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IDENTIFYING POVERTY CORRELATES OF HOUSEHOLDS' ENVIRONMENTAL HEALTH INDICATORS IN NIGERIA: A LOGISTIC REGRESSION PARADIGM

Sani Isyaku Usman
Corresponding Author: Northwest University, Kano, Nigeria.
Email: saihab2008@yahoo.com

Abdullahi Daiyabu Marmara
Federal University Dutse, Nigeria. Email: admarmara@yahoo.co.uk

Abstract

This paper examines the correlates of poverty in Nigeria. While most of the studies done on poverty determinants rely on the socio-economic, demographic and health survey data, the present paper uses the survey data on environmental health indicators to determine poverty in Nigeria. A Logistic regression was estimated based on the data with the poverty as the binary dependent variable (that is poor and non-poor) and a set of environment health variables as the explanatory variables. The results presented in this paper suggested that the environmental health survey data can be used to determine the correlates of poverty. Thus, the study suggests among others that governments at all levels should put more effort in order to achieve sustainable environment through adequate provision of water supply and sanitation.

Keywords: Poverty, Poverty Correlates, Households, Environmental Health Indicators, Logistic Regression

1. Introduction

Poverty is one of the serious manifestations of human deprivation; it is thus an issue of global concern. Poverty is a plague afflicting people all over the world and it is considered one of the symptoms or manifestation of underdevelopment. Poverty encompasses inadequate income and denial of the basic necessities such as education, health services, clean water and sanitation which are essential for human survival and dignity (World Bank, 2002).

The continued prevalence of poverty throughout the world keeps its alleviation as a central objective of economic growth. Strategies for reducing poverty have begun to pay attention to its relationship with environmental health condition. This two way relationship is a significant one. Many researches showed that poor environmental health contributes to poverty through worsened health and by constraining the productivity of the poor and it (poverty) restricts the poor to acting in ways that are damaging to the environment.

More than ten years have passed since the world leaders signed the agreement of Millennium Development Goals (MDGs). The eight goals, which are intended to be achieved by 2015 ranges from freeing humanity from extreme hunger and poverty; achieve universal basic education; promote gender equality and empower women; reduce child mortality; improve maternal health; combat HIV/AIDS, malaria and other diseases; ensure environmental sustainability; and develop global partnership for development. The MDGs framework has

helped set global and national priorities and focus subsequent actions to achieve economic growth and maintain the environmental quality through improving environmental health. The goal of eradicating poverty and ensuring environmental sustainability are by far more crucial to developing regions and countries especially sub-Saharan Africa, where 43% of the people in the 1990s live below poverty level, because of its impact on other indices like literacy, health and general quality of life (Ali and Thorbecke, 2000). At $1 per day, Word Bank reported that up to 72.9% of people in this region are poor.

Poverty measurement is inevitably a debated topic since there is a large amount of subjectivity involved in constructing such estimates. Poverty is even more complicated to measure in a rapidly changing economy because existing benchmarks that have been used to measure poverty may no longer be valid. Apart from measurement issues one aspect of poverty is the composition of the poor: Who are the poor? Poverty has undergoes various definitions as it has been perceived differently by economists, sociologists, politicians and world organizations alike. It was conventionally measured using income/consumption approach based on the poverty line criteria. Its definition later extended to meeting the basic necessities of life, such as food and shelter, thus incorporating qualitative indicators and their satisfaction. Another school of thought defined poverty in terms of capabilities to replace the basic needs. The definition of poverty was later broadened to include other indicators such as pronounced deprivation, literacy, unemployment, healthy life, violence and poor environmental condition.

Health outcomes resulting from environmental conditions are classified under 'environmental health'. It concerned with human health, including quality of life that is determine by issues of safe drinking water, adequate sanitation, and clean air. A lot of researches conducted have established a link between poverty and poor environmental health. This relationship is often viewed as 'cyclical'. Poverty is viewed as one of the primary causes of poor environmental condition; and poor environmental condition resulted into diseases which further leads to poverty by reducing the capabilities of people concerned. This is often regarded as 'poverty trap'. However, others argued that establishing such a link would involve the analysis of disease occurrences, severity of diseases and receipt of medical care. Thus poverty can be understood as a complex and multidimensional process in which environmental health can contribute to reducing different dimensions of poverty.

