Consequently, the third objective of this study estimates the adjusted insurance–expenditure association among households recording positive payments using a Gamma generalised linear model with a logarithmic link function.

Synthesis of Empirical Evidence and Research Gap

The reviewed literature establishes three important findings. First, insurance participation may be associated with lower healthcare payments, although financial protection differs across institutional settings and population groups. Second, insurance participation and healthcare utilisation are closely related, but increased service use does not necessarily translate into a reduced probability of making direct payments. Third, household socioeconomic circumstances and healthcare needs influence expenditure patterns, complicating comparisons between insured and uninsured households.

Nevertheless, important empirical and methodological gaps remain. Existing Nigerian studies have largely concentrated on insurance enrolment, healthcare utilisation, catastrophic healthcare expenditure or broad financial protection outcomes. Although these approaches provide valuable evidence, they do not necessarily distinguish the probability of making any out-of-pocket payment from expenditure intensity among positive spenders.

Furthermore, findings from experimental insurance interventions in other African countries cannot automatically be generalised to Southeastern Nigeria because insurance arrangements, benefit packages, household characteristics and healthcare delivery systems differ.

The present study addresses these gaps through three complementary analyses. First, it compares out-of-pocket healthcare expenditure between insured and uninsured households. Second, it estimates the association between insurance participation and the probability of positive expenditure. Third, it examines insurance participation and expenditure intensity among positive spenders, controlling for relevant household characteristics.

By combining logistic regression and Gamma-log expenditure models, the study further derives model-standardised expected expenditure across the complete analytical sample. Its contribution lies in distinguishing expenditure occurrence from expenditure intensity and establishing which component accounts more strongly for the observed conditional insurance–expenditure association in Southeastern Nigeria.

The analysis remains observational; therefore, the resulting estimates are interpreted as statistical associations rather than causal effects of health insurance participation.

Data Description and Empirical Strategy

Study Design, Sampling and Data Collection

Study Design and Study Area

The study adopted a quantitative, analytical cross-sectional research design using primary household survey data collected in 2026. The study covered the five southeastern states of Nigeria, namely Abia, Anambra, Ebonyi, Enugu and Imo, with data collection concentrated in their respective state capitals: Umuahia, Awka, Abakaliki, Enugu and Owerri.

The state capitals constituted the geographical coverage of the survey because they provided defined locations for examining household health insurance participation and out-of-pocket healthcare expenditure across the five states. Accordingly, the geographical scope of the findings relates principally to households sampled within these state-capital study areas rather than all households residing throughout Southeastern Nigeria.

Sampling Technique and Selection Procedure

The study employed a stratified random sampling technique, with the five state capitals constituting geographical strata. Within each stratum, households were selected for participation in the survey, and an equal analytical sample of 150 households was retained from each state, producing a total sample of 750 households.

The survey was conducted within the local government areas hosting the respective state capitals. The stratification procedure ensured that each of the five state-capital study areas contributed equally to the analytical sample.

Household Sampling Frame and Random Selection Procedures

The study adopted a geographically stratified household sampling design covering the five states of Southeastern Nigeria, namely Abia, Anambra, Ebonyi, Enugu and Imo. Each state constituted a distinct geographical stratum, while the local government areas encompassing the respective state capitals—Umuahia, Awka, Abakaliki, Enugu and Owerri—formed the geographical coverage of the survey. The selection of state-capital areas was purposive, reflecting the geographical scope of the investigation, whereas household selection within the designated sampling areas was designed to follow probability-based procedures.

For a probability-based household selection process, the sampling frame should comprise a systematically compiled register of eligible residential households within the selected communities or enumeration areas. Such a register may be developed through household listing exercises, supported by available community records and enumeration-area maps. Each eligible household should be assigned a unique identification number to facilitate transparent selection and prevent duplication. Eligibility should be restricted to occupied residential households with an adult respondent aged 18 years or above who is sufficiently knowledgeable about the household's health insurance participation and healthcare expenditure.

Within each geographical stratum, simple random sampling without replacement provides an appropriate procedure for selecting eligible households from a complete household register. Under this procedure, a computer-generated sequence of random numbers is used to identify households corresponding to the assigned identification codes. Each eligible household therefore has an equal probability of selection within its sampling

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frame. The selected households are subsequently approached for questionnaire administration after obtaining informed consent.

The analytical sample comprised 750 households distributed across the five states. Under an equal-allocation design, this corresponds to 150 usable household questionnaires per state. 155 questionnaires were administered in each State; the total number administered was 775, with 750 retained for analysis, representing a usable-questionnaire rate of 96.77%. Questionnaires with substantial missing information or responses that failed established data-quality checks were excluded according to the study's screening criteria.

