HOUSEHOLD OUT-OF-POCKET SPENDING, HEALTH OUTCOMES AND POVERTY IN NIGERIA (1988-2021)

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Abstract

This study examined the impact of household out-of-pocket spending and health shocks on poverty in Nigeria. Time series data were obtained from World Development Indicators (WDI) from 1988 to 2021. Poverty was proxied by Real Income Per Capita (RIPC) in one model and Secondary School Enrollment (SSE) in another model. The independent variables were Maternal Mortality Rate (MMR), Malaria Incidence Rate (MIR), Life Expectancy (LEXP) and Out of Pocket Expenditure on Health (OOPEX). The study used the Least Squares Regression method to estimate both the short-run error correction model and the long-run estimates. The findings revealed a significant negative impact of OOPEX and MIR on both RIPC and SSE. LEXP also has a significant positive impact on RIPC and SSE. However, MMR has an insignificant impact on RIPC and SSE. Based on the findings, the study recommends that to reduce poverty, the government need to enhance financial protection, improve maternal health services, combat malaria and improve healthcare infrastructure.

Keywords: Life expectancy, Malaria incidence, Maternal mortality, Out of pocket health spending, Secondary school enrollment.

Jel Classification Code: I15

1. INTRODUCTION

The World Health Organization defines health as a state of complete physical, mental, and social well-being, and not just the absence of disease or infirmity (World Health Organisation, 1946). Achieving good health and low poverty rates are two crucial objectives of Sustainable Development Goals for any country. However, health shocks are unexpected events that can result in a loss of well-being due to illness or injury, while poverty has multiple dimensions. High out-of-pocket healthcare expenses can force many households into poverty. When a household member dies, and there is an increase in out-of-pocket healthcare expenses, the household becomes more vulnerable to poverty due to a reduction in income, savings, investment, and productive activities (Adeshina & Akintunde, 2020).

Nigeria failed to attain any of the Millennium Development Goals (MDGs) and its advancement towards health-related Sustainable Development Goals (SDG) targets has been meagre at best (Kruk, et al. (2018). The health outcomes in Nigeria are woeful, with the majority of the population experiencing insufficient progress over the last three decades. The country's health sector receives minimal investment, with only 4% of the government's total expenditure in 2018 allocated towards it, while a considerable amount is spent on addressing security concerns, leaving very little for health (World Bank, 2021).

The development of any country is heavily reliant on good health, and despite Nigeria having the largest Gross Domestic Product (GDP) in Africa, its per capita income is low, sitting at approximately US2500 dollars as of the end of 2021, a value lower than that of 21 other African countries and equivalent to 19% of the world's average (World Bank, 2022). This paints a bleak picture of a nation grappling with poverty despite its abundance of resources. Around 40% of Nigerians live in poverty, in social conditions which lead to poor health outcomes and place them at constant risk of incurring exorbitant healthcare expenses due to high out-of-pocket spending (Abubakar et al., 2022).

Despite having a young population, Nigeria spends more on healthcare than many other countries in West Africa, mostly through out-of-pocket payments (Popoola, 2022). However, Nigerians have a lower life expectancy of 54 years compared to many of their neighbours. This is due, in part, to the fact that Nigeria has more deaths of children under the age of five than any other country in the world. Nigeria also faces additional challenges such as chronic diseases, a high burden of infectious diseases, and ever-present risks of epidemics like Lassa fever, meningitis, and cholera (Abubakar et al., 2022). Additionally, Nigeria ranks very low on the World Bank's Human Capital Index 2020, with a score of 0.36, placing it among 24 countries out of 174 globally with a score below 0.4 (World Bank, 2021).

While Nigeria's health expenditures have increased somewhat during the fourth republic, the country's total government health spending as a percentage of overall health spending was only 4.22% in 2021, which is lower than the African average of 7.8% and the global average of 12.3% (WHO, 2023). Furthermore, households in Nigeria had to bear an exceptionally high out-of-pocket spending of 73% of the total health expenditure in the country, compared to the African average of 36% and a much lower world average of 16%. (World Bank, 2022).

Nigeria has experienced inadequate health outcomes compared to other African countries due to the insufficient contribution of the government towards health spending. As stated by the World Health Organization in 2016, the country has a high incidence of illnesses such as HIV/AIDS, with a rate of 1,996 per 100,000 individuals, tuberculosis with a rate of 322 per 100,000 individuals, and malaria with a prevalence rate of 31,913 per 100,000 individuals. The high maternal mortality rate of 814 reported cases of death per 100,000 live births, the under-five mortality rate of 108 per 1,000, and the maternal death rate of 560 per 100,000 live births all serve as additional evidence for this. (World Bank, 2017). The inadequate funding by the government for the health sector over the years has also led to a shortage of healthcare workers. For example, the national doctor-patient ratio in 2017 was 1:6000, which is considerably lower than the WHO minimum standard of 1:600 (Onisanwa & Olaniyan, 2019).

The heavy reliance on out-of-pocket healthcare payments may worsen poverty in the country. For rural households, accessing formal healthcare often involves paying high user fees, which adds to their out-of-pocket expenses. This trend is especially problematic for poor households, as they may struggle to afford unexpected medical expenses or other financial shocks, leading to a cycle of poverty (Onisanwa & Olaniyan, 2019). Experiencing a health crisis can hinder efforts to reduce poverty and lead to a further economic disadvantage for households. In Nigeria, several factors including inadequate health insurance coverage, financial difficulties, unemployment, poor quality of healthcare services, ineffective governance, low levels of education, and limited access to healthcare information all contribute to health shocks and the overall increase in poverty levels (Adeshina & Akintunde, 2020).

Despite the implications of increased household out-of-pocket spending and poor health outcomes on poverty in Nigeria as different studies have shown, the amount of funds allocated to the health sector has been very low. The insufficient allocation of funds to the health sector in Nigeria has resulted in a rise in household out-of-pocket expenditure, leading to various health shocks that drive households into poverty. This situation is worrisome, considering the significance of quality healthcare. This study, therefore, seeks to investigate the impact of household out-of-pocket spending and various health outcomes on poverty in Nigeria.

2.0 LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Out-of-Pocket Spending

Out-of-pocket expenditure refers to the direct payment made by individuals or households or healthcare services or medical expenses that are not covered by insurance or third-party payers. These expenses are typically paid at the time of service or afterwards, and they include costs such as deductibles, copayments, and coinsurance. (WHO, 2010). It can also be seen as the personal expenses incurred by individuals for goods and services that are not reimbursed or covered by any form of insurance or public assistance. It encompasses various areas of spending, including healthcare, education, housing, transportation and other daily necessities (National Bureau of Economic Research, 2009).

