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Per Capital Income and Health Outcome in Nigeria

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ABSTRACT

This study looked at the relationship between Nigerian health outcomes and per capita income. Investigating the long-term relationships between life expectancy and per capita income, government health spending, interest rates, and unemployment rates is the aim of the study. The secondary data needed for the analysis came from the Central Bank of Nigeria (CBN) Statistical Bulletin and the World Bank development indicators. The Auto-Regressive Distributed Lagged (ARDL), also known as the bound testing approach to co-integration, was used to estimate the equation. Our research revealed a long-term co-integration relationship between the variables. There is a demonstrated positive long-term relationship between life expectancy and per capita income, but a negative long-term relationship between life expectancy and government spending on health, interest, and the unemployment rate. Based on our findings, the study recommends that the federal government increase the annual budget allocation to the health sector to 15% based on the United Nations and World Health Organization benchmark, ensure a favorable investment environment that can improve health standards and per capita income, and implement measures for appropriate monitoring of funds allocated to the health sector.

Keywords: *Per Capital Income, Health Outcome, Life Expectancy, and Government Health Expenditure*

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INTRODUCTION

Health outcomes are causally impacted by a nation's income per capita, which is a description of its economic circumstances. In a similar vein, the kind of health system and its resources have an impact on population health. One can evaluate a nation's health system's effectiveness by looking at the relationship between resources and results. If a nation's health system produces better health outcomes for the same amount of resources, or produces the same results but with fewer resources, then that nation's health system is performing better than another's (Elola et al., 2020). According to Elola et al. (2020), health systems are funded by taxes, income-related social contributions (social security systems), or healthcare services held by the state (national health services). In nations with high per capita incomes, social security makes an extraordinary contribution to the maintenance of the health system's finances.

Providing funding for social welfare, of which health care is a crucial component, is one of the main responsibilities of every government. In order to improve the health of the populace and enable them to significantly contribute to the nation's economic growth and development, the government allocates public funds to the provision of health care services. Although it is thought that increasing funding for social services should improve service performance, this is not the case in Nigeria. One of the main reasons for inefficient public spending in many developing nations is budget theft and/or mismanagement (World Bank, 2019). Nigeria's health condition is low, for example, according to numerous health indices, even if the country's funding for the health sector is growing. According to a 2016 UNAIDS report, Nigeria has the second-highest rate of HIV/AIDS prevalence worldwide. Nigeria was also listed by the Central Intelligence Agency (CIA) as having the eighth-highest infant death rate in the world in 2017 (69.8 per 1000 live births). Additionally, according to the United Nations Department of Economic and Social Affairs (UN DESA), Nigeria has the 194th longest life expectancy in the world, at 52.29 years.

These figures demonstrate that either insufficient health spending is being allocated to the development of Nigeria's healthcare system or that suitable policies are not being implemented to enhance the nation's healthcare system. Since health care is expensive, the WHO advised that

nations should set aside at least 13% of their yearly budget for the health sector in order to effectively fund it. This is in an effort to close the enormous health funding gap that exists between governments and their citizens, particularly in developing and underdeveloped nations. Nigeria was one of the member nations who signed the recommendation. Additionally, in 2001, all African Union members, including Nigeria, which hosted the high-level meeting, signed the Abuja Declaration, which suggested that at least 15% of the continent's annual budget should go toward the health sector in order for it to provide healthcare on par with other countries worldwide. However, government health expenditures, or the budgetary allocation to the health sector, have consistently fallen short of expectations, meaning that a significant portion of healthcare services will have to be paid for out of pocket, which is beyond the means of the majority of Nigerians.

Therefore, it should come as no surprise that GDP per capita is frequently used as an explanatory variable in the extensive empirical literature on the factors influencing health outcomes. Pritchett and Summers' important study (1996:863) summarizes the overwhelming findings of the literature, noting that "wealthier nations are healthier nations" and "gains from rapid economic growth flow into health gains." It is important to note that health care spending has a significant positive impact on an economy. Research indicates that those with greater incomes have better health and a lower death rate in underdeveloped nations (Gwatain et al., 2020). This opinion was also backed by Cutler, Deaton, and Llera-muney (2006), who pointed out that mortality is indeed noteworthy in impoverished nations, with children under the age of five accounting for about 30% of all deaths, compared to less than 1% in rich countries. Many policy choices have been triggered by the announcement of the Millennium Development Goals (MDGs) in order to achieve the goals. The fact that the majority of African nations are still well below the MDG objective as of 2019 is disappointing, nevertheless. Only 33 out of 147 developing nations (22%) are on track to achieve a two-thirds drop in the mortality rate, according to Anyanwu and Ehiajakar's (2007) projection. However, it is quite unfortunate that all the countries in the Sub Sahara Africa are off the track and even in some countries, the mortality rate is on the increase.

