THE RELATIONSHIP BETWEEN OUT-OF-POCKET EXPENDITURE AND NEONATAL MORTALITY RATE IN NIGERIA

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ABSTRACT

The study analyzed the relationship between Out-of-pocket expenditure (OOPE) and Neonatal mortality rate (NMR) in Nigeria spanning the period 2000 to 2020. The research used time series data generated from world bank indicators considering the variables, Neonatal mortality rate (NMR), Out of pocket expenditure (OOPE) and Per capita income (PCI). Stationarity test, Cointegration, Granger Causality and Least Squares test were conducted. The Augmented Dickey Fuller (ADF) unit root test revealed that one of the variable was stationary at levels while the rest became stationary at the first difference. The Johansen cointegration test result showed that there is a long run relationship among the variables. The Granger causality result reveals a unidirectional relationship between NMR and OOPE while the least squares test indicates a statistically significant relationship between OOPE and NMR. Consequently, the results show that an increase in OOPE, led to a fall in NMR. It therefore recommends governments vigorous pursuit of pooling of financial risks in a manner that it can be used to fund healthcare services for every mother and neonate who is covered and also find alternative sources of financing to exempt or remove all user fees inorder to ease the burden of OOP catastrophe on households.

Keywords: Out-of-pocket expenditure, neonatal, mortality rate
JEL Codes:

1. Introduction

The importance of health in the development and economic wellbeing of individuals and nations as well as the reduction in child mortality, is increasingly being recognized by African governments and the international community (Grekou and Perez 2014). Therefore, reducing the burden of mortality and morbidity among the poor is widely regarded as one of the foremost public health challenges in the world today and a major concern of the international community, as reflected in the MDGs and now SDGs of the 2030 Agenda for Sustainable Development (Dhifri, 2018).

Child mortality is a key global indicator of child health (UNICEF, 2016) and one of the most important measures of global health (Black, Levin, Walker, Chou, Liu and Temmerman, 2016) as stated in the Millennium Development Goal (MDG4) and the Sustainable Development Goal (SDG3) (United Nations, 2016) whose aim is to reduce under-5 mortalities to as low as 25 deaths per 1000 live births in all countries by 2030. The leading causes of these child deaths involves infectious diseases, preterm birth complications, birth asphyxia/trauma, pneumonia, congenital anomalies, diarrhea and malaria, all of which can be prevented or treated with access to simple,

affordable interventions which include immunization, adequate nutrition, safe water and food and quality care by trained health providers when needed. Liu, Oza, Hogan, Chu, Perin and Zhu (2016). Thus, the need for access to life-saving interventions to ensure steady mortality decline especially in low- and middle-income countries. (UN IGME, 2021)

Substantial global progress has been made in reducing child deaths since 1990. The total number of U5 deaths worldwide declined from 12.6 million in 1990 to 5.3 million in 2018, which is equivalent to 1 in 26 children dying before reaching age 5 in 1990 compared to 1 in 11 in 2018 (WHO, 2019), half of which occurred in Sub- Saharan Africa and Asia (UNIGME, 2019). In Nigeria, the year 2000 to 2019 recorded a fall in the rate of neonatal mortality from 46.3 per 1,000 live births to 35.9 per 1,000 live births by the end of 2019. Infant mortality rate fell from 110 in 2000 to 74.2 while under five mortality rate experienced a decline from 183.1 in 2000 to 117.2 per 1,000 live births in 2019 attributed to various innovations, inventions and improvement in health care (WHO, 2019). Indicating that health expenditure is actually reducing child mortality but the rate of reduction recorded in the above mentioned time frame of 18 years is rather slow. However, in recent years, there have been limited improvements in maternal and reproductive health and increasing out-of-pocket expenditure (World Bank, 2011), an indication that there is a need to identify priority groups such as neonates (0 – 28 days) because of their fragile nature and susceptibility to diseases in order to accelerate progress towards the MDGs targets and reduce disparities.