2.1.2 Health Outcomes

Health outcomes refer to the effects or consequences of healthcare interventions or public health efforts on the health status of individuals or populations (Kindig & Stoddart, 2003). Health outcomes are the measurable results of healthcare interventions, treatments, or preventive measures on the health and well-being of individuals, including improvements in morbidity, mortality, quality of life, functional status, and patient satisfaction (Centers for Medicare & Medicaid Services, 2020). It encompasses the overall impact of social, economic, and environmental factors on the health of individuals and communities, taking into account both positive and negative aspects (WHO, 2020).

2.1.3 Poverty

Poverty refers to a state or condition in which individuals or communities lack the resources, capabilities, and opportunities necessary to meet their basic needs and enjoy a minimal standard of living. It is typically characterized by inadequate income, limited access to education, healthcare, and basic services, and a lack of assets or economic security. Poverty can manifest in various forms, such as extreme poverty, where individuals struggle to meet their most basic needs for survival, or relative poverty, which refers to a situation where people have significantly lower incomes or fewer resources compared to the average population within a particular society or country (United Nations, 2015). Poverty can also be seen as a condition of deprivation and lack, where individuals or households are unable to access or afford the resources and opportunities necessary for a decent standard of living. It encompasses both material and non-material aspects, including income poverty (insufficient income to meet basic needs), food insecurity, inadequate housing, limited access to education and healthcare, and social exclusion. Poverty is a multi-dimensional issue influenced by social, economic and political factors, and it affects various aspects of individuals' lives, including their physical and mental well-being, educational attainment, and social mobility (World Bank, 2021).

2.2 Theoretical Framework

The theoretical framework adopted for this study is the Grossman model of health capital. The theory explains how individuals make decisions about their health investments such as medical care utilization and preventive measures, and how these decisions impact their health outcomes (Grossman, 1972). It provides insights into the relationship between out-of-pocket spending, health outcomes and poverty in Nigeria.

Out-of-pocket expenses are the direct payments made by people at the point where they receive medical care in Nigeria. It can have a big impact on poverty and health outcomes, and the Grossman model explains how they are related.

The approach suggests that people invest in their health by spending money on things like medical care and other initiatives that advance public health awareness. These investments are impacted by variables like income, education, and the cost of medical treatment. To optimize health capital, the model advises that individuals assess the advantages and disadvantages of healthcare investments.

In Nigeria, where a significant portion of healthcare services are financed through out-of-pocket spending, individuals may face financial constraints when accessing healthcare. High out-of-pocket spending can lead to reduced utilization of healthcare services, particularly among low-income individuals, as they may not be able to afford the necessary medical treatments or preventive measures.

The impact of out-of-pocket spending on health outcomes can be twofold. First, individuals who cannot afford necessary medical care may experience delays in seeking treatment or may forgo it together. This can result in worsening health conditions, increased disease burdens and poorer health outcomes. Second, high out-of-pocket spending can lead to catastrophic health expenditures, pushing individuals and households into poverty. In Nigeria, where the poverty rate is significant, the financial burden of healthcare can exacerbate the poverty cycle. Individuals may have to sell assets, borrow money, and cut spending on other essential needs to cover healthcare costs. These economic challenges can further compromise their well-being and perpetuate poverty.

2.3 Empirical Literature Review

Adeoye et al. (2022) conducted a documentary analysis to assess the impact of COVID-19 on the socioeconomic lives of Nigerians and the government's policy response to the situation. The findings from their content analysis revealed that COVID-19 exacerbated existing poverty in Nigeria, and most government policy programs were ineffective in mitigating its effects.

Gbagidi et al. (2021) investigated the relationship between public health expenditure, health outcomes, and economic growth in Nigeria from 1987 to 2018. They adopted the Vector Autoregressive Model (VAR) and found that all the variables responded to their shocks as well as shocks from other variables, based on the results from the impulse response function.

Priyanka and Sumalatha (2021) analyzed the impact of out-of-pocket spending on household well-being in Maharashtra, India, using data from the national sample survey office's 71st round conducted by the Ministry of Health and Family Welfare, Government of India. The results showed that more than 4.8% of the population had their well-being hampered by out-of-pocket expenses, forcing them to drop below the poverty line. Data visualization was used to present the findings using tables, charts, and graphs. Due to higher out-of-pocket expenses than urban residents, it has been established that rural households are more impacted by the rise in poverty.

Sirag and Nor (2021) examined the relationship between out-of-pocket spending on health expenditure and poverty using a sample of 145 countries from 2000 to 2017. They utilized the dynamic panel threshold technique and found that there was a favourable or negligible impact on poverty reduction for the lower-income group below the threshold for out-of-pocket health spending. However, above the cutoff, health expenses paid for out of pocket increased poverty levels. Adeshina and Akintunde (2020) conducted a study in Nigeria from 1981 to 2017 to examine how health shocks affect poverty. They used the Vector Error Correction Model (VECM) and employed Impulse Response and Variance decomposition techniques. The results indicated that an increase in out-of-pocket expenditure and death rate contributes significantly to shocks in the poverty level.

Ouadika (2020) analyzed the vulnerability of poverty to health shocks in Congo, using data from the 2011 Congolese Household Survey (CHS). The study employed the three-step feasible generalized least squares (FGLS) method to estimate vulnerability to poverty and model the effect of health shocks on expected future consumption. The findings showed that health variables such as recent household death, serious illness, and malaria make a significant contribution to vulnerability to poverty, affecting an average of 32.6%, 32.3%, and 24.4% of households, respectively.

Onisanwa and Olaniyan (2019) examined the effect of health shocks on changes in household consumption in Nigeria. They utilized a fixed effect model and a multinomial logit model. The findings showed that disability and death have a negative effect on food consumption. Death decreases non-food consumption, while disability does not have a statistically significant impact. Severe illness has a significant positive impact on consumption. Ogunjimi and Adebayo (2019) used the Toda-Yamamoto causality to examine the relationship between health expenditures, health outcomes and economic growth in Nigeria from 1981 to 2017. Their findings revealed a unidirectional causality running from health expenditure to life expectancy and maternal mortality rate in Nigeria.

