



PROBIT ANALYSIS OF ECONOMIC EFFECTS OF NATIONAL HEALTH INSURANCE AUTHORITY ON HEALTH OUTCOME IN CALABAR METROPOLIS

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ABSTRACT

The study examined the economic effects of National Health Insurance Authority on infant mortality rate in Cross River State, Nigeria. The study adopted the survey design for analysis due to the type of data used. The population of the study consisted of employees and management staff of the University of Calabar Teaching Hospital, University of Calabar, Calabar and the Federal Neuropsychiatric Hospital who are actively involved in NHIA scheme. The sampling technique adopted in the study is the simple random sampling technique while the sample size is made up of two-hundred and eighty-six (286) respondents chosen from the study population. The data were collected from employees and management staff of the hospitals through structured questionnaire while the probit regression was employed for the analysis. Findings from the probit regression revealed that National Health Insurance Authority (NHIA) does not contribute significantly towards reduction in infant mortality rate. The study recommended that government needs to review the National Health Insurance Scheme to include the poor if it expects health outcome of the people such as infant mortality rate to improve, the government should also incorporate the informal sector of the economy in the National Health Insurance Scheme so as to enhance a wider coverage thereby assisting to improve health outcomes in the country. Furthermore, any policy to invigorate the public confidence in NHIS as well as increase enrolment, should be targeted at the young, poor, less educated, males, and rural dwellers.

KEYWORDS: National Health Insurance Scheme, Health Outcome, Healthcare, Public servant
JEL Classification: I13, I12, I11, J48

INTRODUCTION

Sustainable healthcare has been acknowledged globally as means of ensuring that all the Citizens irrespective of their social and economic status have improved access to medical services. Being able to access quality healthcare has been considered as one of the major challenges in most less developed countries, which Nigeria is an example, this is due to the fact that in such countries, out-of-pocket health expenditure increasingly dominate healthcare financing.

However, due to widespread prevalence of poverty in Nigeria, the healthcare providers like primary, secondary and tertiary healthcare centres are supported by the government through the National Health Insurance Scheme (NHIS) (Ibiwoye & Adeleke, 2017). United Nations Department of Economic and Social Affairs (UNDESA, 2019) reported that Nigeria's life expectancy stood at 52.29 and is ranked 194th in the world while the World Development Indicator in 2022 posited that life expectancy for Nigeria was 55.44 years which is 0.57 per cent increase from 2021 since life expectancy for Nigeria in 2021 was 55.12 years.

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This low life expectancy observed in Nigeria is at variance with the budgetary allocation to the health sector, thus, indicating that spending more on the health sector is not enough towards enhancing the health system of economy for effective health outcome. Generally, it is agreed that high cost of accessing healthcare services is one of the reasons for poor health outcomes, increased morbidity, and preventable mortality like; infant and maternal, particularly among low-income households. In order to address these challenges, the Federal government of Nigeria established the National Health Insurance Scheme (NHIS) by degree 35 of 1999, but was officially launched and became operational on June, 2005 to improve financial protection, enhance access to healthcare services, and ensure improvement in health outcomes of the citizens. Surprisingly, despite the establishment of the NHIS, its effectiveness in achieving its core objectives and the perceived challenges continue to persist, most especially at the state level including Calabar Metropolis in Cross River State. Due to the observed challenges in the scheme, the government again changed the name from National Health Insurance Scheme into National Health Insurance Authority under the 2022 act designed to provide affordable healthcare for Nigerians.

Existing evidence suggests that Nigeria is one of the countries that experiences high levels of out-of-pocket healthcare expenditure, this accounts for over 70 per cent of total health spending, and has placed a significant financial burden on households (World Health Organization, 2021). In Cross River State, healthcare out-of-pocket expenditure is over 95 percent, which is extremely high and coupled with a low insurance coverage of about 0.6 percent, this has contributed towards the increasing financial catastrophe for households, thereby leading to the high level of infant and maternal mortality. Awojobi (2019), Adebisi and Adeniji (2021) as well as Novignon Arthur, Tabiri, Atakorah and Nonyignon (2023) studies revealed that insufficient health financing mechanisms is a contributing factor towards delayed healthcare utilization, poor treatment adherence, and worsening health conditions among vulnerable populations. More so, though the NHIS was established in 2005 to provide universal health coverage, the rate enrolment remains relatively low, especially for informal sector workers who form a larger segment of the population (Aregbeshola & Khan, 2018). Findings from previous studies revealed mixed outcomes concerning the effect of NHIA on health outcomes and health status, with some of these studies maintaining that NHIA causes an improvement in service utilization while others posited that the influence of NHIA on health outcomes are minimal (Uzochukwu, Ughasoro, Etiaba, Okwuosa, Enyuladu and Onwujekwe, 2015).