Since a greater income enables households to spend more on the family's personal health, which in turn improves the household's health, the argument that income may have a positive effect on health outcomes is tenable. According to this scenario, a nation's financial level will have an impact on its health outcomes based on national characteristics including diet, education, and factors that impact the provision of health-related services. However, exogenous influences can also have an impact on a nation's citizens' health. According to Fogel (2020), economic expansion and rising per capita income can sustain people's improved health and nutrition. Investments in the health sector are therefore crucial for both the public sector and private companies, given the contribution of the workforce free from health issues to economic growth. Governments therefore devote a sizable portion of their finances to the public service of health. Additionally, the private sector invests in the health sector due to its limited flexibility. Because they involve both public and private investment, health care costs are also a significant spending item for economic growth. This is how the rest of the paper is structured. Our contribution to the literature is outlined in Section 2, which also offers a succinct literature assessment. The variables and data used in the empirical study are described in Section 3. The empirical findings are presented in Section 4, and the conclusion is drawn in Section 5.

REVIEW OF EMPIRICAL STUDIES

Since the benefits of greater economic prosperity are translated into better health outcomes, the adage that "wealthier nations are healthier nations" has been supported by numerous research (Asiedu et al., 2021). Anand and Ravallion (2022) contested this claim, arguing that when poverty and government spending variables are taken into account in the same model, the impact of income per capita on health outcomes becomes negligible. Asiedu et al. (2021) examined the relationship between per capita income and health outcomes in 128 developing nations between 1994 and 2019. Using a dynamic panel model (system GMM), they came to the conclusion that while per capita income has a negative and substantial impact on the under-5-mortality rate, it has a positive and significant impact on life expectancy. Additionally, they noted that characteristics that are not country-specific greatly improved health outcomes and that the effects increased over time.

Harttgen and Misselhorn, (2019) looked at how GDP per capita affected health outcomes in nations in Sub-Saharan Africa. The empirical data shows a weak correlation between GDP per capita and child undernutrition, using stunting, underweight, and wasting as stand-ins for health outcomes.

Vollmer et al. (2019) looked into the connection between undernutrition in children and per capita income. Using 121 health and demographic surveys from 36 low- and middle-income nations, they found little to no correlation between the decline in childhood undernutrition and per capita income.

Baird et al. (2021) used empirical data from 59 developing nations worldwide to investigate the impact of aggregate income shocks on infant mortality. The study came to the conclusion that infant mortality is negatively impacted by GDP per capita. It was discovered that the negative impact of GDP per capita on infant mortality was more pronounced for females than for males.

In a study on the effectiveness of economic growth in

lowering under-nutrition. Haejoo and Muntaner (2006) found that rising per capita income lowers under-nutrition in emerging nations. They contend that people's ability to purchase goods and services that enhance their overall health and nutrition in particular rises with per capita income.

In a 2019 analysis on the effect of public health spending on health outcomes, Filmer and Prilchet (2019). Added per capita income and discovered that per capita GDP, inequality, female education, ethnic fragmentation, and prevalent religion account for 95% of the cross-national variation in mortality. The vast majority of the research revealed that GDP per capita had a favorable and noteworthy effect on health outcomes. They offered proof to back up the hypothesis that an affluent country is a healthy one.

According to Dhrifi (2023), health spending has a favorable effect on lowering child mortality in high-income and upper-middle-income nations, but it is not statistically significant in low-income and lower-middle-income countries. Compared to public health spending, private health spending was found to be more effective at higher levels of development. In contrast, public health spending has been shown to be more successful than private health spending in lowering child mortality at lower levels of development.

According to Ray and Linden (2020), public health spending is typically more health-promoting than private health spending; nevertheless, the combined impact of the two health spending components is not as strong as that of primary education in encouraging health outcomes.

