

## Effect of Income Inequality on Health Indicators in Nigeria (1980-2014)

Fatukasi, A.A. (Ph.D)

Department of Economics, Adekunle Ajasin University,  
Akungba-Akoko, Ondo State, Nigeria.

AYEOMONI, I. Omosebi

Email: ayeomoniyo@yahoo.com

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### Abstract

The rising profile of income inequality and the challenges it poses on the health of the entire citizenry in Nigeria over the pass years has brought about an increase in mortality rate and low life expectancy. Thus, this study examined the effect of income inequality, per capita income, education level and savings level on health indicators proxied by mortality and life expectancy rate in Nigeria using stationary, co-integration test and dynamic ordinary least square (DOLS) method. The study used time series data from International Monetary Fund World Economic Outlook which spanned from 1980-2014. The unit root test applied to the variables showed that the variables were stationary in the short run and co-integration test confirmed a long run relationship between the variables. Furthermore, the study showed that income inequality has an inverse effect on mortality rate. However, direct relationship existed between income inequality and life expectancy rate in the model. Finally, per capita income, education level and saving level employed as control variables have positive effect on health indicators in Nigeria. The study therefore concluded that health indicators are highly influenced by income inequality, per capita income, education level and savings level in Nigeria.

**Keywords:** mortality rate, life expectancy rate, health indicators, income inequality distribution, per capita income, education level

### 1. Introduction

In Africa and Nigeria in particular, people strive to achieve a higher standard of living. The intention is to emulate the affluence of the Western world has called for a critical look at the cause of income inequality distribution in Nigeria. An issue of continuing interest among scholars and policy makers is the extent to which the linkage between income inequality distribution and health indicators affect productive. Essentially, Health indicators play a significant effect in development process, since it constitutes a component of investment in

human capital development and workforce is the most abundant production factor in these countries. This issue has received numerous debates in the health indicators across many countries. According to Najedlabaf, *et al* (2013) high income improves good health via cleaning water, suitable nourish, regarding hygienic principles-basic needs of human such as shelter, clothing and food. In support, Drabo (2011) found that environmental quality is a good channel through which income inequalities affect population health while Pulok (2012) analyzed that income inequality dictates the nature of individual health in most of the developing countries. This stance was however contested by Alawode and Lawal, (2014) that richer people have better health status because they can afford goods and services, medical care facilities, adequate nutrition, cleaning environment and housing that inevitably promote health while low income people are more likely to fall ill due to malnutrition, inability to attend schools which resulted into unemployment. While supporting the view, Adegoke (2013) stated that Nigeria is one of the thirty most unequal countries in the world with respect to income distribution in that the poorest half of the population holds only 10% of the national income. The reasons for the income inequality distribution mostly centered on lack of equal opportunities which include health, education, employment, ethnic, region, differences in political ideology and access to productive assets.

Bakare (2012) stated that income inequality is considered to be interrelated factors which include education, occupation, regional, ethnical, rural expenditure pattern and even political differences. These factors produce a similar pattern of income distribution and also create a context of rural infrastructure through policies that influence education and public health care services in Nigeria.

The link between income inequality and health indicators is crucial issue from both the descriptive and policy prescription perspectives across the globe. World Health Organization (WHO, 2003) posited that whether people are healthy or unhealthy is influenced by income and social status, literacy and level of education, unemployment, health care services, biology and genetics, availability of food, gender and culture among others. In addition, Bamgbose *et al* (2005) stated that economic viability and level of education are major determinants of active poor living environment which is detrimental to the health status.

In recent time, income inequality and health indicators have continued to be problematic in developing countries, especially in Nigeria; despite the emphasis placed on improvement of health care facilities through even distribution of income among the citizens. The rising profile of income inequality and the challenges it poses on the health of the entire citizenry in Nigeria over the pass years has brought about an increase in mortality rate and low life expectancy, low level of education, unemployment rate, etc. As UNICEF (2006) put it, Nigeria is classified as having severe child mal-nutrition and a very high mortality rate for children under age five. In addition, following the introduction of the Millennium Development Goals (MDGs) held at the United Nations headquarters in April 2000, one of the cardinal foci is to reduce disease, hunger, illiteracy and environmental degradation by 2015. Also, MDGs summit on sustainable development held in Jonannesburg in 2002, disease and poverty were again the main point of discussion. All efforts put in place by various governments and Millennium Development Goals (MDGs) to achieve quality health status over the years prove abortive. Thus, this study examined the effect of income inequality on health indicators in Nigeria for the period of 1980-2014 using dynamic ordinary least square (DOLS) approach. It is now obvious that income inequality distribution had significant effect on health indicators in Nigeria. This is an abnormal situation as several questions have been