It is pertinent to note that Community based Integrated Management of Childhood Illness (IMCI) and the Integrated Community Case Management (ICCM) project are some of the key child survival interventions that the Nigerian Government has embarked on with the aim of addressing the major childhood illnesses which includes management of infection, jaundice, hypothermia and counseling on breastfeeding for young infants less than 2 months of age (neonates) as evidenced in local communities of Abia and Niger States, geared towards curbing NMR and boosting the awareness of caregivers on the available essential package of interventions for child survival along the continuum of care (Ufere, 2019).

The high level of OOP health spending as a major source of healthcare financing limits the ability of poor households to access and utilize basic healthcare services , thus, the factors that lead to child deaths are directly or indirectly related to the cost that the households pay for their childrens health protection . The treatment seeking behavior of households in terms of child mortality, shaped by perceived and real quality of services provided by different health care facilities and also by individuals capacity to pay (indirectly measured as a share of their per capita income) for the pre and post-natal care of the mother and child , which is a great determinant of the

wellbeing of the neonates and other socio-demographic factors is what this work centers on. It is against this backdrop therefore that the study examines the relationship between out of pocket expenditure (OOPE) and neonatal mortality rate (NMR). To achive this, the study is structured into 5 sections. Section 1 is introduction. Section 2 is literature review. Section 3 is methodology. Section 4 is empirical analysis. Section 5 is conclusion and recommendations.

2. Literature Review

2.1 Conceptual Clarification

Healthcare expenditure refers to all expenses for medical care, prevention, promotion, rehabilitation, community health activities, health administration and regulation, and capital formation with the predominant objective of improving health. It covers the provision of health services (preventive and curative). Thus, investing in the health care system will not only lead to healthier lives but also create employment, enhance political and social stability, and contribute to economic growth and productivity (WHO, 2017). It is of two types which includes public and private expenditure. The public expenditure connotes government stance on health as it implies government fiscal position on health issues. Who pays how much for what, determines how many people obtain treatment, and thus the overall health of a population. WHO endorsed a resolution titled 'Sustainable health financing, universal coverage and social health insurance'. The private health expenditure on the other hand is the share of current health expenditures funded from domestic private sources which includes private individuals (out of pocket expenditure), non-governmental organizations (NGO's) and donor agencies (like World Bank).

Out of pocket expenditure is the health expenditure through out-of-pocket payments per capita (World Bank, 2018). Out-of-pocket payments for health care play an important role in many countries. From low income countries, there is evidence that people not covered by Insurance pay high amounts for health care in relation to their income. The various types of out of pocket expenses include private consultations with doctors, over the counter drugs (OTC), co-payments and user fees and unofficial fees.

Neonatal mortality refers to the first 28 days of life. The neonatal period is the most vulnerable time of a child's survival. Neonatal mortality includes deaths that occur during the first 28 days of life, meaning it is the period that begins with birth and ends 28 complete days after birth. (Ouma; Bashar and Tuno, 2014). Neonatal deaths may be subdivided into early neonatal deaths, occurring during the first seven days of life (0-6 days) and late neonatal deaths, occurring after the seventh day but before the 28th day of life. The WHO (2006) shows that neonatal deaths in developed countries are declining and this is as a result of changing patterns in reproductive health,

socioeconomic progress and improved quality of obstetric and neonatal facilities (Sambo, 2004).

2.2 Theoretical Review

The Income inequality hypothesis theory was proposed by Wilkinson (1992, 1994) and extended by Pickett and Wilkinson (2015). The approach observes that the direct effect of income inequality on health is through comparison, competition, cohesion and social dysfunctions. It also focuses on the direct tie between health and income inequality, regardless of a person's particular income level. There are several potential pathways through which income inequality might harm an individual's health directly. For example, high levels of inequality might produce instabilities in the social capital by increasing mistrust and stress, or declining social cohesion, which in turn adversely influence an individual's own health through psychosocial responses like violent crime or self-destructive behavior. Mellor and Milyo (2002) are of the opinion that the IIH has two versions: The strong version which states that inequality affects all members in a society equivalently, irrespective of their income levels. And the weak version which suggests that income inequality may harm the health of only the least well-off in a society, or that the harmful effect of inequality on health decreases with one's income rank.

