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Maternal Education Household's Wealth and Child Mortality in Rural Nigeria

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Abstract

Poverty, maternal literacy and child mortality has been a policy issue in Nigeria, most especially in rural areas. Studies have established their individual effects on households. However, the need to establish the link between the three welfare indicators is of great economic and social importance. The study aimed at investigating the linkage and effect of maternal education and household wealth on incidence of child mortality in rural Nigeria. The study made use of data obtained from the 2013 Nigeria Demographic and Health Survey (NDHS2013). Logit, probit and Principal Component Analysis models were the analytical techniques adopted. The findings revealed that mothers residing in the north-west recorded the highest percentage of no formal education (54%). Also, asset deprivation (poverty rate) is 63%, though higher in the northern divide than in the south. About 44 percent of the rural households recorded child mortality, with north-west households having the highest. The results revealed that maternal education improves households' wealth; also, households with low level of maternal education and wealth index have the likelihood of recording higher child mortality rate in rural Nigeria. If the Sustainable Development Goals of ending extreme poverty, achieving good health, and ensuring gender equality in relation to female education are to be achieved, maternal human capital development and households' welfare improvement should be the areas of focus in rural Nigeria.

Keywords: Maternal education, Household wealth, Poverty status, Child mortality

Introduction

Child mortality remains a reference indicator for measuring the standard of living, development or wellbeing of a society, as well as the future workforce of a country or a nation. As noted by [1], understanding the determinants of child health is important because health in childhood affects human capital accumulation, health and labor market status in adulthood.

Following the concession reached by nations of the world to reduce child mortality as contained in the Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), efforts to improve child

health in the developing world have recently become one of the major targets of national governments and international organizations, [2]. Throughout the past two decades, a number of strategies were proposed and implemented in order to reduce child mortality and improve child health in developing nations. Some of these strategies include improving health care financing, improving access to healthcare, increasing educational level and most importantly efforts to reduce poverty. Despite all these efforts, under-five and infant mortality rates still remain high in many developing nations. Childhood mortality remains significantly high in sub-Saharan African countries. Internationally, it is estimated that 7 million children under the age of five died in 2011

[3]. Sub-Saharan African region is a major contributor to this statistics.

The trend of infant and child mortality in Nigeria is such that the greater percentage of child deaths occurs in the rural area. For example, in 2008, childhood mortality was 191 deaths per 1,000 live births in the rural Nigeria as against 121 deaths per 1,000 live births in the urban areas [4]. Also, from 2013 NDHS report, child mortality is 64 per 1000 live births respectively. This means that, one in every 16 infants does not survive to their fifth birthday from their first. Also, child mortality is 89 deaths per 1,000 live births in the rural areas as against 42 deaths per 1,000 live births in urban areas. In addition, the prevalence of poverty in the rural areas, illiteracy, religious and cultural beliefs, lack of basic infrastructures and lack of medical personnel and equipment as well as the attitude and expertise of health personnel have worsened the situation (Jamison, 2007). Child mortality remains a daunting challenge in rural Nigeria, [5].

In spite of the concerted international and national efforts on the undesirable levels of child mortality, poor child health outcomes have continued to be a debilitating issue of concern in rural Nigeria. Yet, Nigeria still falls short of Millennium Development Goal targets [6].

Education has been one of the key concepts used as a variable in explaining health outcome. Empirically, the importance of mother's education for child health has been well demonstrated [7],[8]. According to [9], maternal education affects children's health outcomes through its effect on improving women's socioeconomic status. After controlling for household socioeconomic characteristics, studies have concluded that maternal education is an important determinant of child mortality and overall child health. The various pathways through which maternal education promotes child survival, as suggested by the literature, include the acquisition of health knowledge, adherence to recommended feeding practices for children, and increased command over resources.

On the other hand, income alone may play an independent role in enhancing child's health as more resources available to a household should translate into higher expenditures on food and health. In poor environmental settings, lack of access to material resources and meager living conditions may actually represent the most important obstacle to being adequately nourished and healthy.