identified on this abnormality in Nigeria. What is income inequality? What have been the causes of income inequality in Nigeria? What factors determine health indicators? What policies can improve health status? The rest of this paper is planned as follows: Section 2 presents the literature review. The Section 3 discusses methodology of the study. Data analysis and interpretation of result is the main thrust of section 4 while section five deals with summary, conclusion and recommendation.

## 2. Literature Review

The link between income inequality and poor health is highly consistent when individuals are compared within a country, but there is little association between low income and health status when compared across countries. Countries with higher average incomes do invariably have better overall health status. Income inequality simply means differences in the rewards to factors of production. Bakare (2012) described income inequality as a situation whereby money received during a specified period of time, particularly as payment for work or interest on investment in different sizes, degrees or circumstances, especially in an unfair difference in ranking. Graham (1995) defined income inequality as line drawn between the rich and poor. The low income class is characterized by poverty, poor health care, unstable jobs, low level of education, whereas the high income class is also characterized by adequate and accessible health care, adequate education attainment. The average class shares those characteristics between the low and higher income class. Subramanian and Kwaachi (2004) opined that income inequality may resort into poor health status. Also, Wen *et al* (2003) suggested that an increased income inequality leads to spatial concentrations (i.e. poverty, race and ethnic enclaves) and residential segregation is potentially detrimental to individual health status.

The study by World Health Organization (2001) analyzed that little ailments in most cases get complicated due to lack of money to seek immediate necessary medical care services and thereby resorted into self medication/natural medicine as means of treatment however, herbal medicines in most cases lead to serious illness, liver or kidney mal- function and even death. In view of Neckerman and Torche (2007) and Schwabish *et al* (2006) opined that income inequality could influence health via influence on the implementation of particular social and health related policies.

Studies in some countries (Almas, 2004; Juan, 2013; Wen, *et al* 2003) have established strong relationship between income inequality and health indicators. In the same way, a study conducted by Drabo (2011) showed that income inequality significantly affects environmental quality and environment degradation worsens population's health whereas, Alvaro *et al* (2010) found that income inequality has a greater direct effect on life expectancy at birth than through social capital using Spearman coefficient.

Donnell, *et al* (2013) investigated health and inequality; and found that a significant and substantial impact of ill-health on income mainly operating through employment, although it is difficult to gauge the magnitude of the contribution this makes to income inequality. Also, Pulok (2012) examined revisiting health and income inequality relationship: evidence from developing countries using panel data from 31 low income and middle income countries for the period of 1982-2002. He found that there is a direct relationship between health and income distribution in this set of developing countries over the study period. Nakaya and Dorling (2005) analyzed geographical inequalities of mortality by income in two developed island countries: a cross national comparison of Britain and Japan using series of regressions. Their finding revealed that (i) in Britain mortality is lower where inequalities in

income are lower, whereas in Japan there is no obvious relationship between income and geographical inequalities. (ii) Income mortality relations are consistent among different age-sex groups in Britain, but there is substantial differences in the relationships are revealed between different demographic groups in Japan.

The study by Juan (2013) examined beyond income inequality in Ecuador: on decomposing socio-economic-related child health inequalities for period of 2004 to 2012. The result shows that health inequalities have increased and that the SES gradient of health has worsened. In support, Almas (2004) analyzed income inequality and their measurement in Finland. The finding showed that income inequality, education, opportunities and happiness have significant effect on health indicators in Finland. In addition, Calderon and Serven (2004) investigated the effects of infrastructure development on growth and income distribution using a large panel data set encompassing over 100 countries and spanning the years 1960-2000. The finding showed that growth is directly affected by the stock of infrastructure assets and also, income inequality reduces with higher infrastructure quantity and quality. Bigsten and Levin (2000) investigated growth, income distribution and Poverty: a review. The finding revealed that social policies promote health, education and social capital, as well as, safety nets to protect the active poor's health.