In a related study, Rahman et al. (2020) demonstrated that while both public and private health spending have a statistically significant negative impact on the infant mortality rate, the impact of private health spending is greater than that of public health spending. Increases in per capita income were also found to have a major positive impact on population health outcomes.

Even after controlling for GNI per capita, Powell-Jackson et al. (2011) found that GNI per capita had no discernible impact on health outcomes. According to a related study, middle-income nations' health outcomes are positively and statistically significantly impacted by the elasticity of GDP growth and per-capita health expenditure (Bustamante & Shimoga, 2020).

Damian and Chukwunonso (2021) used secondary data from 1990 to 2020 to examine the relationship between per capita income spending and child mortality in Nigeria. Using multiple regression, they looked at the explanatory factors for the three dependent variables that indicate health outcomes (under-five mortality, newborn mortality, and neonatal mortality rate).

The findings indicate that there is no discernible relationship between infant mortality and per capita health spending. Nonetheless, the research indicates a noteworthy influence of per capita mortality among children under five.

METHODOLOGY

Theoretical framework

The Absolute Deprivation Hypothesis serves as the foundation for this investigation. According to the hypothesis, individuals with the lowest incomes are more likely to have poor health and a higher risk of dying because of a number of factors linked to extreme poverty, including poor nutrition, a lack of access to high-quality healthcare, exposure to various physical hazards from an unfavorable environment, and the health behaviors of low-income earners.

Model specification

Using life expectancy (LFE) as a proxy for health outcome and per capita income (PCI), health expenditure (HEE), interest rate (INR), and unemployment rate (UNR) as dependent variables, one model was employed to estimate the effect of per capita income on health outcomes in Nigeria in accordance with the study's goals.

$$LFE = f(PCI, HEE, INR, UNR) \quad (1)$$

Equation 1 above is the functional form while equation 2 represented the behavioral equation

$$LFE_t = a0 + a1LPCI_t + a2HEE_t + a3\,INR + a3UNR_t + U_t \quad (2)$$

A priori expectations are $a1, a2 > 0$ and $a3 < 0$

Where:
LFE = Life Expectancy, PCI = Per Capita Income, HEE = Health Expenditure, INR = Interest Rate, UNR = Unemployment Rate, U = Error term,a0 = Constant or Intercept,a1 – a3 are the coefficients of the independent variables, L = log and t = time.

Estimation technique

The stationarity test was conducted using enhanced Dickey-Fuller test statistics. According to statistical theory, variables must be stationary before using common econometric methods. To prevent spurious (misleading) results, this was done. To determine whether or not there is a long-term link between all of the chosen macroeconomic and health data, the Johansen co-integration test was also used. The rate of adjustment to long-term equilibrium was then calculated using the error correction model. Additionally, stability and diagnostic tests were conducted to verify the models' resilience.

RESULTS AND DISCUSSION

Unit Root Test

The Augmented Dickey-Fuller test is used to assess the

Table 1: Unit Root Test Results.

Variable	Level	First Difference	Order of Integration
lnLFE	-3.236773 (0.0264)	-1.520340 (0.5110)	I(0)
lnPCI	-8.901440 (0.0000)	-36.77044 (0.0001)	I(0)
lnHEE	-0.372363 (0.9032)	-7.912464 (0.0000)	I(1)
lnINR	-5.601310 (0.0001)	-23.42013 (0.0003)	I(0)
lnUNR	-2.111453 (0.2415)	-6.616112 (0.0000)	I(1)
5% C.V	5% = -2.945842	5% = -2.948404	

Source: Author's computation from Data (2025)
Note: i. Pro-value are reported in parenthesis. ii. The Augmented Dickey-Fuller test statistics are compared to 5 per cent critical value (C.V).

Table 2: Lag Length Selection Criteria for the Model.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-360.5122	NA	27003.25	30.13022	30.13521	30.22534
1	-355.7472	322.5125	11.23146	22.24348	24.41328	23.10042
2	24.20064	81.12774*	0.000414*	9.065123*	17.72457*	12.15142*
3	-112.0025	146.3737	0.013530	14.64460	21.23573	17.02367
4	-323.1374	54.77491	12.00331	22.03644	26.31726	23.14540

Source: Author's computation
** indicates lag order selected by the criterion (each test at 5% level)*
FPE: Final prediction error;
AIC: Akaike information criterion;
SC: Schwartz information criterion;
HQ: Hannan-Quinn information criterion

Table 3: Critical lower and upper bounds values.