Nonetheless, the issue regarding the mechanisms laying behind the relationship that links child health, mother education and household wealth still remains an interesting field to explore as-up to date- there seems to be no clear consensus on the transmission channels which lead to better health outcomes. A number of studies [10],[11],[12],[13] indeed have failed to find a strong causal association between maternal education and child health outcomes. As discussed in [13], this weak evidence supporting the positive role of maternal education may be attributed to the fact that this variable is mostly a proxy for socioeconomic status and hence its effect vanishes once controlling for income.

Due to the issues raised, the following research questions were answered in this study; what is the distribution of maternal education in rural Nigeria? What is the distribution of household's wealth like in rural Nigeria? What is the extent of child mortality in rural Nigeria? How does maternal education and households' wealth reduce child mortality in rural Nigeria? The main objective of this study is to examine the effect of maternal education and household wealth on child mortality in rural Nigeria.

Based on the aforementioned, this study would establish the level of households' wealth, rate of child mortality and maternal education across the six zones in rural Nigeria, so as to know the zone with, highest rate of child mortality, lowest household wealth and maternal educational level. This will assist in formulating zone specific policy options that will significantly reduce child mortality rate and enhance maternal education (human capital development) and household wealth in rural Nigeria.

Literature Review

In this session, relevant empirical studies and literatures on the child mortality, household wealth and maternal education were reviewed.

Many studies showed the existence of negative relationship between maternal education and child mortality [14],[15]. But, many other studies claim that maternal education affect child health not only directly, but also indirectly through other factors. The main pathways which are mostly tested for mediating the relationship between maternal education and child health are socio-economic status, health knowledge, and attitudes towards modern health care, women autonomy, and fertility [14],[16],[17].

Different studies have found significant bio-demographic and socio-economic factors that determine neo-natal mortality, infant mortality and child mortality. These factors include; marital status, birth order of the child, preceding birth interval, maternal education, household size, and sex of the child [18],[19],[20]. In addition to these factors, age of the mother at first birth, number of children born to a mother, access to sanitation facilities, quality of water, and access to radio are the factors that found to significantly affect childhood mortality. Similarly, maternal health, household income and maternal education were significant determinants of child nutritional status [21].

Similar studies have been done for other countries. For example [22] in the study for the determinants of under-five mortality in Nigeria has found significant effect bio-demographic and environmental factors. Availability of public services like electricity, public toilets, proper sanitary disposals and piped water were also found to be among important factors that determine child survival in the same country [23]. The other important factor identified is time and duration of breast feeding. In addition, they stated that mother's increased participation in outside-home employment negatively affected probability of child survival.

In Nepal, mother's education and her decision making power in the household are the most powerful determinants of infant mortality [24]. [25] Also found that sex of the child; birth interval and mother's occupation are significant determinants of child survival in Cote D'voire. Furthermore, Factors related to childcare environment are important to improve the survival status of children. [17] Found that socio-economic status is the most important channel which links maternal education and child nutritional status. Their findings suggest that about half of the effect of maternal education on child nutritional status is explained by socio-economic status and geographic residence while modern health care utilization and health knowledge account to a lesser extent for portions of the maternal education effect. Reproductive behaviours variables such as birth spacing and parity are found instead to show a strong independent influence on child anthropometric shortfalls.

On the other hand, maternal education helps to have better health knowledge and contributes for the improvement of child health and therefore a decrease in probability of childhood death. Formal education

helps mothers to easily understand health education. It was also stated that educated mothers can better understand messages of health education than the uneducated counterparts. This caused a difference in utilization of the health services available, despite equal access to the health services regardless of educational difference. There are some countries where health care service access is differed by differences in maternal education [26]. By looking at the interactions among mother's education and public health programs, [27] said that maternal education affects child health through efficiency and allocative effects. It stated that maternal education helps to increase productivity of health inputs and reduces cost of information.

Mother's health knowledge and her empowerment in the household are the main channels thorough which her education level affects her child's health [16]. Similarly, [14] found a significant effect of use of basic health services on childhood survival and its significant association with maternal education. Attitude towards healthcare activities which directly affect nutritional status of children is also related to maternal education [17].