Thus, the relationship among income, income inequality, and health is an issue that has attracted the attention of a variety of disciplines such as economics, sociology, and public health. From an early stage in the debate, it was argued that income has a positive effect on health (Grossman, 1972; Preston, 1975). This is called the absolute income hypothesis. However, some researchers assert that relative income or income inequality plays an equally important role in determining health.

Furthermore, the aggregate association between income inequality and health may reflect a nonlinear relationship between income and health at the individual level. For example, if a transfer of one dollar from the rich to the poor improves the health of the poor more than it diminishes the health of the rich, this income-equalizing transfer will increase the average health of the whole society, even though other factors other than income affects individual health. Thus, in order to identify the true effect of inequality, one should employ individual data. (Gravelle, 1998.

In other words, indicating that Nigerian government/NGO's spending on health via interventions and donations of free health care services by individuals and foundations translates in improving the well being of the poor (children) more than it diminishes the health of the rich , thus increasing the average health of the whole society .

2.3 Empirical Review

There are studies on the rel;ationship between out of pocket expenditure and neobatal mortality across the globe using various methods with mixed results. Adeosun and Faboya (2020) did a study on the impact of health expenditure on infant mortality in Nigeria using Vector auto regression (VAR) model techniques, unit root tests and cointegration test on time series data that spanned for the period between 1986 and 2016. Their findings revealed that expenditure on healthcare possesses a negative correlation with the mortality of neonates and infants. Rahman, Khanam and Rahman (2018) examines impact of health care expenditure on health outcome in SAARC-ASEAN Region using fixed and random effect models. The findings showed that total health expenditure, public health expenditure and private health expenditure significantly reduced infant mortality rates, and, the extent of effect of private health expenditure (Out of Pocket payment) was greater than that of public health expenditure as it had a significant role in reducing the crude death rate. Per capita income growth and improved sanitation facilities also had significant positive roles in improving population health in the region.

McKinnon, Harper and Kaufman (2016) examined the socioeconomic and health system determinants of wealth-related inequalities in neonatal mortality rates (NMR) across 48 low- and middle-income countries. Meta-regression was used to assess whether differences in the magnitude of NMR inequalities was associated with inequalities in maternal health services coverage or socioeconomic inequality in NMR . They found that the magnitude of socioeconomic inequality in NMR was most strongly related to inequalities in antenatal care and greatest in countries with higher out-of-pocket health expenditures, more doctors per capita, and a higher adolescent fertility rate. Nikoloski and Amenda (2014) analysed impact of health spending on health outcomes in 14 African countries covering the period 2002 – 2014. The findings suggest that public health expenditures had impact on improved life expectancy at birth in the period under review and reduced neonatal and child mortality rates while private expenditure did not have significant effect on neonate and neonatal mortality.

Kraft, Nguyen, Jimenez-Soto and Hodge (2013) used multivariate regression to assess the contribution of interventions and socioeconomic factors to wealth-related inequality in the Philippines by analyzing the mortality estimates of neonatal, infant, and under-five mortality from 1990-2007. They found that even though there was substantial reductions in the early 1990s in national under-five and infant mortality rates, the rates of decline in recent years has been quite slow with neonatal mortality rates remaining stubbornly high due to wealth-related inequalities in social factors such as maternal education, access to health services and regional location. Riman and Akpan (2012) examined the relationship between healthcare financing and health outcomes in

Nigeria using Multivariate Analysis. The findings show that high levels of infant mortality and morbidity rates were associated with the high incidences of out-of-pocket payments, and the wide disparity and inequality in income distribution. Government health expenditure has positive relationship with neonatal mortality, child mortality and infant mortality rate in Nigeria. Private health expenditure per capita show a negative relationship with neonatal mortality, child mortality and infant mortality rate in Nigeria.