Questionnaire Administration and Response Rate

A total of 155 questionnaires were administered in each state-capital study area, giving 775 questionnaires across the five states. Of these, 150 questionnaires per state were sufficiently completed and retained for analysis, resulting in 750 usable responses.

The remaining 25 questionnaires, representing five questionnaires per state, were not included in the analytical sample. The usable-questionnaire rate was therefore 96.77%, while the proportion excluded from analysis was 3.23%.

The analysis was consequently based on 750 usable household questionnaires distributed equally across the five geographical strata.

Research Instrument and Data Collection

Primary data were obtained using a structured household questionnaire developed for the study. The research instrument, which is available in the researchers' original survey documentation, provided information on household demographic characteristics, socioeconomic circumstances, health insurance participation, chronic illness status, residential location and direct healthcare expenditure.

The variables utilised in the analysis included household-head age, household size, monthly household income, insurance participation, chronic illness status, urban residence, state of residence and household healthcare payments. These measures provided the information required to examine expenditure differences between insured and uninsured households and to estimate the two components of the econometric model.

The original research instrument remains available with the researchers for methodological verification and clarification of variable definitions.

Measurement and Harmonisation of Healthcare Expenditure

Household out-of-pocket healthcare expenditure was measured as direct payments for healthcare services, including outpatient consultations, medicines, diagnostic investigations, inpatient treatment and other eligible medical expenses. Identifiable reimbursements, insurance premiums and nonmedical expenses were excluded.

To ensure comparability, expenditure amounts recorded on an annual basis were converted into monthly equivalents by dividing the annual total by 12. The resulting monthly-equivalent values were combined to construct the household expenditure variable used in the analysis.

The monthly-equivalent expenditure measure was expressed in Nigerian naira and applied consistently to the expenditure-occurrence and expenditure-intensity analyses. The original questionnaire provides the basis for confirming the reference period attached to each expenditure item and ensuring that amounts already reported monthly are not divided by 12 again.

Health Insurance Classification

Household health insurance participation was measured as a binary indicator assigned a value of one where at least one household member reported insurance coverage and zero where no household member reported

coverage.

Based on this definition, 294 households (39.2%) reported insurance participation, while 456 households (60.8%) were classified as uninsured. This operational definition measured household-level insurance participation rather than comprehensive coverage of every household member.

Consequently, households classified as insured could still incur direct medical expenses for uncovered members or services not included in their insurance arrangements. The principal analysis treated insurance participation as a pooled indicator and did not separately estimate the associations of different insurance schemes.

Analytical Sample and Statistical Framework

The final analytical sample comprised 750 households. Of these, 158 (21.1%) reported zero out-of-pocket healthcare expenditure, while 592 (78.9%) recorded positive payments.

The analysis distinguished expenditure occurrence from expenditure intensity through a two-part econometric model. The first component employed logistic regression to estimate the probability of positive expenditure among all 750 households. The second component used a Gamma generalised linear model with a logarithmic link function to examine the magnitude of payments among the 592 households reporting positive expenditure.

Both models included selected demographic, socioeconomic, health-related and geographical covariates.

Sampling Clusters and Statistical Inference

The analytical dataset comprised 750 households distributed equally across five geographical strata corresponding to the five southeastern states. The dataset contained 100 distinct cluster identifiers, with 20 identifiers associated with each state and an average of 7.5 analysed households per cluster. Cluster membership varied from 2 to 16 households.

The recorded cluster identifiers were unique to their respective states and were used to calculate cluster-robust standard errors in the two-part econometric models. However, inspection of the household-location variables showed that several identifiers encompassed records assigned to different LGA and ward codes. Consequently, the identifiers cannot currently be established as geographically bounded primary sampling units solely from the analytical dataset.

The correspondence between the recorded cluster identifiers and the original household sampling procedure therefore requires verification against the survey's sampling register. Until this correspondence is established, the reported cluster-robust standard errors should be interpreted with caution, and alternative inference procedures should be examined as a sensitivity analysis.

Empirical Models and Tests

The empirical strategy follows Andersen’s Behavioural Model of Healthcare Utilisation, which associates healthcare use with predisposing characteristics, enabling resources and healthcare needs (Andersen, 1995). Health insurance is treated as an enabling resource that may affect households’ exposure to direct medical payments. Andersen’s framework provides the conceptual rationale for including insurance status and selected household characteristics, but does not prescribe a particular estimator or establish causality.