However, none of these studies were focused on the influence of national health insurance scheme on infant mortality in Calabar Metropolis of Cross River State. Therefore, this current study filled this gap by focusing on the impact of national insurance scheme on infant mortality using probit method of analysis. This study is of immense benefit to the federal ministry of health, NHIA regulators, health maintenance organizations (HMOs) and service providers on how to improve the management of the programme.

LITERATURE REVIEW

Empirical literature

Awojobi (2019) discovered that workers in the formal sector are the beneficiaries of the scheme while the poor informal sector workers are excluded from the services of the scheme. Similarly, Aisha & Umar (2021) discovered that awareness and prevention campaign, drug quality, health treatment and dental care service reduce the probability of a worker falling sick and missing work days. Adebisi & Adeniji (2021) assessed the utilization of health care and associated factors amongst the federal civil servants using the NHIS in Rivers state using descriptive cross-sectional method of analysis using and questionnaire for collection of data. The result revealed that, although, 123 (43.9%) of the respondents made payments at a point of access to health care services, overall, there was a reduction in out-of-pocket payment and that this has led to improvement in life expectancy. This implies that NHIS has influence an improvement in life expectancy of the people of River's State. Nwoko & Abubakar (2021) examined the extent to which national health insurance scheme (NHIS) of Nigeria has impacted on the health system through promotion of accessible, affordable and quality healthcare in Nigeria. The study concluded that national health insurance scheme (NHIS) had significantly impacted on the healthcare needs of the populace by promoting accessibility to healthcare, making it easy for the health seekers through the financing of health needs and promoting good health in Nigeria. Furthermore, the study discovered that majority of the populace in the informal sector are not adequately captured in the health insurance scheme.

Novignon, Arthur, Tabiri, Atakorah & Novignon (2023) investigated the impact of negative health outcomes on household welfare and the role of public health insurance in mitigating this impact. The study used data from the seventh round of the Ghana Living Standards Survey (GLSS). In order to address the potentially non-random nature of the health insurance scheme, the Lewbel instrumental variable estimation technique was used. The results suggest that more days of illness lead to fewer hours of labour supply and this result was statistically significant across all specifications. Furthermore, the study found that rural dwellers and informal sector workers, days of illness reduced labour supply, while the impact was relatively less with health insurance coverage.

Ahmed (2025) explores the impact of the National Health Insurance Authority (NHIA) on healthcare access, affordability, and the role of Taraba State Government. Using a qualitative case study approach, data were drawn from policy reports, health agency publications, and secondary sources, including the Taraba State Contributory Health Insurance Agency (TASHIA) and the Federal Ministry of Health records. The findings show that the NHIA has improved healthcare access for some civil servants and vulnerable groups through TASHIA programs and partnerships with accredited facilities. However, challenges such as low coverage in the informal sector, weak funding mechanisms, poor awareness, and inadequate rural infrastructure limit its effectiveness. The study concludes that achieving Universal Health Coverage (UHC) in Taraba State requires stronger collaboration between NHIA, the State government, and local authorities, coupled with innovative community-based health insurance strategies. Therefore, the continuous existence of poor health outcomes in spite of the introduction of the NHIS trigger questions concerning the scheme's influence and the factors hindering the performance of the scheme in Cross River State. Economic theory suggests that health insurance relevance for a reduction in financial barriers towards healthcare access by spreading risk across individuals, hence supporting timely healthcare utilization and preventive health behavior (Arrow, 1963). However, the benefits of National health insurance schemes to some extent depends on factors such as its coverage, level of awareness, quality of service, and healthcare infrastructure available. In Calabar Metropolis, where socioeconomic disparities are prevalence, difference of level of citizens enrolment in NHIA and utilization may affect the extent to which the scheme contributes towards improvement in health outcomes. Understanding these variations is critical for assessing the economic effects of the NHIA as well as evaluating whether insured individuals enjoy better health outcomes than the uninsured population. Therefore, this study seeks to examine the economic effects of the National Health Insurance Authority on infant mortality in Calabar Metropolis using a probit analytical framework. This is due to the fact that probit model is suitable for analysing binary health outcome variables, like; improved or unimproved infant mortality rate. Hence, the study contributes towards policy discuss aimed strengthening healthcare financing mechanisms which contributes towards achieving improvement in infant mortality rate in Calabar Metropolis of Cross River State, Nigeria.