Moreover, Asafu-Adjaye (2004) examined income inequality and health: a multi country analysis in Australia using panel data set for 44 countries covering six time periods. The results showed that income inequality (measured by the Gini coefficient) has a significant effect on health status when we control for the levels of income, savings and education. Nilsson and Bergh (2012) investigated income inequality and individual health in Zambia and the findings confirmed a non-linear direct relationship between economic resources and individual health and suggested further that the relationship between inequality and health in developing contexts might be very different from the predominant view in the existing studies based on developed countries, and that alternative mechanisms might mediate the relationship in poor countries. Similar studies were also conducted in France using a decomposed concentration index and the result showed that income inequalities affect health indicators (Tuberuf, 2008). Thus, the study corroborated with earlier studies of Asafu-Adjaye (2004) showed that income inequality proxied to Gini coefficient has a significant effect on health status in Australia. In support, Drabo (2011) confirmed that environment quality is an important channel through which income inequalities affect population health in France.

Finally, some other studies examined indicators of inequality for Maori and Pacific people in Zealand for approximating 10 years for each of the indicators. The finding showed that less positive results are visible in 12 indicators (57%), which produce increasing gaps between Maori and Pacific people (Marriott and Sim, 2014). Hence, the result is in agreement with the finding of Evidiki and Anayochukwu (2014) that almost two-thirds of the recent decline in income inequality in Latin America is explained by policies and strong GDP growth using a panel econometric analysis. Basundhara (2014) examined inequality and assessing environmental justice in Kathmandu, NEPAL using chi-square test. The finding showed that lower socio-economic class households are facing more health effects even with similar exposure to environmental pollution. Thus, the empirical result is in support with the Netshitenzhe (2013) that income inequality is a significant factor that influences health status in South Africa.

As at the time of writing this paper, only few past studies have relevance to this work. Most of the studies examined on the same topic are predominantly foreign and, as a result,

problematic in attempting to adopt them wholesale in Nigeria. However, the nearest was by Alawode and Lawal (2014) conducted in Nigeria. To the best of our knowledge, there has been a fewer study (ies) on this topic in Nigeria. Hence, this area is still relatively under researched. Therefore, this study stands to add to literatures in Nigeria.

### 3. Methodology

This section address the issues that relate to the methodology of the study with emphasis being laid on the choice of the hypothesis, research design and strategies, types and sources, the nature and type of data collected, the data processing and the parameters to be estimated. The section also specifies the model specification to test the hypothesis of the study for the purpose of giving the readers a deep insight into the phenomena under study.

#### 3.1 The Hypothesis

The study verifies the null hypothesis stated below:

**H<sub>0</sub>:** income inequality distribution has no significance effect on health indicators in Nigeria.

#### 3.2 The Research Design and Strategies

The study employs experimental research design approach for the data analysis. Under this approach, the theoretical consideration (*a-priori* criteria) is combined with the empirical results and extracts vita information from the available data. It enables us to examine the effect of independent variables (income inequality distribution) on the dependent variables (health indicators-life expectancy rate, infant mortality rate and literacy rate).

#### 3.3 Types and Sources of Data

Given the nature of the model, it is imperatives that the data that will permit the estimation of the stochastic equations representing the empirical test of income inequality and health indicators-mortality rate and life expectancy rate has to be collected. Time series data were used in the study and they are entirely secondary data. The data series covered the period between 1980 and 2014. The secondary data used for the study will be estimated using dynamic ordinary least square method. The data will be processed through the dynamic ordinary least square (DOLS) estimation technique. Unit root test will be conducted to test the stationarity of the time series data used in the study. Beside, the study employed co-integration to overcome the problem associated with non-stationary time series data. These packages are suitable because they are time efficient, not biased and more importantly, it add richness, versatility and flexibility to the econometric modeling and it integrates the short run dynamics with the long run equilibrium. Finally, the data would be sourced from the publications of International Monetary Fund World Economic Outlook.