Hamzat et al. (2019) conducted a study on the impact of health expenditure on the child mortality rate in Nigeria from 1980 to 2015. They utilized the Autoregressive Distributed Lag model (ARDL) and found that all the explanatory variables had a significant negative impact on the infant mortality rate in Nigeria.Ubi and Ndem (2019) focused on modelling the dynamics of poverty and its impact on health outcomes in Nigeria. They used a vector autoregressive econometric approach (VAR). The results of the infant mortality equation indicated a positive correlation between infant mortality and all variables except carbon dioxide emissions and poverty. The variance decomposition analysis showed that, in the short run, poverty does not significantly predict infant mortality in Nigeria. However, the impulse response function revealed a long-term significant negative impact of shocks in the poverty index (misery index) on infant mortality during the study period.

Atake (2018) examined the impact of health shocks in Sub Sahara Africa by examining the vulnerability of the poor and uninsured households to health shocks in three countries: Togo, Burkina Faso and Niger. The results of a three-step general least squares method showed that household poverty in the three nations is significantly worsened by health shocks. Nkpoyen et al. (2014) conducted survey research to evaluate the relationship between health capital and poverty reduction in rural Cross River State, Nigeria. The study collected data through structured questionnaires and interviews administered to six rural communities. Using the Pearson product-moment analysis, the findings revealed that healthcare demand, accessibility and affordability of healthcare services, and the proportion of household income allocated to healthcare significantly relate to rural poverty reduction.

2.4 Gaps in Literature

Some of the previous studies conducted on out-of-pocket spending, health outcomes and poverty in Nigeria such as Ouadika (2020), Nkpoyen et al. (2014), and Priyanka and Sumalatha (2021) relied on household surveys and self-reported data which may be subject to bias and measurement error. This study will try to cover this gap by using more objective secondary data on various health outcomes to enhance the accuracy and reliability of the findings. Secondly, none of the studies was able to clearly define a variable to capture poverty, though it is difficult to define poverty. However, this study will proxy poverty by two variables which are Real Income Per Capita and Secondary school enrollment. An increase in access to secondary education can translate to a reduction in poverty since educated individuals have access to gainful employment that can make them break the poverty cycle (Oranga, et al. (2020). Also, an increase in per capita income means a reduction in poverty since an individual will be able to afford the necessities (Fields, 1989).

3.0 METHODOLOGY

3.1 Data Sources and Description

For this investigation, time series data from 1988 to 2021 were used. World Development Indicators provided information on real per capita income, out-of-pocket spending per person, maternal mortality rate, life expectancy, and malaria incidence rate, while the World Bank provided information on secondary school enrollment.

Table 3.1 Variable Description

Variable	Meaning	Source
Real Income Per Capita	It is the average income earned per person in a given country. It is calculated by dividing the country's national income by its population and then adjusting for inflation. It is measured in US dollars.	**World Development Indicators**
Secondary School	This is defined as the share of the children of secondary school age that are currently enrolled	**World Bank**

Enrollment.	in school.	
Maternal Mortality Rate	This is defined as the number of maternal deaths during a given period per 100,000 live births.	**World Bank**
Malaria Incidence rate:	This is defined as the number of cases of malaria per 1000 people at risk each year.	**World Bank**
Life Expectancy	This is the average number of additional years that a person of a given age can expect to live.	**World Bank**
Out-of-pocket expenditure per capita	This measures the direct payments made by individuals to healthcare providers at the time of service use. It is measured in US dollars	**World Bank**

3.2 Model Specification

This research uses two models. This is because poverty is a multifaceted notion that is difficult to quantify using just one variable. To keep things simple, the study will only use two dependent variables as proxies for poverty reduction: Real income per capita and secondary school enrollment. Since more people will have access to meaningful jobs, which can help them break the cycle of poverty, an increase in secondary education availability can result in a decrease in poverty (Oranga et al., 2020). Also, an increase in per capita income means a reduction in poverty since an individual will be able to afford the necessities of life (Fields, 1989).

Maternal mortality rate, life expectancy, and other health variables were utilized as proxies for health outcomes in the study model, which was modified from the work of Ogunjimi and Adebayo (2019) to meet the study's goal.

Functional Form of the Model

Model 1

$$RIPC = f(MMR, MIR, OOPEX, LEXP) \text{--} (1)$$

Where RIPC = Real Income Per Capita proxied for Poverty, MMR= Maternal Mortality Rate,

MIR= Malaria Incidence Ratio, OOPEX= Household Out Of Pocket Spending Per Capita, LEXP= Life Expectancy at Birth.

The long-run model will be estimated using the ordinary least squares approach.

The mathematical form of the static model is formulated as follows:

$$RIPCt = \alpha 0 + \alpha 1MMRt + \alpha 2MIRt + \alpha 3OOPEXt + \alpha 4LEXPt \text{------------------} (2)$$

The stochastic form of the model is given as

$$\boldsymbol{RIPCt = \alpha 0 + \alpha 1 MMRt + \alpha 2 MIRt + \alpha 3 OOPEXt + \alpha 4 LEXPt + ut}\text{-----------}\mathbf{(3)}$$

The short-run coefficients on the other hand will be estimated using the error correction mechanisms (ECM)

The dynamic error correction model is formulated as follows:

$$\boldsymbol{\Delta RIPC_t = \omega + \sum_{i=1}^{n1} \varphi_i \Delta RIPC_{t-i} + \sum_{i=0}^{n2} \beta_{1i} \Delta MMR_{t-i} + \sum_{i=0}^{n3} \beta_{2i} \Delta MIR_{t-i} + \sum_{i=0}^{n4} \beta_{3i} \Delta OOPEX_{t-i} + \sum_{i=0}^{n5} \beta_{4i} \Delta LEXP_{t-i} + \delta ECT_{t-i} + \in_t}\text{------}\mathbf{(4)}$$

Where α_0 is the intercept of the long-run model, α_1 to α_4 are the long-run coefficients of the independent variables, ωis the intercept of the short-run model, φ_i is the coefficients of the lagged values of RIPC, $\beta_{1\,i}$to $\beta_{4\,i}$ are the short-run coefficients of the explanatory variables. δ is the coefficient of the error correction term (ECT) which represents the speed of adjustment from the short-run to the long-run equilibrium. U, ∈ are the Noise or stochastic components for the long-run and short-run model respectively and Δ is the difference operator.

Model 2

$$\boldsymbol{SSE = f(MMR, MIR, OOPEX, LEXP)}\text{------}\mathbf{(5)}$$

Where SSE = Secondary School Enrolment proxied for poverty.

The long-run model will be estimated using the Ordinary Least Squares approach.