Theoretical framework

Several theories were reviewed in this study such as; Rational Choice Theory (RCT) is grounded in neoclassical economics, sustained by the ideals of utilitarianism and game theory (Marshall 1998; Ritzer 2008; Haralambos & Holborn; 2008).

An American social theorist, George Homans, pioneered RCT by grounding its explanations in behavioural psychology and economics sociology using the "cost-benefit" approach. RCT takes actors as the central focus of explanations. Individuals are seen as actors endowed with capacity to take rational action. Rational action itself involves a systematic assessment of the various means of attaining goal and the selection of the most appropriate means of doing so (Haralambos & Holborn, 2008). At the heart of the theory is individual self-interest. That is, actors have ends or goals toward which their actions are tailored. Actors are also viewed as having preferences (or values, utilities).

Structural functionalism as loosely explained refers to the large-scale social structures and institutions of society, their interrelationships, and their constraining influence on actors (Ritzer, 2008). Historically, some founding fathers of sociology like Herbert Spencer, Auguste Comte and Emile Durkheim, laid the classical foundation of structural-functionalism. Talcott Parsons later refined it to reflect his work titled "the social system" in 1951 (Scott & Marshall, 2005). As a theoretical perspective in sociology, functionalism holds a view of society as a social system that is made up of different parts, which are interdependent and interrelated (Igbo, 2003). These component parts of society, which include the family, school, government, law; economy, etc. perform various functions positively toward the maintenance, stability and survival of the social system. From the organismic analogy, the functionalists equate the human society with the human or biological organism that has a structure comprising organs, systems and capillaries, which must function for the maintenance and survival of the whole organism.

Expected utility theory posited that health insurance demand are influenced by several economic and social factors and backed by theories of insurance. The Expected Utility theory of Von-Neumann and Morgenstern is the most prominent theory for analyzing decision making under uncertain circumstances. The Von-Neumann - Morgenstern utility function shows the decision makers' preferences with respect to risk. This theory concentrates on the maximization of expected utility of income when there is the possibility of a loss that can be insured against. Friedman & Savage (1948) as cited in Mohammed et. al. (2013). state that the theory of demand for insurance is based on the expected utility theory and an assumed preference for certain losses over uncertain ones of the same expected magnitude. This theory is used in this study because, an individual's decision to participate or not to participate is associated with the individual's maximization of expected utility of income or wealth since individuals are assumed to be risk averse (Friedman & Savage 1948) as cited in Mohammed et. al. (2013).

The expected utility theory states that the decision maker chooses between uncertain prospects by comparing their expected utility values, that is, the weighted sums obtained by adding the utility values of outcomes multiplied by their respective probabilities. Human capital model of the demand for health was propounded by Grossman's in 1972 as a model of health production and the theory has been extremely influential in this field of study and has several unique elements that make it notable. Grossman's model views each individual as both a producer and a consumer of health. Health is treated as a stock which degrades over time in the absence of improvement health capital stock, so that health is viewed as a sort of capital. The model acknowledges that health is both a consumption good that yields direct satisfaction and utility, and an investment good, which yields satisfaction to consumers indirectly through increased productivity, fewer sick days, and higher wages. Investment in health is costly as consumers must trade off time and resources devoted to health, such as exercising at a local gym, against other goals. These factors are used to determine the optimal level of health that an individual will demand. The model makes predictions over the effects of changes in prices of healthcare and other goods, labour market outcomes such as employment and wages, and technological changes. For the purpose of this study, the equation is anchored on the human capital model of demand for health which clearly show the distinction between health as an output or an object of choice and medical care as an input had not, however, been exploited in the theoretical and empirical literature prior to 1972. Therefore, the optimal level of investment in health occurs where the marginal cost of health capital is equal to the marginal benefits or health outcome.

METHODOLOGY

The design used for the study is survey design. The study area is Calabar metropolis. It is situated in the southern part of Nigeria. Calabar Metropolis comprises of Calabar Municipality and Calabar South local government areas with a total population of 367,848 (176,218 for municipality and 191,630 for Calabar south (NPC, 2006). The population of the study consisted of employees and management staff of the University of Calabar Teaching Hospital, University of Calabar, Calabar and the Federal Neuropsychiatric Hospital who are actively involved in NHIS scheme. The population of study was selected using purposive sample. This is to enable the researcher select the sample that allowed the researcher get the information required to address the objectives of the study. The institutions selected and the respondents were the target of the research study. The selection was as follows;

University of Calabar Teaching Hospital	400
Federal Neuropsychiatric Hospital, Calabar	200

University of Calabar, Calabar

400

Total

1000

The simple random sampling method was used to select the employees and management staff which data was collected from using questionnaire. The sampling size was determine using Taro Yamane's formula usually adopted for known population as follows:

$$\eta = N/1 + N(e)^2 \quad \eta = 1000/1 + 1000(0.05)^2 \quad \eta = 286;$$

Where η = sample size N = total population

e = level of significance. The sample size for this study is made up of two-hundred and eighty-six (286) people chosen from the study population. From this sample, 40 per cent (114) were administered in University of Calabar Teaching Hospital and 40 per cent (114) in University of Calabar, Calabar while 20 per cent (58) were administered in Federal Neuropsychiatric Hospital, Calabar.