Regression analysis is commonly undertaken to identify the effects of each of these characteristics on income (or expenditure) per capita. Regression techniques are good at identifying the immediate, proximate causes of poverty, but are less successful at finding the deep causes; they can show that a lack of education causes poverty, but cannot so easily explain why some people lack education. Attention is needed choose the independent variables carefully, to be sure that they are indeed exogenous. A number of more exotic models are now available for this purpose, including probit and logit models that identify the determinants of poverty by not just showing the relationship between poverty and its determinants, but examining the extent and probability of a person or household being poor.

1.1. Statement of the Problem

A large number of studies on poverty determination or correlates in Nigeria using socioeconomic, demographic and health survey data are available. Most of these done on poverty in Nigeria relies on the expenditure and consumption data and thus use the poverty line computed from the Nigeria National Bureau of Statistics (NBS), and Central Bank of Nigeria (CBN), using the of cost of basic needs method.

However, few studies focus on environmental health indicators such as accessibility to safe drinking water, adequate sanitation and clean air (indoor air pollution) and refuse waste disposal nature as determinants of poverty. This paper would contributes to the existing literature on poverty correlates in Nigeria by identifying the determinants of poverty in Nigeria using household environmental health characteristics survey data by examining the extent or probability to which an individual household is poor or not.

Emphasis on household environmental health indicators stems from their link to environmental related diseases such as malaria, dysentery and cholera, which are known to be widespread. An understanding of the extent, nature, and determinants of poverty is a

precondition for effective public action to reduce deprivation in the country. The major objective of the present study is to analyze the impact of households' environmental health characteristics on poverty.

Environmental health matters greatly to those living in poverty. Many opinion polls have found that poor income groups tend to mainly raise issues linked with clean air, safe drinking water and adequate sanitation as national environmental concerns, suggesting that environmental health concerns directly affects their quality of life and therefore are a priority for them (WHO, 2006). It was estimated that environmental risk factors play a role in more than 80 percent of the diseases and injuries around the world. Africa and Asia are most affected by health related diseases. On the whole, the impact of health risks those are consequence of lack of access to safe drinking water, inadequate sanitation, poor waste disposal system, indoor air pollution, and vector-borne diseases such as malaria, is higher compared to modern hazards, which include urban pollution and problems arising from industrial chemicals and wastes. The absolute risk is even larger in the poorest regions (Ezzati *et al.* 2004).

1.2. Research Objective

The broad aim of this study is to identify the determinants of poverty in Nigeria using household environmental health survey data. Thus, the study is concerned to analyze
- To determine the correlates of poverty using household environmental health determinants;
- The linkage between poverty and environmental health indicators;

1.3. Research Questions

This study is designed to identify the determinants of poverty using environmental health survey data in Nigeria. The study will therefore seek to answer the following questions:
- What are the immediate poverty determinants in relation to household environmental health factors?
- What is the extent of poverty using the relevant factors?
- Is there any relationship between poverty and household environmental health factors?

1.4. Research Hypothesis

For this study the hypotheses stipulated for, are as follows:
- H_{O1}: Poverty is not determined by environmental health indicators.
- H_{O2}: There is no relationship between poverty and environmental health indicators.

2. Literature Review

2.1. Conceptual and Theoretical Framework

2.1.1. Concept of Poverty

The persistence of poverty is linked to its multidimensionality: It is dynamic, complex, institutionally embedded, and a gender- and location-specific phenomenon. The pattern and shape of poverty vary by social group, season, location, and country. There is much ambiguity in the way poverty is discussed by social scientists and analytically quantified by economists. Poverty means being deprived materially, socially, and emotionally. It steals the opportunity to have a life unmarked by sickness, a decent education, a secure home, and a long retirement (Oppenheim and Harker, 1996).