#### 3.4 Specification of Model

The study adopts Nejadlabaf, *et al* (2013) model with little modification. According to them, health status is a function of income inequality distribution, per capital income, education level and savings level in Nigeria. Thus, this is mathematically written below:

$$HI_t = F(GINI_t, PI_t, EDU_t, SAV_t) \dots\dots\dots (1)$$

For the purpose this study and to suit the title of the study, as well as, to provide further empirical evidence, this study is modified such that health indicators-which is proxied by mortality rate and life expectancy rate as response variables while income inequality

distribution, per capita income, education level and savings represent independent variables. As a result this, the model will be presented in the following ways. This is written as:

$$MOR_t = F(GINI_t, PI_t, EDU_t, SAV_t) \dots\dots\dots (2)$$

$$LER_t = F(GINI_t, PI_t, EDU_t, SAV_t) \dots\dots\dots (3)$$

Thus, equation (2) to (3) is presented in econometric form and it is written as models below:

$$\text{LogMOR}_t = \alpha_0 + \alpha_1 \text{logGINI}_t + \alpha_2 \text{logPI}_t + \alpha_3 \text{logEDU}_t + \alpha_4 \text{logSAV}_t + U_1 \dots\dots\dots (4)$$

$$\text{LogLER}_t = \beta_0 + \beta_1 \text{logGINI}_t + \beta_2 \text{logPI}_t + \beta_3 \text{logEDU}_t + \beta_4 \text{logSAV}_t + U_2 \dots\dots\dots (5)$$

Equation (4) and (5) are estimated in the course of this paper thus:

Where:

- logMOR<sub>t</sub> = log of mortality rate in t time
- logLER<sub>t</sub> = log of life expectancy rate in t time
- logGINI<sub>t</sub> = log of income inequality distribution in t time
- logPI<sub>t</sub> = log of per capita income in t time
- logEDU<sub>t</sub> = log of education level proxied as log of secondary School enrolment in t time
- logSAV<sub>t</sub> = log of savings level in t time
- U<sub>t1</sub>, U<sub>t2</sub> and U<sub>t3</sub> = estimated random errors in t time
- α<sub>1</sub> – α<sub>4</sub> and β<sub>0</sub> – β<sub>4</sub> = Parameters to be estimated

A-priori economic model is about the sign and the size of the parameters of the function. This gives us the theoretical criteria that form the basis for which the results of the OLS regressions models can be evaluated. Thus, the parameters are expected to appear as respectively:

**A-priori Proposition of the Models**

$$\alpha_1 < 0; \alpha_2 > 0; \alpha_3 > 0; \alpha_4 > 0; \beta_1 < 0; \beta_2 > 0; \beta_3 > 0 \text{ and } \beta_4 > 0.$$

On the basis of the foregoing literature review, we hypothesize that current health indicators proxied to mortality rate and life expectancy rate are affected by previous income inequality distribution and per capita income. We use, education level proxied to gross enrolment ratio in secondary schools, and savings as other control variables. Income level is included because it is generally positively associated with health and inversely associated with income inequality. Education is an important variable because a more literate society has greater awareness of factors influencing health and is therefore better placed to take preventive measures, or seek medical assistance when ill. Thus, it is expected to be positive related with health status. The level of savings in an economy is used here as a proxy for the capacity to afford health care. Therefore, we expect a positive relationship between savings level and health indicators in the estimated model.

**4. Regression Results and Discussions**

The equation of the effect of income inequality distribution on health indicators in Nigeria has been estimated using stationary test, co-integration test and Dynamic ordinary least square (DOLS) approach applied to the time series data for the period of 1980-2014.

**Stationary and Co-Integration Test**

Table 1:

Analysis of Stationary Test

Variable	Test Statistic	5% Critical Value	Level	Remarks
LOGMOR	-4.598341	-2.9591	1(2)	S
LOGLEF	-6.209851	-2.9591	1(2)	S

LOGGINI	-3.115643	-2.9591	1(2)	S
LOGPI	-2.969374	-2.9558	1(1)	S
LOGEDU	-3.199066	-2.9558	1(1)	S
LOGSAV	-4.972110	-2.9558	1(1)	S

**Source:** computed by the Author, 2015.

Table 1 revealed the summary of the unit root test of the considered variables used for empirical study. The test showed that income inequality, per capita income, level of education and savings level were stationary in the first and second difference respectively at 5% significance level in the model. A variable is stationary where the value of the test statistic is greater than the critical value. This implies that there is a short run relationship between the variables in the model.