Probit regression analysis was employed analysis since it is based on the cumulative normal probability distribution. The dependent variable, y , takes a binary form of zero and one. The equation is anchored on the human capital model of demand for health. The theory is relevant since it made a distinction between health as an output or an object of choice and medical care as an input had not, however, been exploited in the theoretical and empirical literature prior to 1972. Therefore, the optimal level of investment in health occurs where the marginal cost of health capital is equal to the marginal benefits or health outcome. The model depicts that $MC = r + \lambda$ Where; MC is the expected health outcome; r is input of health outcome and λ is the age of the individual demanding health outcome. The probit model can be specified as shown below:

$$Y_i = F(X_i\beta) + \epsilon_i$$

$Y_i = 1$, if adopted and 0, otherwise

Where;

$\epsilon \sim N(0,1)$; β = maximum likelihood; ϵ = error term; X = set of independent variables included in the model. Since estimates of the probit model provide only direction of effects, the marginal effects are usually calculated to interpret the actual change in probability of independent variables.

$$\text{Marginal effects} = \beta_i \phi(z)$$

Where:

β_i = coefficients of the variables; $\phi(z)$ = cumulative normal distribution value associated with the mean dependent variable from the probit estimation. Therefore, health outcomes is expressed in three equations as;

Infant mortality equation

$$\text{INFMO} = f(\text{NHIS}, \text{AGE}, \text{EDQ})$$

$$\ln(\text{INFMO}) = \ln(\hat{Y}/1 - \hat{Y}) = \beta_0 + \beta_1 \text{NHIS} + \beta_2 \text{AGE} + \beta_3 \text{EDQ} + u$$

Theoretically, the a priori expectation are as follow; β_1 , β_2 and $\beta_3 < 0$

Where:

NHIS = National health insurance scheme; AGE = Age distribution of beneficiaries; EDQ = Educational qualification of beneficiaries; \hat{Y} is the predicted probability of the event which is coded with 0= Non-performance; 1= otherwise (performance); 1- \hat{Y} = is the predicted probability of the other decision; X= is the predictor variable representing other independent variables for internal and external variables.

The variables are measured by using the responses of the respondents in the questionnaire. The responses were coded with No = 0; Yes = 1

Definition of variables

Mortality Rate: Morality rate measures the number of deaths in general or due to a specific factor in a particular population. According to the World Health Organization (2020), indicates the number of deaths by place, time and cause. Centre for Disease Control

and Prevention see it as a measure of the frequency of occurrence of death in a defined population during a specified interval. There are two types of mortality, infant mortality and maternal mortality. The formula for the mortality of a defined population over a specified period of time is:

$\frac{\text{Deaths occurring during a given time period}}{\text{Size of the population among which the deaths occurred}} \times 10$

Infant Mortality Rate: It measures the number of deaths among children less than a year of age during a given time interval. IMR is usually calculated on an annual basis and the formula is as follows:

$\frac{\text{Number of deaths among children < 1 year of age reported during a year} \times 1000}{\text{Number of live births reported during the same time period}}$

It is a widely used measure of health status because it reflects the health of the mother and infant during pregnancy and the year thereafter (CDC, 2012).

4 Result and discussion of findings

Table 1: Probit regression result (Infant mortality equation)

Dependent Variable: INFMR
 Method: ML - Binary Probit (Newton-Raphson / Marquardt steps)
 Sample: 1 276
 Included observations: 276
 Convergence achieved after 3 iterations
 Coefficient covariance computed using observed Hessian

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.098906	0.169673	-0.582922	0.5599
NHIS	0.207982	0.152099	1.367411	0.1715
AGE	-0.341128	0.153636	-2.220363	0.0456
EDQ	0.112135	0.153237	0.731774	0.4643
McFadden R-squared	0.556788	Mean dependent var	0.521739	
S.D. dependent var	0.500435	S.E. of regression	0.500824	
Akaike info criterion	1.403992	Sum squared resid	68.22429	
Schwarz criterion	1.456462	Log likelihood	-189.7509	
Hannan-Quin criter.	1.425047	Deviance	379.5018	
Restr. Deviance	382.0953	Restr. log likelihood	-191.0477	
LR statistic	5.593563	Avg. log likelihood	-0.687503	
Prob (LR statistic)	0.002149			
Obs with Dep=0	132	Total obs	276	
Obs with Dep=1	144			

Source: Researcher’s computation, 2026.