	5%		1%	
	Lower	**Upper**	**Lower**	**Upper**
Restricted intercept no trend	**1.98**	**3.04**	**2.41**	**3.61**
Unrestricted intercept no trend	**2.06**	**3.24**	**2.54**	**3.86**

Source: Pesaran and Shin (1999), Table CI (iii) case II

stationarity status of the chosen macroeconomic and health variables in Nigeria. All of the variables were integrated at first difference, according to the results shown in (Table 1), with the exception of Life Expectancy (LE) and Per Capita Income (PCI), which were stationary at level. They were discovered to be immobile at I(0), to put it another way. This suggests that for every variable at their initial difference, the non-stationarity hypothesis was disproved. This supported the necessity of the co-integration test.

Bound test approach to co-integration

The first step in the ARDL technique is to determine the appropriate lag order (p) in the models. After increasing the lag length iteratively until it reached around lag 4 and beyond, when there seemed to be no advantage in the lag length selection, the result shown in (Table 2) was generated. The ARDL model in this study should have no more than two lags, as indicated by the results in (Table 2) above, because lag length two showed the lowest values on all of the lag length selection criteria.

Wald test result analysis

Following Pesaran and Shin (1999) methodology, we used the Wald test (F-statistics) to assess the cumulative (overall) significance of each variable in the equations before estimating the ARDL model. The following null hypothesis needs to be tested in this situation:

Ho: There are no significant dynamic links between Nigeria's non-oil economy and the balance of payments equilibrium. The null hypothesis for this study is denoted symbolically

H_o: $d_2 = d_2 = d_2 = d_2 = d_2 = d_2 = 0$

That is, as opposed to the alternative, all slope coefficients are zero simultaneously. The rule states that the null hypothesis (no co integration) cannot be rejected if the calculated F-statistics are less than the lower bound value, I (O). In contrast, it can be inferred that the balance of payment and non-oil sector variables are cointegrated if the calculated F-statistics surpass the upper bound value, I(1).(Table 3). Table 4 demonstrates that, at a 5% error level, the calculated F-statistic for the model, 17.35169, is greater than the upper bound critical value, 3.04. Based on this investigation, we conclude that there is evidence of long-term correlations between variables in Nigeria, with Cal 17.35 > Tab 3.04 at the 5% statistical level. The null hypothesis, according to which co-integration does not

Table 4: Wald Bound Test of Presence of Co integration in ARDL for the Model.

Equation: ARDL (4, 4, 4, 4, 4, 3, 4).			
Test Statistic	Value	Probability	Decision
F- Statistic	17.35169	0.0042	Cointegration
Chi-square	121.3110	0.0000	Cointegration

Source: Author's Computation

Table 5: Estimated long run multiplier coefficients
Dependent Variable: LFE

Variable	LPCI	LHEE	LINR	LUNR
Coefficient	0.4898	-0.5628	-1.70496	-4.735.30

Source: Author's Computation.

Table 6: Error Correction Representation of ARDL for the Model**:** Dependent Variable DLFE.

Variable	Coefficient	Std.Error	t.statistics	Prob.
Constant	0.017701	0.041018	0.453506	0.3605
D(PCI(-1))	-0.000715	0.004813	-0.147123	0.7652
D(PCI (-2))	-0.003782	0.004384	-0.761403	0.2641
D(HEE(-1))	0.010317	0.005601	1.432670	0.1601
D(HEE (-2))	0.012201	0.007103	1.210474	0.1000
D(INR(-1))	-0.341360	0.164124	-2.120564	0.0310
D(INR(-2))	-1.053445	0.351101	-2.241368	0.0214***
D(UNR(-1))	0.407131	0.130141	4.329612	0.0005***
D(UNR (-2))	1.122191	0.302053	2.719364	0.0110***
ECMA(-1)	-0.370260	0.042733	-2.760381	0.0064***
S.E. of regression	0.142910		AIC	-0.351502
SSR	0.510442		SC	0.528338
R^2	0.590347		Adjusted R^2	0.602701
D.W. Statistics	1.851382			

Note: *** indicates significance at a 5% level
Source: Author's computation

exist, is thus disproved. The null hypothesis, according to which co-integration does not exist, is thus disproved. Equation 3.9 is used to estimate the long-run coefficients of the variables, which are shown in the accompanying tables.