There has been and continues to be much debate about how poverty should be defined and measured, as it has been perceived differently by economists, sociologists, politicians and development thinkers alike. The conventionally poverty measurement method have focused mainly on income/consumption expenditure as the criteria to measure poverty. Here, a person or household is classified as poor if his/her income falls below a specified poverty line or level.

The level is specified as $1.50 per day by the United Nations, below which an individual or household is poor. The rationale behind this standard way of assessing the poor is that, in principle, an individual above the monetary poverty line is thought to possess the potential purchasing power to acquire the bundle of attributes yielding a level of well-being sufficient to function (Ragupathy, 2007).

The drawbacks of this measure were pointed out by many researchers over the years. Some of the criticisms highlight the possibility that there is no guarantee that an individual or household at or even above the poverty line would actually allocate their income to purchase the bundle that satisfies the minimum basic needs. Often there is lack of opportunities and access to utilize the means available efficiently to achieve the desired end goals. Another drawback is that some (non- monetary) attributes cannot be purchased because market does not exist, for example, with some public goods (Ali and Thornobecke, 2000).

In the 1970s, the definition of poverty extends to meeting the basic necessities of life consisting of food, decent shelter and modes of expenditure, thus incorporating qualitative indicators and their satisfaction. In the 1980s, Amartya Sen introduced the concept of "capabilities" to replace the basic needs concept. Sen considered poverty not only in terms of material well-being, but also with opportunities – what people can or cannot do (capabilities) as well as what they are or are not doing (functions).

Thus Sen. shifts the conceptual framework by defining poverty as a deprivation of human capabilities. Therefore, poverty may at its core be defined as a deprivation of human capabilities whose solution is the introduction of basic freedoms. In sum, Sen. puts forth, freedom is both the ends and the means of development. From Sen's understanding of poverty, UNDP developed human development index as an alternative to income/consumption measure of poverty.

> "(Poverty) is deprivation in the most essential capabilities of life, including a long and healthy life, being knowledgeable, having adequate economic provisioning and participating fully in the life of the community, (UNDP, 1997)".

The world development report 2000/2001 claims to broaden the notion of poverty to include vulnerability, risk, voicelessness and powerlessness. World Bank (2002) defined poverty in terms of "pronounced deprivation in well-being" of the people. The United Nations further included unemployment, poor environmental condition and violence as other indicators of measuring poverty.

This definition is much broader and extends beyond food and nonfood items to include key assets and social determinants, which are essential for human development. Ravallion stated that "poverty exists when one or more persons fall short of a level of economic welfare deemed to constitute a reasonable minimum, either in some absolute sense or by the standards of a specific society" (1996, p.1328).

2.1.2. Poverty and Environmental Health

Poverty needs to be understood as a complex and multidimensional process in which environmental health can contribute to reducing its different dimensions (WHO, 2006). Health outcomes resulting from environmental conditions are classified under environmental health. WHO further defined environmental health, as those "aspect of human health, including quality of life that is determined by chemical, physical, biological, social and physiological factors in the environment. It concerned with human health affected by issues of safe drinking water, adequate sanitation and clean air". DFID suggested that "environmental factors are said to be responsible for almost a quarter of all diseases in developing countries. Women and children from the poor families are most at risk due to water-borne vectors, inadequate sanitation facilities and indoor air pollution resulting from the use of non-improved fuel for cooking" (2000, p.5). Prus-Ustan and Corvalan (2006) argued that the most important environmental hazard is fecal contamination of water and food due to poor or non existence of excreta disposal and inadequate hygiene. This made worse by inadequate and unsafe water supplies. In general, household environmental health risks impacting on poverty are grouped into two broad

categories, following Ezzati *et al.* (2004), Nunan *et al.* (2002), and Prus-Ustan and Corvalan (2006).

(i) Traditional hazards are closely linked with poverty. They refer to health risks that a consequence of lack of access to clean water for drinking and cooking, inadequate sanitation poor waste disposal, indoor air pollution and vector borne-diseases such as malaria.