The mathematical form of the static model is formulated as follows:

$$\boldsymbol{SSEt = \gamma 0 + \gamma 1 MMRt + \gamma 2 MIRt + \gamma 3 OOPEXt + \gamma 4 LEXPt}\text{------}\mathbf{(6)}$$

The stochastic form of the model is given as

$$\boldsymbol{SSEt = \gamma 0 + \gamma 1 MMRt + \gamma 2 MIRt + \gamma 3 OOPEXt + \gamma 4 LEXPt + ut}\text{------}\mathbf{(7)}$$

The short-run coefficients on the other hand will be estimated using the error correction mechanisms (ECM).

The dynamic error correction model is formulated as follows:

$$\boldsymbol{\Delta SSEt = \pi + \sum_{i=1}^{n1} \rho_i \Delta SSE_{t-i} + \sum_{i=0}^{n2} \sigma_{1i} \Delta MMR_{t-i} + \sum_{i=0}^{n3} \sigma_{2i} \Delta MIR_{t-i} + \sum_{i=0}^{n4} \sigma_{3i} \Delta OOPEX_{t-i} + \sum_{i=0}^{n5} \sigma_{4i} \Delta LEXP_{t-i} + \theta ECT_{t-i} + \in_t}\text{------}\mathbf{(8)}$$

Where $\boldsymbol{\gamma_0}$is the intercept of the long-run model,$\boldsymbol{\gamma_1}$to $\boldsymbol{\gamma_4}$are the long-run coefficients of the independent variables, **π**is the intercept of the short-run model, $\boldsymbol{\rho_i}$ is the coefficients of the lagged values of SSE, $\boldsymbol{\sigma_{1i}}$ to $\boldsymbol{\sigma_{4i}}$ are the short run coefficients of the explanatory variables, **θ**is the coefficient of the error correction term (ECT) which represents the speed of adjustment from short-run to the long-run equilibrium. U, ∈ are the Noise or stochastic component for the long-run and short-run model respectively, Δ is the difference operator.

3.3 Method of Data Analysis

The study used the following techniques. The kind of data was examined using descriptive statistics. The Augmented Dickey-Fuller (ADF) Test and the Philips-Perron Test were employed to conduct the unit root test. The Engle and Granger test for a single equation was utilized to conduct the co-integration test. Using Ordinary Least Squares, the long-run coefficients were obtained. Also, the OLS was used to estimate the Error Correction Model to determine the short-run coefficients and the error correction term. Several post-estimation tests such as the Jarque Bera normality test, Breuch-Godfrey LM serial correlation Test,Breuch-Pagan- Godfrey heteroscedasticity test, Ramsey-reset test for linearity and stability diagnostic test were conducted to determine the robustness of the model.

4.0 RESULTS AND DISCUSSION OF FINDINGS

The following are the analysis and discussions of the result of the study.

Table 1. Descriptive Statistics

Statistics	RIPC	SSE	MMR	MIR	OOPEX	LEXP
Mean	1965.275	32.4129	1114.38	404.1214	35.0604	49.1588
Median	1913.100	32.6500	1105.0	417.3769	32.4010	47.9860
Maximum	2688.267	56.2100	1400.0	510.3455	77.5370	55.5000
Minimum	1414.101	22.1300	850.00	275.0030	9.4434	45.8430
Std Deviation	475.2272	8.9937	178.763	77.5129	23.9633	3.4013
Skewness	0.174798	0.7760	0.1587	-0.4302	0.2086	0.5085
Kurtosis	1.3610	2.7608	1.5450	1.8584	1.4505	1.7242
Jarque- Bera	3.9784	3.4930	3.1419	2.8952	3.6480	3.7710
Probability	0.1368	0.1744	0.2079	0.2351	0.1614	0.1517
Sum	66819.35	1102.040	37923.00	13740.13	1192.062	1671.399
Sum of Squ. Dev.	7452749	2669.286	1054550	198272.2	18949.89	381.7686
Observation	34	34	34	34	34	34

Source: Authors compilation, 2023

The closeness in the values of the mean and median, as well as the low values of the standard deviation shows that the series are less spread or dispersed. The p-value of the Jarque-Bera statistic shows that all the variables are normally distributed at a 5% level of significance since their p-value is greater than 0.05.

Table 2. Correlation Matrix

	RIPC	SSE	MMR	MIR	OOPEX	LEXP
RIPC	1.0000	0.8823	-0.9284	-0.8909	0.9703	0.9435
SSE	0.8823	1.0000	-0.7798	-0.6937	0.9110	0.7188
MMR	-0.9284	-0.1482	1.0000	0.9263	-0.9034	-0.9381
MIR	-0.8908	-0.6937	0.9263	1.0000	-0.8076	-0.9558
OOEXP	0.9703	0.9110	-0.9034	-0.8076	1.0000	0.8712
LEXP	0.9435	0.7188	-0.9381	-0.9558	0.8712	1.0000

Source: Authors compilation, 2023

The correlation matrix above shows that all the variables exhibit a strong relationship with each other as indicated by the magnitudes of their correlation coefficients.

4.1 Pre-Estimation Test

Unit root test

The time series properties of macroeconomic variables need to be ascertained when carrying out time series analysis to guard against obtaining a spurious regression result (Ogunjimi and Adebayo, 2019). The appropriate test for checking this time series property is the unit root test. This study adopted the Augmented Dickey-Fuller and Pillips-Perron test statistics and the results are presented below:

Table 3. Augmented Dickey-Fuller Unit Root Test Results

Variables	**Level**			**1st Difference**			**Order of Integration**
	ADF test statistic	Critical values at 5%	Decision	ADF test statistic	Critical values at 5%	Decision	
RIPC	-0.9426	-2.9571	Not stationary	-3.2241	-2.9571	Stationary	I(1)
SSE	-1.3626	-2.9540	Not stationary	-5.6286	-2.9571	Stationary	1(1)

MMR	-0.7889	-2.9604	Not stationary	-3.7456	-2.9604	Stationary	I(1)
MIR	1.4586	-2.9763	Not stationary	-3.1578	-2.9571	Stationary	I(1)
OOPEX	-0.8764	-2.9540	Not stationary	-2.9571	-4.6610	Stationary	I(1)
LEXP	1.8835	-2.9604	Not stationary	-4.5866	-3.6122	stationary	I(1)

Source: Authors compilation, 2023

Philips-Perron Unit Root Test

The Philips-Perron statistic will be used to confirm the result from the ADF test.