Johansen Co-integration test will be conducted through Likelihood Ratio statistic by comparing their values with the critical values at 5% level. If the values of the Likelihood Ratio are greater than the critical values, then, we conclude that there is a long run equilibrium relationship; otherwise, the regression residual are not co-integrated.

Table 2A:

Analysis of Co-integration Test

Variables	Likelihood Ratio	5% Critical Value	Hypothesized no of CE(S)
LOGMOR	88.82817	68.52	None**
LOGGINI	50.36342	47.21	At most 1**
LOGPI	30.06417	29.68	At most 2 **
LOGEDU	13.03705	15.41	At most 3
LOGSAV	2.473953	3.76	At most 4

**Source:** computed by the Author, 2015.

Table 2B:

Analysis of Co-integration Test

Variables	Likelihood Ratio	5% Critical Value	Hypothesized no of CE(S)
LOGLEF	87.29559	68.52	None**
LOGGINI	55.56213	47.21	At most 1**
LOGPI	27.50398	29.68	At most 2
LOGEDU	12.46291	15.41	At most 3
LOGSAV	4.343734	3.76	At most 4 **

**Source:** computed by the Author, 2015.

Table 2A and 2B showed that at least three of the variables considered were co-integrated in the model at 5% significance level. The results provided evidence to conclude that there is long run relationship between income inequality, per capita income, level of education, savings level and health indicator proxied by mortality and life expectancy rate at 5% level of significance in Nigeria.

Table 3:

Regression Result of DOLS

Dependent Variable: LOGMOR

Method: Dynamic Least Squares (DOLS)

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
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LOGGINI	-0.182229	0.025048	-7.275266	0.0000
LOGPI	-0.120007	0.012406	-9.673520	0.0000
LOGEDU	-0.152902	0.033162	-4.610759	0.0003
LOGSAV	0.012118	0.010679	1.134766	0.2743
C	2.668080	0.026047	102.4339	0.0000
R-squared	0.997809	Mean dependent var	2.036507	
Adjusted R-squared	0.995473	S.D. dependent var	0.076072	
S.E. of regression	0.005119	Sum squared resid	0.000393	
Durbin-Watson stat	1.904753	Long-run variance	2.090005	

**Source:** Researcher's Computation, 2015.

The Statistical Significance of the Parameter Estimate The statistical significance of the parameter estimate can be verified by standard error test; the adjusted R squared and the Durbin-Watson statistics.

- For the model, when compared half of each coefficient with its standard error, it was discovered that some of the standard errors are less than half of the values of the coefficients of the variables. This shows that the considered variables values are all statistically significant in the model.
- The value of the adjusted R-squared ( $R^2$ ) for the model is very high (i.e. 0.995473). It implies that income inequality, per capita income, education level and saving level explained about 99% systematic variations on health indicators (mortality rate) in Nigeria for the period estimated years while the remaining 1% variation is explained by other determining variables outside the model.
- The result of Durbin Watson is very close to 2, i.e. 1.904753 for the estimated model. This value is within the determinate region and implies that there is an absence of serial autocorrelation among the explanatory variables in the model.

### The Theoretical Significance of the Parameter Estimate

According to the results, the income inequality has negative coefficients for the periods and it is significant at the 1% level. This means that a decrease in the level of income inequality in Nigeria lead to a decline in the mortality rate. The result is in agreement with our *a-priori* proposition which suggest that when there is a decline in GINI, there is a tendency of decreasing in mortality rate in Nigeria. In the same way, the coefficients of per capita income and education level have an inverse relationship with mortality rate and it is statistically significant in the model. The finding is in contrast to the *a-priori* expectation. *Ceteria paribus*, the basic reason for this in the literature is that the highly mortality rate sometimes is not influenced by level of individual wealth, the level of riches and education level over time. Furthermore, Saving level has a positive signs with income inequality for the periods in the model. This implies that habit to save for future needs and emergency illness have a long way to reduce mortality rate in Nigeria. In nutshell, the regression result demonstrates that income inequality, per capita income, education level and saving level are highly significant in influenced mortality rate in Nigeria.