(ii) Modern hazards which include urban air pollution and problems arising from industrial chemicals and wastes.

On the whole, the impact of traditional risks factors is three times higher globally compared to modern hazards (Prus-Ustan and Corvalan, 2006). The absolute impact of traditional risks is even larger in the poorest areas (Ezzati *et al.* 2004).

There are several reasons why environmental health is an important concern for the poor (Prus-Ustan and Corvalan 2006). Poor people often live in areas with the worst environmental conditions; they have lower resistance to infections; they pay more to health services; when they fall ill, they lose income and even jobs. Better environmental health conditions therefore goes beyond directly improving health outcomes. Additional benefits often include saving time, lowering cost of living, and reducing the burden of daily life.

Environmental health is both a direct component of human well-being and a form human capital that increases capabilities, and improving it can help contribute to reducing poverty both directly and indirectly. Thus the role of health in shaping the economic outcomes of a nation like Nigeria cannot be over emphasized. But diseases that are outcome of poor environmental conditions such as diarrhea, malaria, and cholera that are a consequence of poor environmental condition have come to plant their roots in Nigeria, especially among the poor due to poor/ inadequate accessibility to clean water and sanitation (Ahmad *et al.* 2011). In addition to that, indoor air pollution adds to the burden of the diseases.

2.2. Empirical Framework of the Study

A lot of researches conducted have established a link between poverty and poor environmental health. This relationship is often viewed as cyclical. Poverty is viewed as one of the primary causes of poor environmental condition; and poor environmental condition resulted into diseases which further leads to poverty by reducing the capabilities of people concerned (Nunan *et al.* 2002). This is often regarded as 'poverty trap'. However, others argued that establishing such a link would involve the analysis of disease occurrences, severity of diseases and receipt of medical care (Nwaiwu, 2012). Thus poverty can be understood as a complex and multidimensional process in which environmental health can contribute to reducing different dimensions of it.

Ahmad *et al.* (2011), examine relationship between poverty and health in Nigeria using health and demographic survey data for the period 1998-2008. Health was defined in terms of accessibility water supply and sanitation, while poverty using unemployment. The study employed correlation coefficient statistic and the result shows negative correlation between poverty and health.

2.3. Poverty Impact of Household Environmental Health Indicators

a) Water Supply and Sanitation: Lack of access to improved drinking water and sanitation afflicts people's life at all ages. In 2012 it was estimated that almost 748 across the globe million people have no access to an improved water supply and 2.5 million people did not have access to adequate sanitation facility (JMP Report, 2012). The consequence is outbreak of diseases that reduces people's capabilities and to the burden on their lives. The 2000 World Bank report on water supply and sanitation has established a positive relationship between water supply and sanitation with some key sectors including health, education and environment in Nigeria. Inadequate water supply and sanitation result into higher vulnerability to water borne diseases such as malaria, diarrhea, dysentery, and other parasitic infections (World Bank, 2000). The effect also translate into low enrollment of primary pupils, especially the son's of the poor, for they have to spend more time collecting water and hence misses school. The resulting lack of

education and social development further marginalizes the children of the poor and reduces their future chances of self-improvement.

b) Indoor Air Pollution: Indoor air pollution – a much less publicized source of poor health- is responsible for over 1.5 million deaths from respiratory infections per year and for 2.7% of the global burden of diseases (WHO, 2006). In developing countries, indoor air pollution is largely attributed to smoking resulting from the use of non-improved sources of fuel for domestic cooking such as biomass, coal and dung, which combines with unventilated and overcrowded accommodations. The burden falls on the most vulnerable women and children, since they are traditionally spend more time indoors and near the stove. Only the more affluent households use gas or electricity for domestic cooking (OECD, 2003).

c) Refuse or Waste Disposal: Households are considered major sources of waste or refuse generation and disposal in comparison on other sources such as educational and commercial institutions or the municipal (from cleaning of public places such as streets), (Agbesola, 2013). Waste/Refuse generation and disposal highly harmful to the environment and people's health (Magutu and Onsogo, 2011). Waste/refuse generation and disposal is an unavoidable product of man's activities in day to day living. However, proper waste disposal poses a problem in many developing countries like Nigeria today. Population growth however makes proper waste disposal even more challenging (Agbesola, 2013). Poor refuse disposal is perceived environmental hazard of high significance and plays no small role in increasing extant of environmental pressure (Chowdhry *et al.* 2009). It has a link with both water and air pollution. Waste should be disposed of in a safe way which takes into cognizance health of the environment and that of the public (Ali and Thornobecke, 2000).