Table 4. The Phillips-Perron unit root test results

Variables	**Level**			**1st Difference**			**Order of Integration**
	Philips-Perron Statistic	Critical values at 5%	Decision	Philips-Perron Statistic	Critical values at 5%	Decision	
RIPC	-0.7671	-2.9540	Not stationary	-3.1607	-2.9571	stationary	I(1)
SSE	-14445	-2.9540	Not stationary	-5.6831	-2.9571	Stationary	1(1)
MMR	-0.5947	-2.9540	Not stationary	-3.6513	-2.9577	stationary	I(1)
MIR	-0.1797	-2.9540	Not stationary	-3.2926	-2.9577	stationary	I(1)
OOPEX	-1.02930	-2.9540	Not stationary	-4.8091	-2.9577	stationary	I(1)
LEXP	-2.1103	-2.9540	Not stationary	-3.2882	-2.9577	stationary	I(1)

Source: Authors compilation, 2023

We are to reject the null hypothesis that a variable has a unit root if the ADF or PP test statistic is greater than the critical values at a 5% level of significance. Otherwise, we will accept the null hypothesis. The unit root test result above shows that all the variables are not stationary at levels but are stationary at first difference. Since the order of integration is I(1) for all the variables. It means we need to estimate a short-run model. However, we cannot rule out the possibility of a long-run relationship among the variables. Hence, we need to test for the long-run relationship using the Engle and Granger cointegration approach for a single equation.

The Engle and Granger test for Cointegration

We are adopting the Engle-Granger cointegration test since we are dealing with a single equation model. This involves testing the residuals in the ordinary least square estimates to see if they have a unit root. Variables are said to have a long-run relationship if there is no unit root in their residuals when combined linearly otherwise they are not co-integrated (Salisu, 2015).

Table 5. Engle-Granger unit root test for the residuals

	ADF test statistic @ level	**Phillips-Perron Test statistics @ level**	**Critical value at a 5% Level of significance**	**Decision**
Model 1	-4.3439	-4.1134	-2.9540	Stationary
Model 2	-4.8919	-4.8935	-2.9540	Stationary

Source: Authors compilation, 2023

The table above shows that both the ADF test statistic and PP statistic are greater than the critical value at a 5% level of significance. It means there is no unit root in the residuals. Hence we can conclude that the variables are co-integrated. The variables can be combined linearly. We may therefore proceed to estimate both the short-run and the long-run model using the Least Squares approach.

4.2 Model Estimation

The results below are the long-run estimates obtained using the least squares regression method.

Table 6. Presentation of the Long Run Estimates

	Model 1 Dependent Variable: RIPC				**Model 2 Dependent Variable: SSE**			
Variables	Coefficients	Standard Errors	T-Statistic	P-Value	Coefficients	Standard Errors	T-Statistic	P-Value
MMR	0.4378	0.2357	1.8572	0.0735	-0.0118	0.0113	-1.0389	0.3074

MIR	-0.7916	0.5609	-1.4113	0.1688	-0.6411	0.0269	-2.3806	0.0241
OOPEX	-13.6397	1.2052	-11.3178	0.0000	-0.5104	0.0579	-8.8110	0.0000
LEXP	52.4515	13.8505	3.7870	0.0007	2.0490	0.6651	3.0808	0.0045

Source: Authors compilation, 2023

The table above shows the long-run coefficients of the independent variables for the two models. The first model shows that in the long run, MMR and MIR have no significant impact on RIPC as revealed by their probability values of 0.0735 and 0.1688 respectively. On the other hand, OOPEX has a significant negative impact on RIPC and a unit increase in OOPEX will bring about a 13.63970 unit decrease in RIPC (indicating an increase in the level of poverty). Also, LEXP has a significant positive impact on RIPC and a unit increase in LEXP will bring about a 52.45150 unit increase in RIPC (a fall in poverty). On the other hand, estimates from the second model show that MMR has no significant impact on SSE as indicated by the p-values and a unit increase in MIR will bring about a 0.64 unit decrease in SSE. The p-value shows that the relationship is statistically significant. Also, the result shows a significant negative relationship between SSE and OOPEX and a unit increase in OOPEX will bring about a 0.51 unit decrease in SSE. Lastly, there is a significant positive relationship between LEXP and SSE and a unit increase in LEXP will bring about a 2.05 unit increase in SSE.

Table 7. Post Estimation Test (Long Run Models)

	Model 1	**Model 2**
R^2	0.9837	0.8952
Adjusted R^2	0.9815	0.8808
D.W Statistic	1.89	1.74
Prob. (F-statistic)	0.0000	0.0000
Prob. (Jaque-Bera)	0.3174	0.7309
Breuch-Godfrey	0.4702	0.7665
Breuch-Pagan-Godfrey	0.3530	0.2345
Ramsey Reset Test	0.2624	0.5477

Source: Authors compilation, 2023

From model 1, R^2 of 0.983726 shows that 98% of the variation in RIPC is caused by MMR, MIR, OOPEX, and LEXP in the long run. This is an indication of the high explanatory power of the model and therefore good for prediction. The D.W. statistic of 1.89 (approx. 2) shows that there is no auto-correlation in the model. The probability of an F-statistics of 0.0000 shows that the overall model is statistically significant. At a 5% level of significance, the Breuch-Godfrey probability of 0.4702 indicates that there is no serial correlation in the model. At a 5% level of significance, the model's Jarque-Bera probability of 0.317417 indicates that it is regularly distributed. At a 5% level of significance, the Breuch-Pagan-Godfrey probability of 0.3530 demonstrates the model's lack of heteroscedasticity, while the Ramsey reset probability of 0.2624 demonstrates the model's linearity and accurately defined specification.

On the other hand, from model 2, the R^2 of 0.895229 shows that 89% of the variation in SSE is caused by MMR, MIR, OOPEX and LEXP in the long run. This demonstrates the model's strong explanatory power, making it suitable for making predictions. The D.W. score of 1.74 (about 2) indicates that the model does not contain any auto-correlation. The total model is statistically significant, as indicated by the probability of an F-statistics of 0.000000. At a 5% level of significance, the Breuch-Godfrey probability of 0.7665 indicates that there is no serial correlation in the model. At a 5% level of significance, the model's Jarque-Bera probability of 0.730922 indicates that it is regularly distributed. The Breuch-Pagan-Godfrey probability of 0.2345 shows the absence of heteroscedasticity in the model at a 5% level of significance and lastly, the Ramsey reset probability of 0.5477 shows that the model is linear and correctly specified at a 5% level of significance.