Very few studies have focused on the regional differences in sub-Saharan Africa with specific emphasis on the role of wealth, mothers' educational attainment, and location in explaining the disparities in infant and child mortality rate. This paper, therefore, helps to fill the void that currently exists in the literature. Understanding the regional differences in infant and child mortality rate in sub-Saharan Africa is important in these respects: First, by knowing the regional differences, Sub-Saharan African countries where there are urgent health needs of infants and children will be easily targeted. Second, by knowing the differences caused by wealth inequities, mothers' educational attainment, and location, health policies can now be channeled to address the needs of the affected areas.

Materials and Methods

Source and type of data

The study area is rural Nigeria consisting of six geopolitical zones namely; North Central, North East, North West, South East, South-South and South West. The data used is from secondary source, Nigeria Demographic Health Survey [28] which is a cross-sectional survey that was implemented by the National Population Commission on a nationally representative

sample of households. It contains rich demographic and few relevant socioeconomic data on households and household assets. It provides data on the welfare of children and adult in households.

The 2013 NDHS sample was selected using a stratified three-stage cluster design consisting of 904 clusters, 372 in urban areas and 532 in rural areas. A representative sample of 40,680 households was selected for the survey. A fixed sample take of 45 households were selected per cluster. Households in rural areas are however the target in this study.

Analytical tools and models

The study employed a number of analytical tools based on the objectives of the study. The tools include descriptive statistics, Principal Component Analysis (PCA), and the probit regression. The specification of the models used in analysis is the subsequent subsection of the study.

Principal component analysis

Empirically, wealth index has been identified as a suitable measure of household's wealth that is consistent with expenditure and income measure [29].

Already contained in the DHS data is wealth index which was constructed using households' asset data via a principal components analysis [28]. Wealth Index represents a more permanent and stable status than either income or consumption measure as alternative indicators of wealth. It is noteworthy to state wealth is more easily measured (with only a single respondent needed in most cases) using this approach and requires far fewer questions than either consumption expenditures or income.

Following [30], many other studies have implemented and recommend the use of PCA for estimating wealth effects [31]. The estimation of relative wealth using PCA is based on the first principal component. Formally, the wealth index for household i is:

$$y_i = \alpha_1 \left(\frac{X_1 - \bar{X}_1}{S_1} \right) + \alpha_2 \left(\frac{X_2 - \bar{X}_2}{S_2} \right) + \dots + \alpha_k \left(\frac{X_k - \bar{X}_k}{S_k} \right)$$

Where, X_i is the score of each asset i

$\bar{X}_k$ And S_k is the mean and standard deviation of asset X_k ;

α represents the weight for each variable X_k for the

first principal component;

y = Wealth Index.

Physical, social, health and monetary household assets were used in constructing the wealth index. The categories so obtained are grouped into five parts based on their ranks (poorest, poorer, middle, richer and richest) with each comprising of 20% of the population [28]. The study however classified household wealth into two categories based on the already determined wealth index - poor class and the rich class.

Probit regression model

Probit model was employed to examine the effect of maternal education and households' wealth in addition to other socio-economic characteristics on child mortality in rural Nigeria. The model is stated as:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \epsilon_i$$

Where;

Y is the occurrence of death of a child between the age of five in a household (1 if the child died and 0 if not), $X_1, \dots, X_n$ are the independent variables (socioeconomic, biological, behavioral, and environmental factors), β 's are the coefficients that were estimated from the model, and

ϵ_i is the error term that represents the unobserved factors that would have effect on under-five mortality.

X_1 = Age of the mother (yrs.)