3. Methodology

3.1. Data

This study makes use of secondary data on household demographic and health surveys for Nigeria during 2006-2013. The data was collected from annual reports of National Population Commission, Nigeria, National Bureau of Statistics, Nigeria, World Health Organization, MDG_S Performance Tracking surveys and UNICEF. The survey data covered both rural and urban population in the country during the period under study (2006-2013). The data provides detailed information on the source of household water for drinking and cooking, household type of toilet facility, household type of fuel for domestic cooking, and household type of refuse disposal. A household is defined as a person or group of individuals related or unrelated to each other, living together in the same dwelling unit and share common source of food (NBS, 2014 and NPC, 2014).

3.2. The Model

In logistic regression model, the dependent variable is a binary or dichotomous taking two values 0 and 1 showing the probability of occurrence or otherwise of an event. Logistic regression determines the impact of multiple independent variables presented simultaneously to predict membership of one or other of the two dependent variable categories. Since the dependent variable is dichotomous we cannot predict a numerical value for it so the usual regression least squares deviations criteria for best fit approach of minimizing error around the line of best fit is inappropriate. Instead, logistic regression employs binomial probability theory in which there are only two values to predict: that probability (p) is 1 rather than 0, i.e. the event/person belongs to one group rather than the other. Logistic regression forms a best fitting equation or function using the maximum likelihood method, which maximizes the probability of classifying the observed data into the appropriate category given the regression coefficients (Field, 2012).

   Therefore, in logistic regression model, instead of predicting the value of dependent variable Y from predictor variables, the probability of Y occurring given known values of Xs is

predicted. This probability varies according to the values of regressors. The logistic regression equation from which the probability of Y is predicted is given by:

$$P(y) = 1/1 + e^{-(\beta_0 + \beta_1 x_1 + \ldots\ldots\ldots\ldots + \beta_k x_k)} \tag{1}$$

Where **p(Y)** is the probability of Y occurring, **e** is the base of natural logarithm, and the $\beta_0 + \beta_0 + \beta_1 x_1 + \ldots\ldots + \beta_k x_k$ are the coefficients form of linear combination much the same as in the simple regression.

The basic logistic regression analysis begins with logit transformation of the dependent variable through utilization of maximum likelihood estimation. This is done using what is popularly known as Odds Ratio. The odds ratio for an event is represented as the probability of the event outcome divided by one minus probability of event outcome.

The odds ratio is given by:

$$Odds = P(X) / 1-P(x) \tag{2}$$
$$= e^{-(\beta_0 + \beta_1 X_1 + \ldots\ldots\ldots + \beta_n X_n)} \tag{3}$$
$$Odds = P(X) / 1-P(x)$$

Where **p(X)** is the probability of success if event will occur and **1-p(x)** is the probability of failure if an event not occurring.

Hence equation (3) can be transformed into an alternative form of logistic regression equation by taking the Naperian logarithm of the odds ratio popularly known as logistic transformation (Logit) to obtain equation (4) below:

$$Log(P) = Ln[p/1-p] = \beta_0 + \beta_1 x_1 + \ldots\ldots + \beta_n x_n \tag{4}$$
$$Log(p) = \beta_0 + \beta_1 x_1 + \ldots\ldots\ldots + \beta_n x_n$$

Since **log (p)** is has an unbounded range, the best strategy is to predict for every case that the subject of the indicator will fall into failure group. Using that strategy we would be corrected of the time (Karl, 2014). However, this strategy is more or less adopted by the present study.