Stability Test

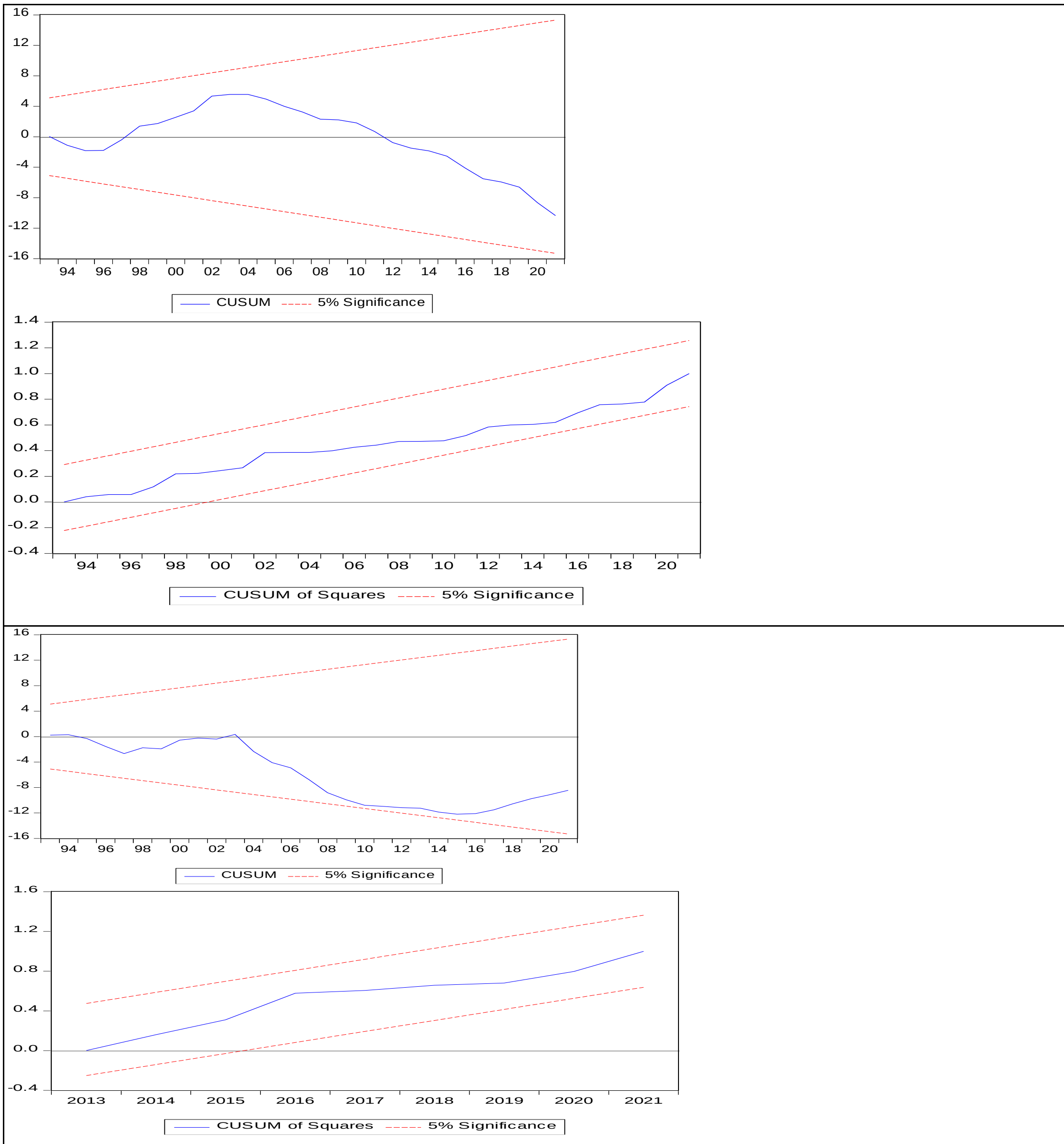


Fig 1. CUSUM and CUSUM of Squares for the Long-run estimates

Source: Authors compilation, 2023

The figures above show that the plot of the CUSUM for both models under consideration is within the five per cent critical bound. Both lines lie in between the upper and lower bound. It implies that the parameter estimates do not suffer any structural breaks or instability throughout the study i.e. all the coefficients in the static models are stable.

Short Run Estimates

Table 8. Parsimonious Error Correction Model

	MODEL 1 Dependent variable: D(RIPC)		MODEL 2 Dependent variable: D(SSE)	
Variables	**Coefficients**	**T-statistics (P-values)**	**Coefficients**	**T-statistics (P-values)**
D(RGDPP(-1))	0.2965	1.945062 (0.0667)	-	-
D(SSE(-1))	-	-	0.2663	1.2267 (0.2318)
D(MMR(-1))	-1.5965	-3.0879 (0.0061)	0.0649	1.7399 (0.0947)
D(MIR)	-2.4704	-2.1541 (0.0443)	-0.2141	-2.9311 (0.0073)
D(MIR(-1))	5.12721	4.0138 (0.0007)	0.0341	0.4545 (0.6535)
D(MIR(-2))	-5.0880	-4.3496 (0.0003)	-	-
D(MIR(-3))	3.4774	3.9325 (0.0000)	-	-
D(OOPEX)	-5.8339	-3.7482 (0.0014)	0.1227	-4.0028 (0.0005)
D(LEXP(-1))	712.16	2.5697 (0.0188)	2.2681	-1.2581 (0.2204)
D(LEXP(-2))	-600.424	-2.3913 (0.0273)	-	-
ECT(-1)	-0.4248	-3.6431 (0.0017)	-1.2355	-3.6432 (0.017)

Source: Authors compilation, 2023

The short-run estimates for model 1 above show that one period lag of RIPC has no significant impact on its current value as given by the p-value of 0.0667. On the other hand, a period lag of MMR has a significant negative impact on current RIPC and a unit increase in one period lag of MMR will reduce RIPC by 1.596482 and hence increase the level of poverty. Also, the current and past values of MIR have a significant negative impact on RIPC as revealed by their p-value at 5%. In addition, a unit increase in the current value and two-period lags of MIR will bring about 2.470362 and 5.087984 unit decrease in RIPC respectively (which represent an increase in poverty) and a unit increase in one and three-period lags of MIR will bring about 5.127207 and 3.477409 unit increase in RIPC respectively (representing a fall in poverty). Furthermore, the current value of out-of-pocket spending OOPEX has a significant negative impact on RIPC and a unit increase in the current value of OOPEX will bring about a 5.833915 unit decrease in RIPC (increasing the level of poverty). Also, one period lag of LEXP has a significant positive impact on RIPC and a unit increase in one period lag of LEXP will bring about a 712.1609 unit increase in RIPC (which translate to a fall in the level of poverty). The result also showed that two-period lags of LEXP have a significant negative impact on RIPC and a unit increase in the value will bring about a 600.4236 unit decrease in RIPC (an increase in the level of poverty). Lastly, the coefficient of the error correction term of -0.424820, shows that 42% of the deviations in the short run affected by shocks will be corrected in the long run.