Muldoon, Galway, Nakajima, Kanters, Hogg, Bendavid and Mills (2011) applied mixed effects linear regression study on a sample of 136 United Nations member countries to investigate the link between mortality rates and 13 independent variables, including government and out-of-pocket health expenditures for the year 2008 and found that out-of-pocket health expenditure is significantly linked with mortality rates while factors such as health care system, corruption index and access to water and sanitation were other variables confirmed to be central in explaining variability in mortality rates.

3. Methodology

3.1 Data Sources and Description

This study examined the relationship between Out of Pocket expenditures (OOPE) and Neonatal mortality rate (NMR) in Nigeria using secondary data that spanned the period 2000-2020, extracted from the World Bank database where NMR is the dependent variable while OOPE and PCI are the explanatory variables. To estimate the data collected, the study employed Augmented Dickey Fuller (ADF) unit root test, Johansen cointegration test, Ordinary least squares and Granger causality test .

3.2 Model Specification

The model for this study is adopted from the work of Edeme, Emecheta, and Omeje (2017) who used ordinary least square technique (OLS) and included governance indicators in their variables.The model of both works was modified to include variables like life expectancy (LFEXP), infant mortality rate (IMR) and under five mortality rate (U5MR) as the dependent variable to measure health outcomes, and health expenditure (HEXP), urban population (URBP), per capita income (PCI), and HIV prevalence rate (HIVPR) and governance indicators (GI) as the independent variables to measure health outcomes.

The econometric form of their model is shown below as :

$$HO_t = \beta_0 + \beta_1 HEXP_t + \beta_2 URBP_t + \beta_3 PCI_t + \beta_4 HIVpr_t + \beta_5 GI_t + \mu_t \quad \text{.....} \quad 1$$

Where: HO = Health Outcome, HEXP = Health Expenditure, URBP = Urban Population

PCI = Per Capita Income, HIVpr = HIV Prevalence rate, GI = Governance indicators
U_t = Error Term, = Parameters.

In order to achieve the objective of this study, however, the model is modified to use only one dependent variable; Neonatal Mortality Rate (NMR) and the Per capita income (PCI) component are retained in the model while the Out of pocket expenditure component was added to the model whereas, the HIV Prevalence rate (HIVpr) and Governance indicators (GI) in equation (1) were removed. Thus, the new model is shown in equation 2.

NMR = f (OOPE + PCI) 2

Where ; NMR = Neonatal mortality; OOPE = Out of pocket expenses; PCI = Per capita income

The empirical support for the inclusion of these variables in the model are found in the works of Dhrifi (2018). Adopting Neonatal Mortality Rate (NMR) as proxy for Child mortality, equation (2) above is re-specified in equation below:

NMR=f($\beta_0 + \beta_1 OOPE_t + \beta_2 PCI_{2t}$) +$\mu_t$ ……. 3

$NMR_t = \beta_0 + \beta_1 OOPE_t + \beta_2 PCI_{2t} + \mu_t$ ..... … … … … … … … … … … … … . (4)

Where : NMR = Neonatal Mortality Rate; OOPE = Out of pocket expenditure; PCI = Per capita income; β_{1-2}= Parameters of the Model to be estimated; μ_t = Error Term; $\alpha_1, \alpha_2, \ldots\ldots\ldots, \alpha_{3>0}$ are the apriori expectations; β_0, β_1 and β_2 are the slopes of the coefficients.

3.3 Method of Data Analysis

ADF is a test of stationarity that can be used to check for spurious regression in a model. It is imperative to test for unit root to ensure that the variables are stationary because unrelated time series may exhibit strong trends (sustained upward or downward movements), which can make it look as if they are related. Thus, the ADF test is chosen because it can handle bigger and more complex time series models. Following ADF tests, the ARDL bound test for co-integration is done to analyze the long-run relationships and short-run dynamics interaction between the dependent and independent variables. This cointegration approach is unique and different from others as it does not require that all the variables be integrated of the same order but of different orders. It also provides consistent results for small samples (Pesaran and Shin, 1998). The ECM checks for the speed of adjustment of the model from the short run to the long run equilibrium state. The greater the coefficient of the error correction term, the faster the speed of adjustment of the model from the short run to the long run.