X_2 = Household size

X_3 = Mothers' education (years)

X_4 = South west (1=Southwest, 0 otherwise)

X_5 = South South (1= South South, 0 otherwise)

X_6 = South east (1=south East, 0 otherwise)

X_7 = North Central (1=North Central, 0 other wise)

X_8 = North East (1=North East, 0 other wise)

X_9 = North West (1=North West, 0 other wise)

X_{10} = Sex of household the head =1=Female, 0=Male

X_{11} = Wealth Index

Results and Discussion

Characteristics of respondents based on incidence of child mortality

This sub-section summarizes the characteristics of the children, their mothers, and families based on differences in under-five mortality status. It shows child, maternal and households' characteristics between the children alive and the children that died below the age of five. Table

1 revealed that mean of years of maternal schooling for mothers' whose children are alive is higher than that of children that died. T-test results show a significantly higher mean of years of schooling for mothers with their children alive than mothers whom their children died. The mean differences are statistically significant at 1% with t-values of 5.97.

Similarly, the proportion of mothers with no education is higher for those whose children have died. This consistency in having higher maternal education for families of children alive can be a good motivator in looking at the contribution of education to under-five mortality using inferential statistics. In addition, Table 1 also shows that the mean current age of the mother is lower in families where the sampled children are alive.

On the other hand, proportion of better sanitation services, better source of drinking water, and access to electricity is higher for the children alive. The mean of wealth scale is higher for the families where the alive children are sampled from. The mean difference on the wealth index is statistically significant at 1% level of significance with t-values of 2.88.

The mean size of the households for children alive is statistically higher than mean size of households with children died under the age of five.

Greater proportion of children that are alive received vaccinations and immunization. Similarly, more proportion of mothers whose sampled children are alive have health card implying that they made antenatal visit and might have delivered their children in hospitals/ health centers.

Maternal Education, Child Mortality Incidence and Household Wealth Index by Geopolitical Zones

This section presents the distribution of maternal education, child mortality and household wealth index disaggregated across the 6 geopolitical zones in Nigeria. As shown in table 2, about 54.7% of mothers in the north-west zone are illiterate, while those that are illiterate in south-eastern zone constitute the least (0.2%). However, 31.7% and 3.7% of mothers in the south-east and the north-west zones have higher degree respectively. There is clear cut evidence regarding the literacy level of mothers in the northern and southern divide with the latter having higher percentage of women who are literate compare to the former. This marked distinction could show the rate

of child mortality occurrence across the divide.

Further revealed in the table 2 below is the distribution of households' wealth across the regions. It revealed that the northern divide recorded higher population of residents suffering asset deprivation (poor households) relative to the southern zones (Table 1).

Residents in North-west and north-east however recorded the highest population of households with low wealth (84.91 and 82.45) percentage respectively. Thus, the northern divide should be the focal point in terms of formulation of policies that will reduce poverty and improve welfare of the residents. About 44% of the total households sampled recorded child death. Child mortality occurrence is however higher among households in north-west and north-east (53.3% and 50.3%) respectively compared to other zones. As shown in table 3, 50.25 percent of the total households that recorded child mortality are poor. This implies that child mortality occurrence shares a direct link with households' asset deprivation (lack of wealth) (Table 2).

Determinants of Wealth of the Households in Rural Nigeria (Table 3). As reported in table 4, logistic regression model was used to analyze the determinants of households' wealth in rural Nigeria. The log likelihood and probe > chi² values of -9428.425 and 0.000 revealed the model fits the data, revealing the overall significance of the model at 1% level. All the variables with the exception of sex of household head significantly influence household wealth. Age of mothers is significant at 5%, while other significant variables are at 1% level.

Increasing the maternal and paternal age by a year will reduce household's wealth index by 0.59% and 0.5% respectively, indicating that household's wealth tends to reduce as both parents grow old. An additional member to the household will increase household wealth by 0.0599. A year increase in maternal education increases household wealth by 18.26%, thus implying that maternal education tend to have a significant and positive influence on accumulation of wealth in rural Nigeria. This stresses the importance of mothers' access to formal education in tackling poverty.

The wealth index of residents in North-central, North-east and North-west zones reduces by 0.2059, 0.9212 and 0.5951 respectively, relative to those residing in the South-west (base). The implication of this is that poverty (low wealth) level tends to be higher in the three northern zones compared to South-west zone. However, the

Table1: Characteristics of respondents based on incidence of mortality.