On the other hand, the short-run estimates for model 2 above show that one period lag of SSE has no significant impact on its current value as given by the p-value. Also, the current and one-period lag of MMR has no significant impact on SSE as given by their p-values. In addition, one period lag of MIR has no significant impact on SSE. However, its current value has a significant negative impact on SEE. A unit increase in MIR will bring about a 0.21 fall in SSE. Also, a unit increase in OOPEX will bring about a 0.49 decrease in SSE. This impact is significant based on the p-value. Finally, one period lag of LEXP has no significant impact on SSE. The error correction term of -1.235540 shows that about 124% of the deviation in the short run will be corrected in the long run. The ECT is also statistically significant based on the p-value and the coefficient is correctly signed.

Table 9. Post Estimation Test (Short Run Models)

	Model 1	**Model 2**
R^2	0.87	0.9234
Adjusted R^2	0.80	0.8990
D.W Statistic	2.28	2.04
Prob (F-statistics)	0.0000	0.0000
Prob (Jaque-Bera)	0.7825	0.4542
Breuch-Godfrey	0.1143	0.7997
Breuch-Pagan-Godfrey	0.3249	0.5275
Ramsey Reset Test	0.7184	0.48

Source: Authors compilation, 2023

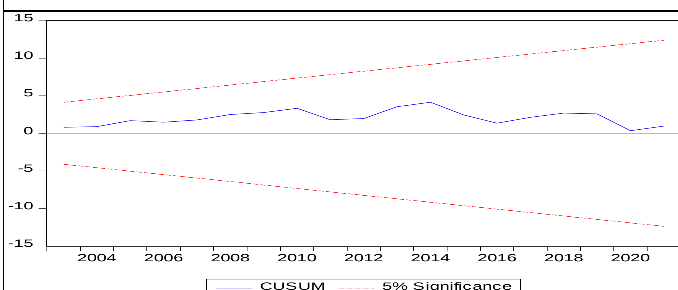
From model 1, The R^2 of 0.87 means 87% of the variation in RIPC is caused by the explanatory variables. This is an indication of the high explanatory power of the model and therefore good for prediction. The D.W. statistic of 2.28 shows that there is no auto-correlation in the model. The probability of F-statistics of 0.000002 shows that the overall model is statistically significant. The Breuch-Godfrey probability of 0.1143 shows the absence of auto-correlation in the model at a 5% level of significance. The Jarque-

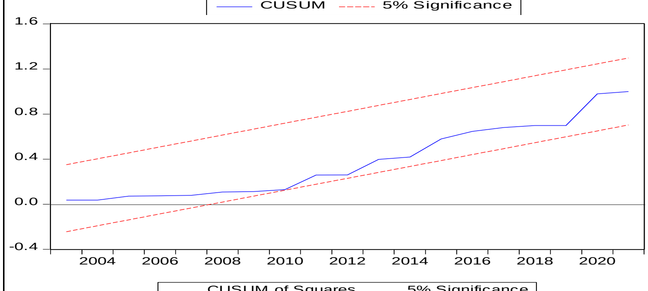
Bera probability of 0.782519 shows that the model is normally distributed at a 5% level of significance. The Breuch-Pagan-Godfrey probability of 0.3249 shows the absence of heteroscedasticity in the model at a 5% level of significance and lastly, the Ramsey reset probability of 0.7184 shows that the model is linear and correctly specified at a 5% level of significance.

The explanatory factors account for 92% of the variation in SSE, according to model 2, where the R^2 is 0.92. This demonstrates the model's strong explanatory power, making it suitable for making predictions. According to the D.W. statistic of 2.04, the model does not contain any auto-correlation. The entire model of an R^2 is statistically significant, as indicated by the likelihood of F-statistics of 0.000004. At a 5% level of significance, the Breuch-Godfrey probability of 0.7997 demonstrates the model's lack of auto-correlation. At a 5% level of significance, the model's Jarque-Bera probability of 0.4542 indicates that it is regularly distributed. The Breuch-Pagan-Godfrey probability of 0.5275 shows the absence of heteroscedasticity in the model at a 5% level of significance and lastly, the Ramsey Reset probability of 0.48 shows that the model is linear and correctly specified at a 5% level of significance.

Stability Test

Model 1





Model 2

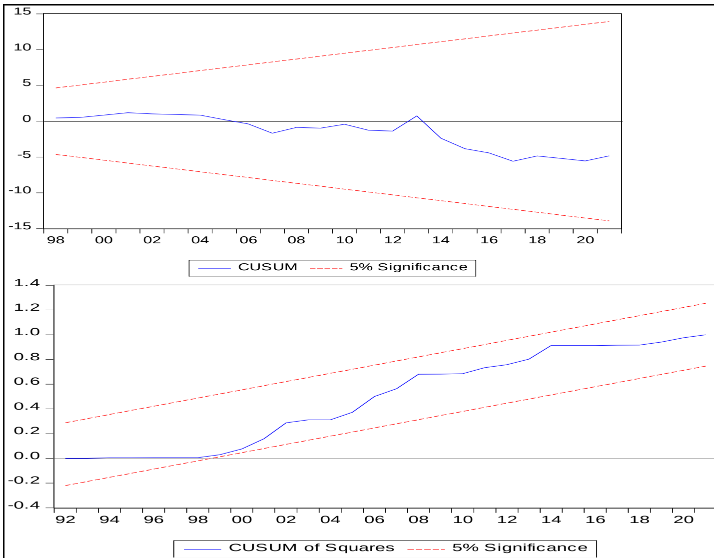


Fig 2: CUSUM and CUSUM of Squares of the short-run estimates

Source: Authors compilation, 2023

The figures above show that the plot of the CUSUM and CUSUM of Squares for both models under consideration are within the five per cent critical bound. Both lines lie in between the upper and lower bound. It implies that the short-run parameter estimates do not suffer any structural breaks or instability throughout the study i.e. all the coefficients in the error correction models are stable.