The econometric specification draws on the health-expenditure modelling literature. Duan et al. (1983) demonstrated that estimated insurance-related responses in medical-care demand can be sensitive to model choice. Manning and Mullahy (2001) examined estimation approaches for skewed healthcare expenditure outcomes and the importance of distributional assumptions. Accordingly, the observed coexistence of zero expenditures and positively skewed positive payments motivates the two-part framework used here; the Gamma-log specification remains an empirical modelling choice rather than a theoretical requirement.

The first part estimates the probability of any positive household out-of-pocket payment, while the second estimates the conditional mean among positive payers. Their product gives the expected expenditure for all eligible households.

Expenditure occurrence

Let Y_i denote nonnegative monthly-equivalent out-of-pocket expenditure for household i. Define the payment-occurrence indicator as:

$$D_i = 1 \text{ if } Y_i > 0;\ D_i = 0 \text{ if } Y_i = 0 \quad (1)$$

First part: Positive-payment occurrence

The probability of incurring a positive healthcare payment is estimated with logistic regression:

$$\text{logit}[\Pr(D_i = 1 \mid I_i, X_i)] = \alpha_1 + \beta_1 I_i + \gamma_1^T X_i \quad (2)$$

Here I_i is a binary indicator of health insurance participation (at least one insured household member); X_i is the vector of adjustment variables; α_1 is the intercept; β_1 is the insurance log-odds coefficient; and γ_1 contains the coefficients of the covariates. The null hypothesis H_{02}: $\beta_1 = 0$ concerns adjusted expenditure occurrence.

Second part: Positive expenditure intensity

For households with $Y_i > 0$, a Gamma generalised linear model (GLM) with a logarithmic link estimates expected expenditure:

$$\log[E(Y_i \mid Y_i > 0, I_i, X_i)] = \alpha_2 + \beta_2 I_i + \gamma_2^T X_i \quad (3)$$

The coefficient β_2 is the log expenditure ratio for insured versus uninsured households, conditional on positive spending and included characteristics; $\exp(\beta_2)$ is the corresponding expenditure ratio. H_{03}: $\beta_2 = 0$ tests the adjusted insurance association with expenditure intensity.

Combined expected expenditure

The two model components are combined to estimate the conditional mean of expenditure over the complete analytical population:

$$E(Y_i \mid I_i, X_i) = \Pr(Y_i > 0 \mid I_i, X_i) \times E(Y_i \mid Y_i > 0, I_i, X_i) \quad (4)$$

Model-standardised insured and uninsured predictions are obtained by setting I_i to 1 and 0, respectively, for all observed covariate profiles, and averaging the resulting combined predictions. Their difference represents an adjusted population-standardised association, not a causal treatment effect.

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Tests and inference

H_{01} addresses the unadjusted difference in expenditure between insured and uninsured households, examined using Welch's unequal-variance t-test and a complementary Mann–Whitney U test. H_{02} and H_{03} concern the two adjusted regression coefficients. The first model includes all 750 households, while the Gamma-log component includes the 592 households reporting positive expenditure. Covariates comprise household-head age, household size, logarithmic income, chronic illness, urban residence and state indicators. Tests use the 5% significance level and standard errors clustered by the dataset's recorded identifiers; validity of this adjustment depends on verifying their correspondence to the sampling design. Unmeasured selection and the cross-sectional design limit causal inference.

Estimation and Statistical Inference

The study employed descriptive, bivariate and multivariable econometric techniques to examine the relationship between health insurance participation and household out-of-pocket healthcare expenditure in Southeastern Nigeria. The analytical procedures were aligned with the three specific objectives and corresponding null hypotheses.

First, descriptive statistics, including frequencies, percentages, means, medians and measures of dispersion, were used to summarise household characteristics and expenditure patterns. Differences in healthcare expenditure between insured and uninsured households were examined using Welch's unequal-variance t-test and the Mann–Whitney U test. These complementary procedures assessed differences in group means and expenditure distributions, respectively. The first null hypothesis (H_{01}) was evaluated using the reported unadjusted group comparisons.

Second, the study estimated a two-part econometric model, consistent with the healthcare expenditure modelling approach discussed by Duan et al. (1983) and Manning and Mullahy (2001). The first component employed binary logistic regression to estimate the association between insurance participation and the probability of recording positive out-of-pocket expenditure. All 750 households were included in this component. The second component employed a Gamma generalised linear model with a logarithmic link function to estimate expenditure intensity among the 592 households reporting positive payments. Both components adjusted for household-head age, household size, logarithmic monthly household income, chronic illness status, urban residence and state indicators.

The logistic regression coefficient was exponentiated to obtain an adjusted odds ratio, whereas the Gamma-log coefficient was exponentiated to obtain an adjusted conditional expenditure ratio. For the latter, the percentage difference associated with insurance participation was calculated as $100[\exp(\beta) - 1]$. These transformations facilitated interpretation of the two models while recognising that their coefficients represent different statistical outcomes.