Variable	Incidence of under-five mortality			
	Alive		Not-alive	
	Mean	*SD	Mean	*SD
Child health factors				
Received measles immunization	0.24	0.43	0.22	0.42
Received polio immunization	0.33	0.47	0.29	0.46
Child demographic factors				
Age of child (in months)	28.89	0.27	21.4	0.19
Total number of children ever born	5.02	1.12	6.1	1.41
Male child	4.45	0.85	3.46	0.74
Female child	6.01	1.14	3.1	0.64
Maternal demographic and other socioeconomic factors				
Mother's current age	28.5	0.1	32.1	0.14
Number of under-five children	3.42	1.1	1.45	0.7
No of year spent schooling –Mother	6.45	0.89	3.45	0.66***
Total number of people in the household	7.21	0.94	5.61	0.77
Mother's education –None	0.18	0.01	0.26	0.01
Mother's education –Junior Primary	0.35	0.01	0.13	0.01
Mother's education –Senior Primary	0.28	0.01	0.11	0.01
Mother's education –Junior Secondary	0.38	0.01	0.22	0.01
Mother's education –Senior Secondary +	0.56	0.01	0.11	0.01
Wealth index	2.97	1.04	1.94	0.85***
Household with safe water	0.44	0.01	0.27	0.01
Household with improved toilet facility	0.19	0.01	0.11	0.01
Health card	0.48	0.01	0.21	0.01

SD: Standard Deviation. ***: Significant at 1 percent level

wealth index of households residing in South-east and South-south increases by 14.40% and 14.04% respectively relative to South-west residents. Thus, households in South-east and South-south zones accumulate wealth more than their South-western counterpart. There is clear cut evidence that poverty is higher among households in the northern divide relative to those in the South, thus zone specific poverty reduction intervention is of great importance in the Northern divide (Table 4).

Effect of Maternal Education and Households' Wealth on Child Mortality in Rural Nigeria

Table 5 showed the result of probit regression Model of the effect of maternal education on child Mortality. The log-likelihood value of -12832. 989, LR chi2 of 3320.35 and prob > chi2 of 0.0000 indicate that the model is significant at 1 percent level of probability. Significant variables influencing child mortality include: north-east, north-west and South-east zones at 1 percent level of

significance. Others include mother's age, mother's education, household size, age of household head and wealth index at 1 percent level of probability. However, sex and north-central zone are significant at 5 percent and 10 percent respectively. Probability that a child would die increases by 0.784, 0.454, 0.327 and 0.825 for residents in north-central north-east, north-west and South-east respectively, relative to south-west residents. This indicates that residents in these zones have higher likelihood of recording child death relative to South-west residents. A year increase in mother's age increases probability of child mortality by 0.098. This implies that aged mother tend to record higher child mortality compare to their younger counterpart.

Incidence of child mortality is reduced by 0.1138 in male headed households. Additional member to a household reduces child mortality by 0.308, while a year increase in age of household head increases the like lihood of child's death by 0.05%. A unit increase in mother's education

Table 2: Distribution of Maternal Education, Child Mortality Incidence and Household Wealth Index by Geopolitical Zones.

Variable	North Central	North East	North West	South East	South South	South West
	Percent (%)	Percent (%)	Percent (%)	Percent (%)	Percent (%)	Percent (%)
Maternal educational attainment						
No education	10.8	30	54.7	0.2	1.9	2.5
Incomplete primary education	23.8	27.6	18.2	5.2	19.3	5.8
Complete primary education	23.5	17	19.5	6.1	23.1	10.7
Incomplete secondary education	21.6	15	8	11.9	33.7	10.2
Secondary school education	19.7	11.4	7.5	17.9	31.5	12.6
Higher education	20.4	7.2	3.7	31.7	30.4	13.4
Maternal occupation						
No job	1.8	1.7	1.4	4.7	9.7	3.8
Professional	22.6	24.6	36.7	37.7	30.3	21.4
Skilled/Artisans	16.6	14.4	19.2	36.7	15.3	21.1
Agriculture	58.8	59.7	42.9	26.2	32.8	56.7
Child mortality incidence						
Under-five alive	68.8	49.7	46.7	65.1	71.1	70.3
Under-five dead	31.2	50.3	53.3	34.9	38.9	29.7
Household wealth index						
Poor household	42.2	82.4	84.91	13.9	15.9	32.4
Rich household	57.7	17.55	15.1	86.1	84.1	67.6

Table 3: Household Wealth and Child Mortality in Rural Nigeria.