4.3 Discussion of Findings and Policy Implications

The long-run estimates show that maternal mortality rate has no significant impact on RIPC and SSE in the long run. Malaria incidence rate has a negative impact on both RIPC and SSE but the impact on RIPC is not statistically significant. The result shows that OOPEX has a significant negative impact on both RIPC and SSE in the long run. This is in line with the findings of Priyanka and Sumalatha (2021). LEXP also has a significant positive impact on both RIPC and SSE. From the short-run estimates, a period lag of RIPC and SSE has no significant impact on their current values. On the other hand, one period lag of MMR has a significant negative impact on RIPC but an insignificant impact on SSE. This aligns with the findings of Ouadika (2020), and Nkpoyen et al. (2014). The non-significant impact of maternal mortality rate (MMR) on both RIPC and SSE, in the long run, suggests that it may not be a direct driver of poverty or school enrollment rates in Nigeria. However, the significant negative impact of its one-period lag on RIPC is an indication that past efforts in reducing maternal mortality rate will increase Real income per capita in the current period and hence reduce poverty. The one and two-period lags of MIR have a significant negative impact on RIPC but an insignificant impact on SSE. This is similar to the findings of Atake (2018) and Adeoye, et al. (2022). However, the current value of MIR has a significant negative impact on SSE. This underscores the need for targeted efforts to combat malaria and improve access to effective prevention, diagnosis, and treatment interventions. Investing in malaria control programs can contribute to poverty reduction by improving productivity. In addition, the current value of OOPEX has a significant negative impact on RIPC and SSE. This is in line with the findings of Adeshina and Akintunde (2020) and Ouadika (2020), The significant negative impact of out-of-pocket expenditure per capita (OOPEX) on real income per capita (RIPC) and secondary school enrollment (SSE) in both the short-run and the long-run highlights the financial burden faced by individuals and families in accessing healthcare and education services. Additionally, LEXP's one-period latency has a very good effect on RIPC. The strong beneficial impact of life expectancy (LEXP) on RIPC and SSE highlights the value of funding public health initiatives and healthcare infrastructure. Increasing life expectancy not only improves well-being in general but also has a favourable impact on economic development and educational outcomes. The coefficients of the error correction terms of -0.424820 and -1.235540 indicated that, in the long run, respectively 42% and 123% of the short-run deviation will be corrected. It suggests that any deviation in RIPC and SSE brought on by shocks in the explanatory variables will be quickly and thoroughly repaired over the long term. The post-estimation tests carried out for the short-run and long-run models 1 and 2 show that all models have a good fit; they are free from autocorrelation and heteroscedasticity. In addition, they are also stable based on the CUSUM and CUSUM of squares and are normally distributed as revealed by the Jarque-Bera. This is a sign of the robustness of the models estimated and is therefore reliable for predictions.

5. CONCLUSION AND RECOMMENDATIONS

This study examined the impact of out-of-pocket spending and health shocks on poverty in Nigeria. The least square regression method was employed to estimate the short-run and long-run models. Real income per capita and secondary school attendance were significantly influenced by explanatory variables such as the malaria incidence ratio, out-of-pocket expenses, and life expectancy. The results highlight how crucial it is to alleviate financial pressures and enhance health outcomes to combat poverty in Nigeria. To lower household out-of-pocket expenses, it was suggested that the government aims to enhance investment in the health industry. It is critical to engage in comprehensive malaria control programs given the strong negative effects of the malaria incidence rate (MIR) on poverty levels and school enrollment rates. Particularly in places with a high burden, these initiatives ought to emphasize preventive measures, early diagnosis, and fast treatment. Productivity can be raised, healthcare expenditures can be reduced, and educational possibilities can be enhanced by lessening the impact of malaria. Additionally, the government should make an effort to spend money on healthcare facilities and services to extend life expectancy as this will help to raise real per-capita income and secondary school enrollment rates, which will help to lower poverty.

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APPENDIX

DATA

	RIPC (US $)	SSE(%)	MMR	MIR	OOPEX(US $)	LEXP (Years)
1988	1468.679654	23.78	1400	500.0555444	10.98987	45.99
1989	1458.268872	24.25	1400	510.345465	11.98987	45.939
1990	1588.502304	24.72	1380	500.558575	11.77877	45.9
1991	1554.119728	24.49	1350	499.65654	12.87786	45.875
1992	1585.603467	24.26	1350	492.44345	9.7676	45.857
1993	1514.931882	24.03	1320	488.898887	9.44343	45.845
1994	1450.807568	23.08	1300	481.98092	11.3455	45.843
1995	1414.101377	22.13	1300	478.7877887	10.4544	45.854
1996	1437.216194	23.45	1300	471.0955	10.2345	45.88
1997	1443.063162	23.09	1280	460.21222	9.9098	45.923
1998	1443.888515	23.33	1240	450.67777	10.34555	45.994
1999	1416.516429	23.55	1200	450.77344	10.42334	46.103
2000	1450.783839	24.61	1200	438.7526127	10.66913906	46.267
2001	1498.522908	27.03	1200	429.0423566	11.29944379	46.51
2002	1685.200922	29.61	1180	412.9589519	11.84056615	46.835
2003	1763.69398	30.8	1170	409.157078	28.71684667	47.242
2004	1878.150729	35	1130	411.3888059	28.80975196	47.72
2005	1948.048436	34.96	1080	415.2785741	35.99215397	48.252
2006	2012.844772	34.46	1040	418.1665202	46.89020297	48.812

2007	2089.777154	31.87	1010	421.3259206	49.7085899	49.373
2008	2172.793771	35.39	996	424.6553438	59.09763126	49.913
2009	2285.734601	39.23	987	416.587205	51.39332983	50.422
2010	2403.645256	44.22	978	398.9026203	59.00922121	50.896
2011	2464.345044	45.56	972	372.5571831	63.11557434	51.346
2012	2500.641181	47.18	963	347.7383259	67.46173302	51.786
2013	2597.008957	56.21	951	328.6545794	72.73859283	52.228
2014	2688.267243	45.62	943	314.4048621	77.53696466	52.672
2015	2687.480056	46.78	931	296.0814002	70.31038846	53.112
2016	2575.455449	42	925	281.3766366	59.67952853	53.541
2017	2529.385248	33.51	917	283.0640745	57.0923297	53.95
2018	2512.192392	33.49	908	291.9425142	50.53861785	54.332
2019	2502.652281	33.47	900	288.0494884	50.40051058	54.687
2020	2396.036462	33.45	872	279.554455	50.1	55
2021	2400.987668	33.43	850	275.0030343	50.1	55.5

SOURCE: World Development I