3.3. Model Specification

This study will carry out a multivariate econometric regression and alternatively a logistic regression model to identify the determinants of poverty in terms of household environmental health indicators. The use of logistic regression model to determine poverty correlates of households has wider conduct among researchers (Chaudhry *et al.* 2001; Achia *et al.* 2010; Ahmad, 2011).

The study therefore specifies functional relationship between poverty and environmental health indicators. The predictor indicators as incorporated by WHO, UNICEF and MDGs were used to determine poverty. The dependent binary variable is poverty taking the value of 0 if household is poor and 1 if households' is non poor. The exogenous variables are households' source of water for drinking, cooking and other domestic purposes, households' type of toilet facility, households' type of cooking fuel and household type of refuse disposal. The environmental health indicators have been classified into improved and non-improved (Table 1). The justification for these variables was explained in the previous chapter.

Table 1. Classification of Environmental Health Indicators

Indicator	Improved	Non-improved
Drinking and cooking water	-Piped water -Public taps -Boreholes -Protected dug well -Protected spring -Rain water -Bottled water	-Unprotected dug well -Unprotected sprig -Cart with tant/drums -River, dam, pond, stream, canal,irrigation channels
Type of toilet facility	-Piped sewer system -Septic tank -Pit latrine -Ventilated improved pit [VIP] -Pit latrine with slab -Composting toilet	-Open defecation -Pit latrine without slab or platform -Hanging and bucket latrines -Shared toilets
Type of domestic cooking fuel	-Gas -Electricity -Kerosene	-Animal dung -Dried grasses -Firewood -Coal
Type of refuse disposal	-Household bin collected by government agency -Household bin collected by private agency -Government authorized bin or shed	-Disposal within compound -Disposal in unauthorized refuse heap

Source: WHO/UNICEF Joint Project, 2014 update; National Bureau of Statistics, Nigeria, 2009, 2012 and 2013 social statistics in Nigeria; National Population commission, Nigeria, demographic and health survey 2005-2013; MDGs performance tracking survey, Nigeria, 2010-2013.

Thus, the logit model for the study is specified as:

$$Log (p) = \beta_0 + \beta_1 wimp + \beta_2 wnon + \beta_3 timp + \beta_4 tnon + \beta_5 fimp + \beta_6 fnon + \beta_7 rimp + \beta_8 rnon + \mu_i$$
(5)

Where:
Log (p) = natural logarithm of odds
$\beta_0 \ldots \ldots \beta_8$ = parameter coefficients
wimp = improved source of water
wnon = nonimproved source of water
timp = improved type of toilet
tnon = nonimproved type of toilet
fimp = improved cooking fuel
fnon = nonimproved cooking fuel
rimp = improved refuse disposal
rnon = nonimproved refuse disposal

Other diagnostic tests conducted in the study include:

a) Wald Test of Significance for Model Parameter

To determine the significance of the independent variables we can use either the Wald statistic or the likelihood ratio test, (Healy, 2006). However, the present study adopts Wald test. The Wald statistic is a method to test whether the coefficients are significantly different from zero. It is used to test the statistical significance of each coefficient (β) of the variables in the model. A Wald test calculates a Z statistic as:

$$z = \frac{\hat{\beta}_i}{se_{\beta_i}} \tag{6}$$

This Z value is then squared, yielding a Wald statistic with a chi-square distribution.

b) Likelihood Ratio Test of Independence

The likelihood-ratio test uses the ratio of the maximized value of the likelihood function for the full model (L_1) over the maximized value of the likelihood function for the simpler model (L_0). Likelihood-ratio test statistic equals:

$$z = \frac{\hat{\beta}_i}{se_{\beta_i}} - 2\log(\frac{L_0}{L_1}) = -2\big[\log(L_0) - \log(L_1)\big] = -2(L_0 - L_1) \tag{7}$$

This log transformation of the likelihood functions yields a chi-square statistic. The test therefore uses the observed and predicted values based on chi-square to assess the fit of the model.