Table 4: Regression Result of DOLS

Dependent Variable: LOGLEF

Method: Dynamic Least Squares (DOLS)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGINI	-0.190125	0.022314	8.520435	0.0000
LOGPI	0.018628	0.011052	1.685527	0.1126
LOGEDU	0.103636	0.029542	3.508057	0.0032
LOGSAV	0.012510	0.009513	1.315017	0.2083
C	1.457022	0.023204	62.79284	0.0000
R-squared	0.987876	Mean dependent var	1.685426	
Adjusted R-squared	0.974945	S.D. dependent var	0.020401	
S.E. of regression	0.003229	Sum squared resid	0.000156	
Durbin-Watson stat	1.539942	Long-run variance	1.660005	

**Source:** Researcher's Computation, 2015.

- For the model, when compared half of each coefficient with its standard error, it was discovered that some of the standard errors are less than half of the values of the coefficients of the variables. This shows that the considered variables values are all statistically significant in the model.
- The value of the adjusted R-squared ( $R^2$ ) for the model is very high (i.e. 0.974945). This implies that income inequality, per capita income, education level and saving level explained about 97% systematic variations on life expectancy in Nigeria for the period estimated years while the remaining 3% variation is explained by other determining variables outside the model.
- The result of Durbin Watson is approximately close to 2, i.e. 1.539942 for the estimated model. This value is within the determinate region and implies that there is an absence of serial autocorrelation among the explanatory variables in the model.

### The Theoretical Significance of the Parameter Estimate

The income inequality revealed negative sign on life expectancy rate and it is significant in the model. This finding implied that a unit percent decrease in income inequality bring about 19% in life expectancy rate in Nigeria and the result is consonant with Nejadlabaf *et al* (2013) found that income inequality distribution has adversely affect on life expectancy in selected developing countries. More so, the coefficients of per capita income and education level have a positive relationship with life expectancy rate and it is statistically significant in the model. This implies that a unit percent change will bring about 2% and 10% change in life expectancy rate in Nigeria *ceteris paribus*. Conclusively, saving level has a positive signs with income inequality for the periods in the model. This implies that an ability to save for raining day has economic implications on life expectancy and increase in saving leads to more life expectancy in Nigeria. This overall result is support by Nejadlabaf *et al* (2013) that per capita income, education and saving that are employed as control variables and taking constant income level have direct positive effect on life expectancy.

In summary, since all the econometric test applied in this study show a statistically significant relationship between the response and explanatory variables from the model in Nigeria. This finding is sufficient enough to accept the alternative hypothesis which states that: there is a significant effect of income inequality distribution on health indicators in Nigeria.

## 5. Summary, Conclusion and Policy Implications

In nutshell, this study investigated effect of income inequality distribution on health indicators in Nigeria. In trying to achieve the objective, the study employed dynamic ordinary least square approach. The findings revealed that there is a significant effect of income inequality, per capita income, education level and saving on health indicators (i.e. mortality and life expectancy rate) in Nigeria for the periods of 1980-2014. With 99% and 97% of the changes in health indicators (i.e. mortality and life expectancy rate) were explained by income inequality, per capita income, education level and savings in the models respectively. The study therefore brought out in clear terms, the reason for high level of poor health indicators in Nigeria. Our findings highlighted five reasons for the high level of poor health status in Nigeria namely:

- Increase in the level of income inequality leads to severe child malnutrition in Nigeria over the years.
- Poor health status was influenced by literacy rate, level of education, income and social status.
- Most of the Nigerians were not cultivate the habit of keeping fund for future emergency needs and this have a significant effect on health indicators over time.

From the empirical findings, it can be concluded that poor health indicators has been one of the major problematic in Nigeria and have lead to poor human capital development over the years. There is no doubt from the results that income inequality, per capita income, education level and savings level have significant effect on health indicators in Nigeria. In this respect, it is recommended that attainable policies should be put in place in order to reduce income inequality that will enable them to attain certain level of health care in order for them to live a socially and economically productive life in Nigeria. The findings of this study supported that the need for the government to formulate policies target to improve the per capita income of every individual in order to minimize income disparity in Nigeria. In addition to this, our findings also suggest that education should be made a necessary condition for reducing poor health status in Nigeria. Other policy measures which enhance human capital development through the health care delivery services should be embraced in Nigeria.

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