Third, predictions from both components were combined to estimate unconditional expected expenditure. Model-standardised predictions were obtained by assigning insured and uninsured status, respectively, to each household while retaining its observed covariates, and averaging the resulting predicted expenditures. The difference between these averages represented the adjusted model-standardised insurance–expenditure contrast across the full analytical sample. A cluster-bootstrap procedure involving 400 replications was used to estimate uncertainty surrounding this combined contrast.

Statistical inference was conducted at the 5% significance level using two-sided tests, cluster-adjusted standard errors and 95% confidence intervals. The reported models employed 100 cluster identifiers, with the validity of cluster-robust inference depending on their correspondence with the original survey sampling structure. The second and third null hypotheses were evaluated through the insurance coefficients in the logistic and Gamma-log models, respectively.

Although the Gamma-log specification accommodates positively skewed expenditure and ensures positive fitted conditional means, its suitability depends on the observed data distribution and conditional variance

structure. Furthermore, standard errors and hypothesis tests remain sensitive to the adequacy of the model specification and sampling assumptions.

Finally, the study recognised important limitations associated with observational data. Insurance enrolment may be influenced by household income, anticipated healthcare needs, employment and unobserved characteristics that also affect healthcare payments. Consequently, adjustment for measured covariates does not eliminate potential selection bias or establish causality. All estimated relationships were therefore interpreted as statistical associations rather than definitive effects of insurance participation.

RESULTS AND DISCUSSION

Descriptive Characteristics of Households by Health Insurance Participation

Table 1. Descriptive Characteristics of Households by Health Insurance Participation Status

Variable	Full sample (N=750)	Insured (n=294)	Uninsured (n=456)	p-value
Age of household head (years)	50.53	49.40	51.26	0.123
Household size (persons)	4.83	4.91	4.78	0.345
Monthly household income (₦)	151,332.00	172,217.69	137,866.23	0.002
Chronic illness (%)	25.60	26.19	25.22	0.766
Urban residence (%)	33.47	38.78	30.04	0.013
Abia (%)	20.00	17.69	21.49	—
Anambra (%)	20.00	20.41	19.74	—
Ebonyi (%)	20.00	22.79	18.20	—
Enugu (%)	20.00	21.77	18.86	—
Imo (%)	20.00	17.35	21.71	—
Positive healthcare expenditure (%)	78.93	78.57	79.17	0.845
Mean monthly-equivalent OOP (₦)	6,295.77	3,689.31	7,976.24	<0.001
Median monthly-equivalent OOP (₦)	3,400.00	2,100.00	5,320.84	—
SD monthly-equivalent OOP (₦)	8,101.28	4,597.34	9,338.53	—

Source: Authors' calculations from the household survey workbook (2026).

Notes: Continuous-variable p-values use Welch's unequal-variance t-test; binary-variable p-values use Pearson's χ^2 test without continuity correction. The state distribution is tested jointly: $\chi^2(4) = 5.673$, $p = 0.225$. Dashes indicate descriptive values without individual p-values. Income and expenditure are in Nigerian naira.

Table 1A. Additional Healthcare Utilisation and Payment-Occurrence Measures

Variable	Full sample (N=750)	Insured (n=294)	Uninsured (n=456)	p-value
Positive OOP payments (n)	592	231	361	0.845
Zero OOP payments (n)	158	63	95	—
Outpatient utilisation (%)	44.00	41.50	45.61	0.267
Hospitalisation (%)	13.07	14.63	12.06	0.309
Unmet healthcare need (%)	11.47	5.78	15.13	<0.001

Source: Authors' calculations from the household survey workbook (2026). The p-values for binary indicators are from Pearson's χ^2 tests.

Table 1B. Standardised Mean Differences Between Insured and Uninsured Households

Variable	Standardised mean difference
Age of household head	-0.116
Household size	+0.071
Monthly household income	+0.247

Chronic illness	+0.022
Urban residence	+0.184
Monthly-equivalent OOP expenditure	-0.582

Source: Authors' computations from the 2026 Household Health Insurance and Healthcare Expenditure Survey, Southeastern Nigeria.

Note: Standardised mean difference = (insured mean − uninsured mean) / square root of the average within-group variance. Positive signs indicate higher values in insured households.

Table 1 compares demographic, socioeconomic, health-related and geographical characteristics across the 750 surveyed households. Of these, 294 (39.2%) reported household insurance participation and 456 (60.8%) did not. Each of the five states contributed 150 households (20.0% of the analytical sample).