Likelihood just means probability. It is based on –2LL ratio, and it test the significance of the difference between the likelihood ratio (–2LL) for the researcher's model with predictors (called model chi square) minus the likelihood ratio for baseline model with only a constant in it. Significance at the .05 level or lower means the researcher's model with the predictors is significantly different from the one with the constant only (all 'b' coefficients being zero). It measures the improvement in fit that the explanatory variables make compared to the null model. Chi square is used to assess significance of this ratio. When probability fails to reach the 5% significance level, we retain the null hypothesis that knowing the independent variables (predictors) has no increased effects (i.e. make no difference) in predicting the dependent.

The forward selection, backward elimination and stepwise (logistic) regression methods were determine automatically which variables to add or drop from the model. The conditional options use a computationally faster version of the likelihood ratio test.

4. Result and Discussion

This study was undertaken to identify the correlates of poverty in Nigeria using household's environmental health indicators. A logistic regression was employed in the analysis. The empirical results for this are summarized in Table 2.

Table 2. Logistic Estimates of the Determinants of Poverty

Predictor	Coefficient	Wald Test	Odds Ratio	p-value
Wimp	-16.38**	15.2	0.43	0.019
Wnon	0.19*	14.0	5.34	0.019
Timp	-3.17**	18.6	1.49	0.999
Tnon	5.81**	14.4	5.97	0.999
Fimp	-3.90**	15.9	0.92	0.997
Fnon	6.52**	19.6	1.75	0.998
Rimp	-4.39**	23.3	0.10	0.036
Rnon	-4.42**	48.4	0.22	0.036

Source: Authors computation using spss version 13. **Notes:** ** and * indicates that the coefficients are significant at 5% and 10% Levels of significant. R2 = 0.736, Joint significance =56.27, Log-likelihood = -22.736**, Probability = 0.0000.

The empirical result shows that, except for wnon all the coefficients are significantly different from zero at 5% level of significance. The variables / predictors wnon, timp, tnon and fnon, have an odd ratio of more than one, which confirms their positive relation with the probability of a household being poor. This means that these variables correlate poverty in the study area.

The coefficients of wnon, tnon, and fnon have positive signs and are statistically significant in determining poverty in Nigeria. This implies that with decrease in the use of non-improved water sources for domestic purposes, non-improved toilet facility and non-improved fuel for domestic cooking by the household, the probability of being poor will decrease or reduce. On the other hand, the coefficients of wimp, timp, fimp, rimp, and rnon have negative signs and hence have negative significance or effect in determining poverty in Nigeria. This implies that increase in the use of improved water sources for domestic purposes, improved toilet facility, improved fuel for domestic cooking, improved and non-improved refuse waste disposal will increases the greater potential of alleviating poverty among households and the probability of a particular household being poor will reduces.

The findings of the study support the priori expectations of the model and also support the findings of Ezzati *et al.* (2004), Prus-Ustan and Corvalan (2006) and Nwaiwu (2012), who argued that environmental health indicators have cyclical linkage with poverty, and account for the greater percentage of disease occurrences especially in the developing regions of Africa and Asia. This is because the prevalence of most diseases is associated with the use of non-improved or unhygenically drinking and cooking water, toilet facilities, and domestic cooking fuel.

5. Conclusion and Policy Recommendations

This study has undertaken a multivariate binary logistic regression analysis to identify the determinants of poverty using household environmental health indicators survey data in Nigeria during 2006-2014. The empirical evidence from the findings shows that the use of unimproved drinking and cooking water, toilet facilities and cooking fuels by households significantly correlates poverty.

- The sole responsibility for the provision water and sanitation in Nigeria is vested in the hands of governments at various levels, therefore governments should put more effort in order to achieve sustained environment through adequate provision of water supply and sanitation.
- Provision of more employment opportunities in order to reduce the cycle of poverty trap in relation to disease occurrences due to poor environmental condition.
- There should be adequate supply of electricity so as to reduce the harmful effect of indoor air pollution in relation to cooking fuel.

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