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. It does not mean causation but indicates that there is correlation between the past values of one variable and the present value of another. It is used to know the causal relationship between variables, that is, if it is either uni directional or bi-directional.

4. Empirical Results and Discussion

4.1 Test of Stationarity

Before carrying out any econometric estimation using time series data that are volatile, It is important to verify the stationarity of the data to avoid spurious results. The unit root test was conducted to take care of that and the results are presented in table 1 below:

Table 1: Summary of the ADF Unit Root Test at Levels

Variables	ADF Statistic Values	Critical Values @ 5%	Probability Value @5%	Order of Integration	Remark
NMR	-7.9231	-3.0207	0.0000		Stationary
OOPE	-4.8513	-3.0300	0.0012		Non stationary
PCI	-4.0202	-3.0207	0.0064		Non stationary

Source: Author's computation using Eviews 10, 2024

Table 2: Summary of the ADF Unit Root Test at First Difference

Variables	ADF Statistic	1% critical values	5% Critical Values	10% critical values	Probability Value	Remark
OOPE	-4.8513	-3.8315	-3.0300	-2.6552	0.0012	Stationary
PCI	-6.3341	-3.8574	-3.0404	-2.6605	0.0001	Stationary

Source: Author's computation using Eviews 10, 2024

Tables 1 and 2 summarize the results of unit root test for all the variables. The unit root test was carried out to investigate the properties of the time series data and determine whether they are stationary or not. The Augmented Dickey Fuller test revealed that Neonatal mortality rate (NMR) is stationary at levels while Out of pocket expenditure (OOPE) and Per capita income (PCI) in Nigeria during the periods of 2000 to 2020 are non-stationary at levels. However, stationarity was attained for OOPE and PCI at the first difference I(1) at 5% confidence levels, thus indicating stationarity for all the 3 variables.

4.2 Cointegration Test

To have confirmed the stationarity of the variables at I (1), the presence or non-presence of cointegration among the variables is examined by determining the long run equilibrium relationship among the variables by employing the Johansen cointegration test.

Table 3: Summary of Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.590485	40.64100	29.79707	0.0019
At most 1 *	0.513890	23.67815	15.49471	0.0024
At most 2 *	0.408384	9.973065	3.841466	0.0016
Trace test indicates 3 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.590485	16.96285	21.13162	0.1738
At most 1	0.513890	13.70509	14.26460	0.0611
At most 2 *	0.408384	9.973065	3.841466	0.0016
Max-eigenvalue test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				

Source: Author's computation using Eviews 10, 2024

The first column of the table 4.3 shows the number of cointegrating relations under the null hypothesis from r=0 to r= k-1 (r= 3-1) = 2, where k is the number of endogenous variables. Since we have 3 variables, it justifies the reason why the hypothesized number of CE's shows from none* to at most 2*

A close look at both statistics shows that the Trace statistics and Max Eigen statistics are higher at 5% critical values.

The trace test indicates 3 cointegrating at 5% critical values denoting rejection of the null hypothesis while the maximum eigenvalue statistics show that the null-hypothesis of no-cointegrating is rejected at 5% level of significance. The trace test statistics suggests three cointegrating equation at 5% while the Maximum Eigen statistics suggests no cointegrating equations at 5% level. Thus, since there is an indication of at least three cointegrating equations out of the three variables being considered, the conclusion of the result drawn is that it is cointegrated, signifying a long-run relationship between NMR, OOPE and PCI in the model.