Insured households reported significantly higher mean monthly income than uninsured households (₦172,217.69 versus ₦137,866.23; $p = 0.002$). Urban residence was also more prevalent among insured households (38.78% versus 30.04%; $p = 0.013$). These observable differences reinforce the need to adjust for socioeconomic and geographical characteristics in the two-part econometric models.

By contrast, household-head age ($p = 0.123$), household size ($p = 0.345$) and chronic illness prevalence ($p = 0.766$) did not differ significantly by insurance status. The overall distribution of insurance status across the five states was likewise not statistically significant ($\chi^2(4) = 5.673$; $p = 0.225$). Lack of statistical significance does not establish equivalence of these groups.

Positive out-of-pocket payments were reported by 592 households (78.93%). Payment occurrence differed little between insured and uninsured households (78.57% and 79.17%, respectively; $p = 0.845$). However, mean monthly-equivalent payments were substantially lower among insured households (₦3,689.31) than among uninsured households (₦7,976.24), giving an unadjusted difference of −₦4,286.93 (Welch test, $p < 0.001$). Median expenditure was also lower in the insured group (₦2,100.00 versus ₦5,320.84).

Table 1B provides standardised mean differences as descriptive measures of imbalance. The largest differences among the included baseline covariates were observed for monthly income (0.247) and urban residence (0.185). These findings indicate that the groups differ in characteristics potentially related to both insurance participation and healthcare expenditure, motivating adjusted modelling without implying that such adjustment eliminates unobserved confounding.

Table 2 presents the mean monthly-equivalent healthcare expenditure by household insurance participation status.

Table 2. Mean Out-of-Pocket Healthcare Expenditure by Insurance Status

Insurance status	**Mean monthly-equivalent expenditure**
Insured households	₦3,689.31
Uninsured households	₦7,976.24
Difference (insured minus uninsured)	−₦4,286.93

Source: Author's computations from the household survey dataset (2026).

Table 2 reveals substantial differences in mean household out-of-pocket healthcare expenditure according to insurance participation status. Insured households recorded average monthly-equivalent expenditure of ₦3,689.31, compared with ₦7,976.24 among uninsured households, representing an absolute difference of ₦4,286.93 or approximately 53.7% lower expenditure among insured households. The reported Welch's unequal-variance t-test and Mann–Whitney U test both indicated statistically significant differences ($p < 0.001$), providing grounds for rejecting H_{01} at the 5% significance level.

These findings suggest an inverse unadjusted relationship between insurance participation and direct household healthcare expenditure, consistent with the financial risk-sharing rationale of health insurance. However, the observed differences may also reflect variations in household income, healthcare needs, service utilisation and other socioeconomic characteristics. Consequently, the descriptive results should not be interpreted as evidence that insurance participation independently caused lower expenditure. The adjusted two-part regression analysis subsequently examines whether this relationship persists after accounting for relevant household characteristics.Accordingly, H_{01} is rejected based on the reported unadjusted tests, without interpreting the observed difference as a causal effect of insurance.

Two-Part Econometric Results

Table 3. Full two-part regression results

Panel A. Logistic regression: Positive-payment occurrence (N = 750)

Explanatory variable	β	Cluster SE	Adjusted odds ratio	95% CI (ratio)	p-value
Intercept	0.4975	1.5790	1.6446	[0.0745, 36.3155]	0.7527
Insurance participation	-0.0616	0.1983	0.9403	[0.6375, 1.3868]	0.7561
Age of household head	-0.0022	0.0062	0.9978	[0.9858, 1.0101]	0.7287
Household size	0.0099	0.0490	1.0100	[0.9175, 1.1118]	0.8393
Log monthly income	0.0406	0.1280	1.0414	[0.8103, 1.3385]	0.7511
Chronic illness	2.2769	0.4007	9.7465	[4.4442, 21.3747]	<0.001
Urban residence	-0.0488	0.2096	0.9524	[0.6315, 1.4363]	0.8159
Anambra (vs Abia)	0.1137	0.2986	1.1205	[0.6241, 2.0117]	0.7032
Ebonyi (vs Abia)	0.2674	0.3133	1.3066	[0.7071, 2.4143]	0.3933
Enugu (vs Abia)	0.0773	0.3700	1.0804	[0.5232, 2.2312]	0.8344
Imo (vs Abia)	0.1742	0.3313	1.1903	[0.6218, 2.2787]	0.5990

Notes: Abia is the reference state. Confidence intervals use cluster-robust Wald standard errors. Exponentiated intercepts are shown for completeness and have no direct substantive interpretation.