Extracting from (Table 5), the estimated long-run model:

$$LLFE = 0.4898\ LPCI_{t-2} - 0.5628\ LHEE_{t-2} - 1.70496 LINR_{t-2} - 4.735.30 LUNR_{t-2} \quad (3)$$

The computed long-run association coefficients in equation 4.1 show that LLFE and LPCI have a confirmed positive long-term relationship, while LLFE and LHEE, LINR, and LUNR have a confirmed negative long-term link. It is crucial to emphasize that neither the health outcome in Nigeria nor the short-term dynamics of the pertinent Per Capital Income variables are assessed by the solution to equation 3.

ARDL Short-Run Analysis of the Models

Table 6 displays the results of the short-run dynamic coefficient linked to the long-run relationship for the models. The lagged error correction model's (ECM) statistical value has an expected negative sign and is significant at the 5% level. A 37% imbalance in the per capita income contribution to the health outcome is indicated by the ECM coefficient of -0.370260. This demonstrates how quickly the model approaches equilibrium. Long-term equilibrium can only be restored by lowering the life expectancy variable if the coefficient of ECM is more than zero (positive), which indicates that the dependent variable, LFE, is in excess. However, Table 6 shows that the coefficient is less than zero that is, negatively). Increasing the contribution of the per capital income variables to the LFE is necessary for the long-term balance.

The ECM coefficient's negative value (-0.370260) indicates that there is short-term disequilibrium, which the model's set of variables is attempting to rectify over the long term. Given the magnitude of this ECM coefficient, it is anticipated that the variables related to per capita income will correct for any imbalance in the contribution of health outcomes to life expectancy (LFE) by approximately 37% over a one-year period. The speed of corrective action is often slow. According to Haris and Sollis (2003), the outcome confirms the long-term equilibrium

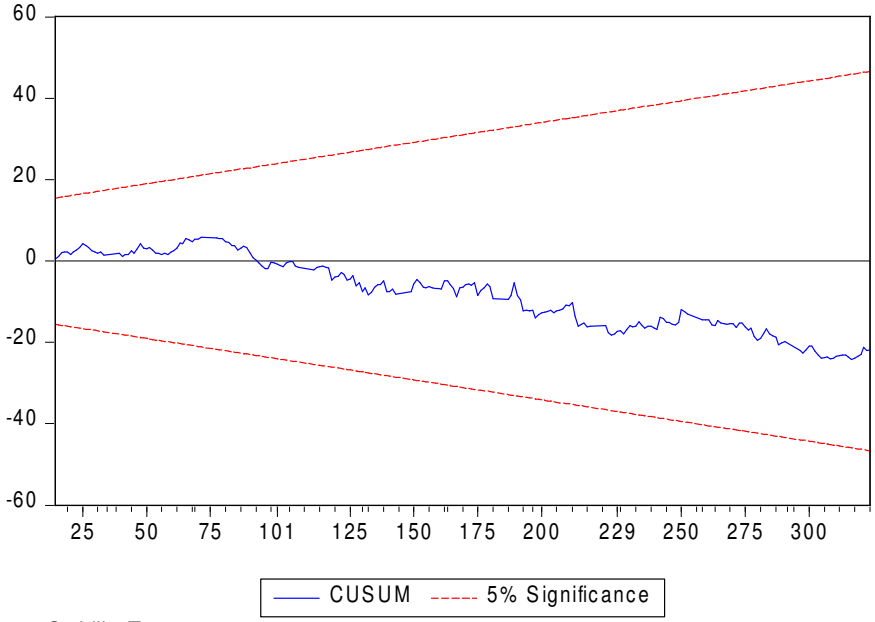

Figure 1: Stability Test

relationship found by the Wald test for the study model. R2 "R-Squared," which evaluates the overall goodness of fit of the entire regression, was formerly set at.590 and was later modified to.602. R2 so accounts for 59% of the total. This indicates that approximately 59% of the variance in the dependent variable may be attributed to the independent variables. This illustrates the good match. The mode does not show serial correlation, as shown by the Durbin-Watson statistic. Because the cumulative Sum falls inside the area between the two critical lines, the model-derived result of the CUSUM test above showed evidence of stability in the coefficient at a 5% level of significance.