4.3 Granger Causality Test

TABLE 4: Summary of Granger Causality Test			
Null Hypothesis:	Obs	F-Statistic	Prob.
LOG_OOPE does not Granger Cause LOG_NMR	19	0.02746	0.9730
LOG_NMR does not Granger Cause LOG_OOPE		3.69527	0.0514
LOG_PCI does not Granger Cause LOG_NMR	19	0.26246	0.7729
LOG_NMR does not Granger Cause LOG_PCI		3.42325	0.0616
LOG_PCI does not Granger Cause LOG_OOPE	19	1.86472	0.1914
LOG_OOPE does not Granger Cause LOG_PCI		1.31682	0.2992

Source: Author's computation using Eviews 10, 2024

The rule of Granger causality states that: If P value is > 0.05, we accept H_0, meaning there is no causality. If P value is < 0.05, we reject H_0, meaning causality exists.

From above result, the p values of OOPE and PCI from both directions are greater than 0.05 thus, we accept the null hypothesis, meaning there is no causality. The results of the causality of NMR and PCI is the same because their P values are all greater than 0.05, so we do not reject the null hypothesis but accept it.

However, the result of the causality of OOPE and NMR proves contrary as the F- statistics (3.69) is greater than 2 in absolute term and its P value is (0.05) which is equal to 0.05. Thus, since the rule states that the P value should be < 0.05, we reject $H_{0,}$ meaning causality exists. The result also indicates a unidirectional causality that running from NMR to OOPE while the reverse is the case for the other way round (OOPE to NMR).

Since causality did not run in both directions of NMR and OOPE, bearing in mind that the researcher hopes to determine whether statistically one can detect the direction of causality when temporarily there is a lead –lag relationship between two variables. Therefore, we conclude that we cannot use OOPE (health expenditure) to better predict NMR than simply the past history of NMR.

4.5. Post Estimation Tests

Table 5: Summary of Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.597575	Prob. F(1,17)	0.4501
Obs*R-squared	0.713114	Prob. Chi-Square(1)	0.3984

Source: Author's computation using Eviews 10, 2024

The result of serial correlation is presented in table 5. From the result, the Prob. Chi-Square of 0.3984 is greater than the critical value at 5 percent level of significance. It therefore suggests that the model is not serially correlated. The null hypothesis which states that the residuals are not serially correlated is thus accepted. It is therefore concluded that this model is reliable and can be used for economic predictions.

Table 6: Summary of Heteroscedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.362835	Prob. F(2,18)	0.7007
Obs*R-squared	0.813807	Prob. Chi-Square(2)	0.6657
Scaled explained SS	1.569068	Prob. Chi-Square(2)	0.4563

Source: Author's computation using Eviews 10, 2024

This test is conducted to see whether the error variance of each observation is constant or not. The decision rule to accept the null hypothesis that there is no heteroscedasticity in the residuals is that

the calculated F-test statistic (F) must be greater than the 0.05 level of significance. From the result in table 6, the F-Statistic is 0.362835 which is greater than 0.05. Therefore, the study accepted the null hypothesis that the model has no heteroscedasticity in the residuals

5. Conclusion and Recommendations

The study examined the relationship between Out of pocket expenditure (OOPE) and Neonatal Mortality Rate in Nigeria, spanning the period 2000-2020. The OLS result answers the first objective by stating that OOPE is statistically significant and has an impact on NMR by reducing NMR , the Cointegration test result on the other hand indicates that a long run relationship exists among the variables while the granger causality result answers the second objective of the work and states that there is no causal relationship between OOPE and NMR, instead NMR is better predicted using the its past history.

The study therefore recommends that the issue of health inequity should be considered when setting priorities to address the lack of fairness in maternal and neonatal health. Measures should be vigorously pursued to check problems of absenteeism by healthcare professionals as a result of private practice which has resulted in neglect of the poor in the society who constitute majority of those that patronize government hospitals since they cannot afford private hospitals. Furthermore, to achieve the goal of universal healthcare coverage, mothers and neonates have to get access to prepayment and financial risk pooling mechanisms whose aim is that such interventions should target the poorest households, particularly in rural areas to reduce reliance on OOP healthcare payments using payments made in advance of illness to treat sick mothers and neonates, by introducing prepayment schemes to cover payments for transportation and subsistence during an illness of pregnancy, postpartum, and neonatal periods.

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