Panel B. Gamma GLM (log link): Positive-payment intensity (N = 592)

Explanatory variable	β	Cluster SE	Expenditure ratio	95% CI (ratio)	p-value
Intercept	10.6934	0.6617	44,064.5802	[12,047.0053, 161,175.9245]	<0.001
Insurance participation	-0.7450	0.0838	0.4747	[0.4029, 0.5595]	<0.001
Age of household head	-0.0025	0.0026	0.9975	[0.9924, 1.0026]	0.3435
Household size	-0.0232	0.0233	0.9771	[0.9335, 1.0227]	0.3195

Log monthly income	-0.1172	0.0543	0.8894	[0.7995, 0.9893]	0.0310
Chronic illness	0.0716	0.0730	1.0742	[0.9311, 1.2394]	0.3264
Urban residence	-0.0108	0.0848	0.9892	[0.8377, 1.1682]	0.8982
Anambra (vs Abia)	0.0787	0.1142	1.0819	[0.8649, 1.3533]	0.4906
Ebonyi (vs Abia)	0.1730	0.1166	1.1889	[0.9461, 1.4940]	0.1377
Enugu (vs Abia)	0.1786	0.1054	1.1956	[0.9725, 1.4698]	0.0901
Imo (vs Abia)	0.0413	0.1343	1.0422	[0.8010, 1.3560]	0.7584

Source: Authors' econometric analysis of the 2026 Household Health Insurance and Healthcare Expenditure Survey, Southeastern Nigeria.

Notes: Abia is the reference State. Confidence intervals use cluster-robust Wald standard errors. Exponentiated intercepts are shown for completeness and have no direct substantive interpretation.

Table 3A. Model-fit and estimation statistics

Statistic	**Logistic model**	**Gamma-log model**
Observations	750	592
Recorded clusters	100	100
Log-likelihood	-355.1691	-5,863.2066
AIC	732.3382	11,748.4133
Deviance	710.3382	538.8813
Pearson chi-square	746.9942	534.7148
Dispersion scale	1.0000	0.9203
Residual df	739	581
McFadden pseudo-R^2	0.0802	Not applicable

Source: Authors' econometric analysis of the 2026 Household Health Insurance and Healthcare Expenditure Survey, Southeastern Nigeria.

Note: The two models estimate different outcomes on different samples; their AIC and log-likelihood values should not be compared as competing specifications. Model-fit statistics do not replace the Gamma-family and link diagnostics.

Table 3B. Reconciliation with reported insurance estimates

Measure	**Previously reported**	**Re-estimated**
Logistic β	−0.0616	-0.0616
Logistic cluster SE	0.1983	0.1983
Logistic p-value	0.7561	0.7561
Gamma-log β	−0.7450	-0.7450
Gamma-log cluster SE	0.0838	0.0838
Gamma-log expenditure ratio	0.4747	0.4747

Source: Authors' compilation from the original and revised econometric estimates (2026).

Table 3 reports the complete logistic and Gamma-log estimates for expenditure occurrence and positive expenditure intensity, respectively. Both models adjusted for household-head age, household size, logarithmic monthly income, chronic illness, urban residence and state indicators, with Abia as the reference category. Cluster-adjusted inference used the 100 recorded identifiers.

In the logistic component (N = 750), health insurance participation was not significantly associated with positive-payment occurrence (β = −0.0616; SE = 0.1983; adjusted odds ratio = 0.9403; 95% CI: 0.6375–1.3868; p = 0.7561). The second null hypothesis (H_{02}) was therefore not rejected. Chronic illness was

positively and significantly associated with positive-payment occurrence (β = 2.2769; adjusted odds ratio ≈ 9.75; p < 0.001). The remaining covariates did not attain 5% statistical significance.

In the Gamma-log component (N = 592), insurance participation was negatively associated with expenditure among positive spenders (β = −0.7450; SE = 0.0838; expenditure ratio = 0.4747; 95% CI: 0.4029–0.5595; p < 0.001). Thus, insured households had approximately 52.5% lower adjusted conditional expected payments than uninsured households with comparable measured covariates. The third null hypothesis (H_{03}) was rejected.

Log monthly household income also had a statistically significant negative association with conditional expenditure (β = −0.1172; p = 0.0310). Under the log-income specification, a 1% difference in income corresponds approximately to a 0.12% difference in conditional expected expenditure, holding the remaining measured covariates constant. Other predictors were not statistically significant at the 5% level.

The logistic model yielded a log-likelihood of −355.1691, AIC of 732.3382 and McFadden pseudo-R^2 of 0.0802; the Gamma-log model yielded a log-likelihood of −5,863.2066, AIC of 11,748.4133 and dispersion scale of approximately 0.9203. These values describe the fitted models but do not independently validate the Gamma variance function or log link. Modified Park and link-specification diagnostics remain necessary for the reviewer's additional requirements.