Child Mortality	Poor Freq	%	Rich Freq	%
NO	6,626	49.75	5,209	66.68
YES	6,693	50.25	2,603	33.32
Total	13,319		7812	

and wealth index reduces child mortality occurrence by 0.407 and 0.810 respectively. This however revealed that child mortality tends to reduce significantly in households where mothers have higher human capital development. Also, households with access to basic infrastructure, health and social amenities (wealth index indicators) recorded lower child mortality cases (Table 5).

Conclusion and Recommendations

Child health is one of the main indicators of development of a country. Empirical evidence of the effect of households' wealth status and maternal education on child mortality is scarce in Sub-Saharan Africa, particularly in Nigeria. Data from DHS were used

to answer a policy-relevant question which is germane to Sub-Saharan African population. Thus, the effect of households' wealth and maternal education on child mortality in Rural Nigeria was examined. We found that household wealth status had a negative and significant effect on child mortality.

A child is more likely to die when he/she is from a household with low wealth status (poor household). An upward move into the next highest class in wealth quintile by a household reduced the risk of child death by a multiplicative factor of 89%. Before reaching their fifth birthday, the risk of dying if a child is from the poorest household was about two times higher than

Table 4: Determinants of the Wealth of Households in Rural Nigeria.

Variables	Coefficient	Std. Err.	Z
Mothers Age	-0.006	0.003	-2.04**
Sex of household head	0.053	0.067	0.8
Education in single year	0.183	0.005	38.73***
Household size	0.060	0.006	10.17***
Age of house hold head	-0.005	0.002	-2.82***
North central	-0.206	0.077	-2.67***
North East	-0.921	0.039	-23.45***
Northwest	-0.595	0.026	-23.28***
South East	0.144	0.029	4.89***
South South	0.140	0.017	8.08***
Constant	-0.353	0.135	-2.61***

LR chi2 = 8983.05

Prob > chi2 = 0.0000

Log likelihood= -9428.452

***Significant at 1%level, ** Significant at 5%level, *Significant at 10%

Source: NDHS (2013)

Table 5: Effect of Maternal Education and Households' Wealth on Child Mortality in Rural Nigeria.

Variables	Coefficient	Std. Err.	Z
Mothers Age	0.099	0.003	38.58***
Sex of household head	-0.114	0.574	-1.98**
Education in single year	-0.408	0.004	-9.26***
House hold number	-0.308	0.005	-6.17***
Age of house hold head	0.005	0.001	3.61***
Wealth Index	-0.18	0.04	-4.5***
North central	0.142	0.784	1.82*
North East	0.454	0.387	11.73***
Northwest	0.328	0.254	12.59***
South East	0.826	0.247	3.35***
South South	0.160	0.163	0.98
Constant	-0.346	0.125	-27.62***

LR chi2(11)=3320.35

Prob> chi2=0.0000

Log likelihood = -12832.989

***Significant at 1%level, ** Significant at 5%level, *Significant at 10%

Source: NDHS (2013)

one of the same age from richest household. This could be an indication that high under-fives' mortality rates experienced over the years have its sources rooted in the circumstances of the poorest/ poor households. Further to this, it was found that maternal education reduced the probability of risk of child being dead. This may be because educated parents become more capable to take steps to protect their children from diseases. Findings are similar to those of [32].

It was therefore recommended that there should be intensification of the advocacy of maternal education as a strategy in increasing household wealth and reducing child mortality in rural Nigeria. This could be achieved through female literacy programmes in the rural areas. Further to this, due regards should be given to enhancement of access to physical, health and social infrastructures (wealth index) in rural Nigeria.

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