From table 1, national health insurance scheme (NHIS) has a positive relationship with infant mortality rate (IINFMR). This means that a one unit increase in NHIS leads to 0.0338272 per 100 increases in infant mortality rate (INFMR). NHIS is not statistically significant at 5 per cent level of significance because its p-value value of 0.1628 is greater than 0.05. Also, from the result, as age increases, infant mortality tends to reduce by 0.033856 per 100. Age has a statistically significant impact on infant mortality at 5 per cent level of significance because its p-value value of 0.0456 is less than 0.05. From the result, one additional year of education increases infant mortality rate by 0.112135 per 100. We assume that education level is one of the important factors affecting infant mortality rate. Surprisingly, we did not find a statistically significant relationship between educational qualification and infant mortality rate given its high p-value of 0.4643 which is greater than 0.05 level.

The McFadden R-squared of the model depicts a good fit. This means that 55.68 per cent of the systematic change in infant mortality rate is accounted for by the independent variable in the model. The other 44.32 per cent left unexplained is attributed to other factors not captured in the model, but represented by the error term. The P-value of LR statistic of 0.002149 indicate that the overall estimated model is statistically significant.

Table 2: Test of Hypothesis

Hypothesis formulated in the null form on the impact of National Health Insurance Authority and Infant mortality rate is tested as stated below;

H_{01} : National Health Insurance Authority has no significant effect on infant mortality rate in Calabar Metropolis.

From the results obtained, we discovered that National Health Insurance Authority (NHIA) do not have significant effect on infant mortality rate. Based on the first research objective, we therefore accept the null hypothesis and conclude that NHIS has no significant effect on infant mortality rate in Calabar Metropolis.

The study discovered that National Health Insurance Scheme (NHIS) do not have significant effect on infant mortality rate in Calabar Metropolis. This outcome could be as a result of low coverage of the National Health Insurance Scheme (NHIS) as well as the high incidence of out-of-pocket payment, and the wide disparity and inequality in income distribution among the populace. Though studies such as Eyong et.al (2016) asserts that NHIS is relevant in reducing life expectancy, the finding is contradicting though with a fairly high McFadden R-squared of 55.68 per cent. This implies that the services offered in NHIS has not yielded the desired result since the problem of infant mortality has not been sufficiently tackled.

5 Summary and conclusion

This study assessed the economic effects of NHIS on health outcome in Calabar Metropolis of Cross River State. The specific objectives were to examine the effect of NHIS on infant mortality rate in Calabar Metropolis of Cross River State. Findings from the infant mortality equation showed that national health insurance scheme (NHIS) has a positive relationship with infant mortality rate (IINFMR). This means that improving the healthcare services provided through the NHIS will also contribute towards increasing infant mortality rate (INFMR) in the metropolis. Though statistically, NHIS is not statistically significant at 5 per cent level of significance because its p-value of 0.1715 is greater than 0.05, but the McFadden R-squared of the model depicts a good fit. This means that 55.68 per cent of the systematic change in infant mortality rate is accounted for by the independent variable in the model. The other 44.32 per cent left unexplained is attributed to other factors not captured in the model, but represented by the error term. The P-value of LR statistic of 0.002149 indicate that the overall estimated model is statistically significant. Government needs to provide additional funding to the NHIS so as to cater for the other people who are not public or civil servants if it expects health outcome of the people such as infant mortality rate to improve. This can be achieved through improved budgetary allocation specifically to the NHIS as well as encouraging non-governmental organizations to fund the scheme. More so, government should expand the healthcare service provided in the NHIS so as to enhance access to scheme especially for people who stay far away from the metropolis. This will assist to reduce the distance and cost of transportation.

Economically, it is believed that health insurance can reduce the high cost of health care on households and health care seekers because health insurance has a source of guarantee to health care seekers. It is a key component of social protection and a significant factor in the economic development of rural areas and urban areas of the economy. On this premise, this present study assessed the economic effects of NHIS on health outcome in Calabar Metropolis of Cross River State. From the findings of the study, it is concluded that National Health Insurance Scheme (NHIS) do not have significant effect on infant mortality rate. However, this study recommends that future studies in this area should be focused on the impact of NHIS on maternal mortality in another Metropolitan city in Nigeria.

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