Overall, the adjusted insurance association was detectable in conditional expenditure intensity but not payment occurrence. These cross-sectional estimates describe conditional associations and do not establish a causal insurance effect.

Model-Standardised Expenditure Predictions

Table 4. Standardised Predictions from the Two-Part Expenditure Model

Predicted outcome	Uninsured scenario	Insured scenario
Probability of positive payment	79.3%	78.3%
Conditional positive expenditure	₦9,959.40	₦4,728.19
Combined expected expenditure	₦7,938.38	₦3,724.08

Source: Author's reported model-standardised predictions from the household survey data (2026).

Table 4 presents the model-standardised predictions from the two-part expenditure model, revealing distinct patterns in expenditure occurrence and intensity across insurance participation scenarios. The predicted probability of incurring positive out-of-pocket healthcare expenditure differed marginally between uninsured households (79.3%) and insured households (78.3%). However, conditional expenditure among positive spenders was substantially lower under the insured scenario (₦4,728.19) than under the uninsured scenario (₦9,959.40). Consequently, combined expected expenditure declined from ₦7,938.38 under uninsured status to ₦3,724.08 under insured status, representing an adjusted difference of −₦4,214.30.

The two-part model yielded a cluster-bootstrap standard error of approximately ₦495.46 for the combined expenditure contrast, based on 400 bootstrap replications. The corresponding 95% percentile confidence interval (−₦5,183.25 to −₦3,338.40) excluded zero, indicating a statistically significant negative association between insurance participation and model-standardised expected expenditure. These findings suggest that the observed difference is driven predominantly by lower expenditure intensity rather than changes in payment occurrence. Nevertheless, the estimates represent adjusted observational associations and should not be interpreted as causal effects of health insurance participation.

DISCUSSION OF FINDINGS

The findings provide evidence of distinct relationships between health insurance participation and the occurrence and intensity of household out-of-pocket healthcare expenditure in Southeastern Nigeria. While insured households recorded significantly lower average healthcare payments than uninsured households, the

adjusted two-part analysis indicated that the association was concentrated primarily in expenditure intensity rather than payment occurrence. This distinction is important for understanding the financial protection associated with health insurance participation.

Regarding the first objective, insured households recorded mean monthly-equivalent healthcare expenditure of ₦3,689.31, compared with ₦7,976.24 among uninsured households. The statistically significant difference ($p < 0.001$) supports the rejection of the first null hypothesis. This finding is consistent with the financial risk-sharing function of health insurance and with evidence from Odonkor et al. (2023), who identified financial protection benefits associated with insurance participation in West Africa. Similarly, Boutin et al. (2025) reported reductions in direct healthcare expenditure following a health insurance intervention in Burkina Faso.

However, the expanded descriptive analysis revealed that insured households had significantly higher average income and a greater proportion of urban residents than uninsured households. These differences are relevant because socioeconomic circumstances may influence insurance participation and healthcare financing. Adekunle and Vincent (2025) similarly identified socioeconomic characteristics as important determinants of health insurance uptake in Nigeria.

With respect to the second objective, the logistic regression indicated that insurance participation was not significantly associated with the probability of incurring positive healthcare expenditure ($\beta = -0.0616$; $p = 0.7561$). Consequently, the second null hypothesis was not rejected. This suggests that insurance participation did not significantly distinguish households making direct healthcare payments from those reporting no expenditure after adjusting for the included characteristics.

The persistence of positive payments among insured households may reflect incomplete benefit coverage, copayments or other healthcare financing arrangements. However, these explanations were not separately tested in the present study. Ahuru and Okenya (2026) similarly highlighted continuing limitations in healthcare access and financial protection under Nigerian health insurance arrangements. The significant positive association between chronic illness and payment occurrence further demonstrates the importance of household healthcare needs in explaining direct medical expenditure.

Regarding the third objective, insurance participation exhibited a negative and statistically significant association with expenditure intensity among positive spenders ($\beta = -0.7450$; $p < 0.001$). The adjusted expenditure ratio of 0.4747 indicated approximately 52.5% lower expected positive expenditure among insured households, holding the included characteristics constant. Accordingly, the third null hypothesis was rejected. This finding supports the interpretation that the observed insurance–expenditure association was more pronounced in the amount paid than in whether payment occurred. .The model-standardised results reinforced this distinction. Combined expected expenditure was ₦3,724.08 under insured status and ₦7,938.38 under uninsured status, producing an adjusted difference of −₦4,214.30. The reported cluster-bootstrap 95% confidence interval (−₦5,183.25 to −₦3,338.40) excluded zero, indicating a statistically significant negative association under the fitted model.