DISCUSSION

To prevent inaccurate regression, ADF was used to confirm the stationarity of every variable included in this study's calculations. Based on the Wald test results, the null hypothesis—that there are no long-term relationships between life expectancy and Nigeria's per capita income variables—was disproved. The short-term relationship between these factors is then tested.

$$LLFE = 0.4898\ LPCI_{t-2} - 0.5628\ LHEE_{t-2} - 1.70496 LINR_{t-2} - 4.735.30 LUNR_{t-2} \quad (4)$$

While LLFE and LPCI have a demonstrated positive long-term association, there is a confirmed negative long-term relationship with LHEE, LINR, and LUNR.

In Nigeria, life expectancy and government health spending have a negative, long-term association. The findings indicate that LLFE decreases by roughly 56.2% for every 1.0% increase in LHEE. This outcome is consistent with the research conducted by Harltgen et al. (2019). It validated a long-term negative correlation between interest rates and life expectancy in Nigeria. It also showed that Nigeria's unemployment rate (LUNR) and life expectancy (LLFE) have a negative, long-term relationship. The findings indicate that for every 1.0% increase in LUNR, LLFE falls by 473%. This outcome is consistent with Asiedu et al. (2021) research. Additionally, it showed that Nigeria's life expectancy (LLFE) and per capital income (LPCI) have a favorable, long-term association. The findings indicate that for every 1.0% increase in LPCI, LLFE falls by 48.9%. This outcome is consistent with the research conducted by Baird et al. (2021). This outcome is consistent with the a priori prediction that life expectancy and per capita income in Nigeria will positively correlate.

Conclusion and policy implications

This study uses annual time series data from 1986 to 2023 to examine the relationship between Nigeria's health outcomes and per capita income. The conclusion demonstrates that there is a sustained correlation between health outcomes and Nigeria's per capita GDP. The article examines the long-term link between each of the factors related to per capita income and health outcomes in Nigeria using co-integration using the Autoregressive Distributive Lag method and the Error Correction Model. In Nigeria, life expectancy and government health spending have a negative, long-term association. It verified that interest rates and life expectancy in Nigeria had a negative, long-term relationship. Additionally, it showed that Nigeria's life expectancy (LLFE) and unemployment

rate (LUNR) have a negative, long-term association. It also showed that Nigeria's per capital income (LPCI) and life expectancy (LLFE) had a favorable long-term association. The ECM coefficient's negative value (-0.370260) indicates that there is short-term disequilibrium, which the model's set of variables is attempting to rectify over the long term. The per capital income variables are expected to compensate for any imbalance in the health result by approximately 37% over a specified time period due to the size of this ECM coefficient. (A year). The pace of corrections is often slow. The outcome supports the Wald test's finding that the research model has a long-run equilibrium connection (Haris and Sollis, 2003).

In order to represent the total goodness of fit of the complete regression, the R2 "R-Squared" score, which was previously.590, has been modified to.602. This suggests that 59% is attributable to R2. This indicates that in about 59% of the situations, the independent factors account for the variance of the dependent variable. It illustrates how well the fit works. There is no serial correlation in the mode, as shown by the Durbin-Watson statistic. Consequently, the analysis suggests that:

1) The federal government should work twice as hard to create a climate that is conducive to investment and can raise health and per capita income.
2) According to the World Health Organization and United Nations standard, the federal government should raise the yearly budgetary allotment to the health sector to 15%. Increasing funding for health initiatives that could improve Nigerian health outcomes is one way to achieve this.
3) The Nigerian government needs to take action to ensure that the money allotted to the health sector is properly monitored. Instead of increasing recurring expenditures as is the case in the nation, money should be redirected toward the provision of health care facilities through an increase in capital expenditure to the health sector and health insurance.
4) In order to enhance health outcomes, the political elite has to cut back on medical tourism abroad and allocate funds to primary healthcare in Nigeria for increased effectiveness.

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