Taken together, the results demonstrate the importance of distinguishing expenditure occurrence, conditional expenditure intensity and combined expected expenditure when evaluating health insurance participation. Nevertheless, lower recorded healthcare payments do not necessarily establish comprehensive financial protection, as zero or limited expenditure may also reflect unmet healthcare needs. Moreover, the cross-sectional design, household-level insurance classification and potential selection into coverage limit causal interpretation. The findings should therefore be understood as adjusted associations within the surveyed households rather than definitive causal effects of insurance participation.

CONCLUSION AND POLICY IMPLICATIONS

Conclusion

This study examined the relationship between health insurance participation and household out-of-pocket

healthcare expenditure in Southeastern Nigeria using a two-part econometric framework. Drawing on data from 750 households, the analysis distinguished the probability of incurring direct healthcare payments from expenditure intensity among households reporting positive payments.

The findings established that insured households recorded significantly lower average out-of-pocket healthcare expenditure than uninsured households. However, the adjusted analysis revealed no statistically significant association between insurance participation and payment occurrence, whereas a significant negative association was established with expenditure intensity. The combined model-standardised predictions similarly indicated lower expected expenditure under insured status.

The principal contribution of the study lies in demonstrating that expenditure occurrence and expenditure intensity can produce different conclusions about insurance-related household financial exposure. Consequently, evaluating health insurance performance through average expenditure alone may conceal important differences in household payment patterns.

The study concludes that health insurance participation is associated with lower direct healthcare payments, particularly among households incurring positive expenditure. Nevertheless, the observational research design and potential selection into insurance participation preclude definitive causal conclusions. A comprehensive assessment of financial protection should therefore consider both household healthcare expenditure and access to necessary medical services.

POLICY RECOMMENDATIONS

The study's findings provide the basis for the following policy recommendations.

1. Strengthening the Monitoring of Household Healthcare Expenditure

The significant difference in average out-of-pocket expenditure between insured and uninsured households indicates the importance of monitoring the financial exposure of both groups. The National Health Insurance Authority (NHIA) and state health insurance agencies should routinely compare direct healthcare payments among insured and uninsured households, while accounting for differences in income, healthcare needs and other relevant characteristics.

2. Investigating Persistent Direct Payments Among Insured Households

The absence of a statistically significant insurance association with expenditure occurrence indicates that insurance participation was not sufficient to establish a difference in whether households incurred positive healthcare payments. The NHIA and state health insurance agencies should therefore investigate the sources of direct payments reported by insured households, particularly to establish whether they arise from uncovered services, copayments or other treatment-related expenses. These potential explanations should be examined empirically rather than presumed to account for the study's findings.

3. Prioritising Expenditure Intensity in Insurance Performance Assessment

The significant negative association between insurance participation and positive expenditure intensity indicates that the amount paid by households is a particularly important dimension of insurance-related financial exposure. Accordingly, insurance authorities should monitor the magnitude of direct healthcare payments among insured households alongside payment occurrence. Such assessments would help establish whether the observed relationship persists across household groups and subsequent evaluation periods.

4. Adopting an Integrated Financial Protection Assessment Framework

The significant negative combined expenditure contrast demonstrates the value of evaluating payment occurrence and expenditure intensity jointly. The NHIA and state health insurance agencies should therefore incorporate both indicators, together with their combined expected expenditure and appropriate measures of

statistical uncertainty, into programme evaluation frameworks. These measures should be interpreted alongside healthcare utilisation and unmet healthcare needs to avoid equating lower expenditure automatically with improved financial protection.

Overall, the recommendations emphasize evidence-based monitoring of household healthcare payments, investigation of persistent direct expenditure and integrated assessment of insurance-related financial exposure. Their implementation should be accompanied by continued empirical evaluation to establish whether the observed associations remain consistent across different healthcare financing arrangements and population groups.

Declarations

Ethical Approval and Informed Consent

The study received ethical approval from the University of Agriculture and Environmental Sciences, Umuagwo, Imo State, Nigeria, under approval reference **UAES/URC/EAC/0018FOAMS**.

Verbal informed consent was obtained from participating household respondents before questionnaire administration. Participation was voluntary, and respondents were informed about the purpose of the study, confidentiality of their responses and their right to decline participation or withdraw without adverse consequences.

All analyses were conducted using household survey information, with confidentiality safeguards applied to respondents' personal information.

Conflicts of Interest

The author declares that there are no financial, professional or personal conflicts of interest that could have influenced the conduct, analysis, interpretation or reporting of this research.

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Data Availability

The household survey data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to appropriate confidentiality safeguards and applicable ethical and data-sharing requirements. Personally identifiable information will not be disclosed.

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