

THE LINKAGE EFFECTS OF MATERNAL EDUCATION, HOUSEHOLD WEALTH STATUS AND CHILD SURVIVAL IN NIGERIA: RURAL AND URBAN DISPARITY

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ABSTRACT

Every single day in Nigeria, 2,300 children die before their fifth birthday, making it the second country in the world with the highest number of under-five mortality rate (U5MR). Maternal education and household poverty among others have been found to be main determinants of U5MR. However, the role of the inter-play of these factors is not well understood. The study therefore hypothesized that the children of women at the nexus of poverty and have no education are more likely to die before their fifth birthday compare to other women in other groups both in the rural and in the urban areas. Nationally representative sample of 7811 live births to 8558 mothers from 38,948 reproductive aged women in 2013 Nigerian Demographic and Health Survey (NDHS) was used. The results of our findings revealed that the hypothesis was sustained. However, in the rural area, a child whose mother has no education and not poor do not have a significantly more chance of survival than a child whose mother is 'not educated and poor'. This was not the case in urban area. There is the need for interventions to reduce the disparities in educational attainment and wealth status existing among women both in the rural and in the urban areas. Wealthy men married to uneducated women should encourage their Wives to take advantage of adult literacy programs.

KEYWORDS: Linkages, interactions, maternal education, wealth status, child mortality. Child survival.**BACKGROUND STUDY**

The risk of a child dying before completing five years of age is still highest in the World Health Organization (WHO) African Region (which is on the average 81 per 1000 live births), about 7 times higher than that in the WHO European Region (which is on the average 11 per 1000 live births).^[1] Generally, a report elsewhere published in 2010 stated that children in developing countries were ten times more likely to die before their fifth birthday compare to their counterparts in developed countries.^[2] However, this disparity has become even wider as disclosed in a recent WHO report that in 2013, the under-five mortality (U5M) rate in low-income countries was 76 deaths per 1000 live births to almost 11 times the average rate in high-income countries (7 deaths per 1000 live births).^[1] This is true because on the global scale, U5M has decreased by 53% between 1990 and 2013,^[1] and 60% of this decline is associated with three WHO regions: the Americas, European and the Western Pacific, thereby leaving about 20% of the global decline for other WHO regions translating into an increasing share of under-five mortality for the African region.

In view of the burden of childhood mortality in developing countries, the WHO included in their

millennium development goals to reduce the mortality rate by two-third by year 2015. The dreamed year has finally come and gone; for sure this goal was not realized. For instance, every single day, in Nigeria 2,300 children die before their fifth birthday, making it the second country in the world with the highest number of under-five mortality (U5M).^[3] Nigeria Demographic and Health Survey (NDHS) revealed that under-5 mortality rates in Nigeria have decreased from 156.9 deaths per 1000 in 2008 to about 128 deaths per 1000 in 2013.^[4,5] However, Nigeria still has a long way to go in achieving the millennium development goals (MDGs) target of reducing the under-5 mortality to 64 deaths per 1,000 live births, and the infant mortality to 30 deaths per 1,000 live births by 2015.^[6] The estimated infant mortality rate in the 2003 NDHS was 100 deaths per 1,000 live births^[7], which decreased to 75 deaths per 1,000 live births in the 2008 NDHS^[5] and further to 69 deaths per 1,000 live births in the 2013 NDHS.^[4] The pattern shows that about 29 percent of deaths under age 5 occur during the neonatal period (37 deaths per 1,000 live births), and 24 percent occur during the post-neonatal period (31 deaths per 1,000 live births).^[4] Overall, the highest sub-Saharan African child mortality levels are in West Africa, except for Ghana, where the

U5MR is 80.0 deaths per 1,000 live births. Other countries with relatively low child mortality rates include Gabon, Madagascar, and Zimbabwe, all with U5MR below 100 deaths per 1,000 live births.^[8]

However, mortality rates for Nigeria in the past 10 years preceding 2013 is found to be consistently higher in the rural areas than in the urban centers. The current position showed that under-five mortality is 67% higher in rural areas (167 deaths per 1000 live births) than in urban areas (100 deaths per 1000 live births).^[4] A study elsewhere^[9], found that residing in rural areas increased the odds of U5M by 53% compared to children living in urban settlements and living in socioeconomically disadvantaged areas is associated with increased childhood mortality.^[2]

Many factors (especially those that are maternal) have been found to significantly determine U5M in Nigeria. These include: maternal age, ethnicity, religion, the place of residence, level of women autonomy and education. Indeed, maternal education had been widely reported to have correlated well with childhood survival.^[6,7,8,9,10 11] When women are educated, they have both greater earning power and improved status within the household that enables them gain greater access to and control over resources for the benefit of their children^[11] Children of educated mothers will survive better than children of non-educated mothers.^[9,12]

Reports on the effects of socioeconomic status (SES) on health showed that each decrease in socioeconomic status was associated with an increased health risk.^[13] For instance, with respect to socioeconomic status defined on income, Case et al. (2002) while using US data set and Currie et al. (2004) using UK data set, were reported in^[14] to have found robust evidence of an income on general health status, even after controlling for parental education level and also found independent effects of parental education especially the mother's on health of the child. Also in US as family income decreases, children are less likely to be seen by a doctor and more likely to be seen in emergency departments and hospitalized.^[13] In sub-Saharan African, a number of studies have found that mothers' ability to seek treatment for children with common sickness such as fever is closely related to their ability to access resources both independently and from others within the household.^[11]

Available literature on rural/urban disparity on under-five mortality have addressed the association of these variables (Rural/Urban) on mortality in Nigeria, but one that have compared the independent association of maternal education level, wealth status and their interactions in this two localities have been relatively sparse. So we hypothesized in this study that the associations of maternal education, wealth status and their linkages on under-five mortality are the same for both rural and urban Nigeria.

THE OBJECTIVES

1. To establish the independent associations existing between maternal education and childhood mortality in both Rural and Urban Nigeria?
2. To establish the independent associations existing between family wealth status and childhood mortality in both Rural and Urban Nigeria?
3. To determine whether the children of women at the nexus of poverty and no education are more likely to die before their fifth birthday compare to other women in other groups both in the rural and in the urban areas.

Data and Methods

We used secondary analysis of population based cross-sectional data for reproductive age women in Nigeria as represented in the 2013 Nigerian Demographic and Health Survey (NDHS). Data were collected using a stratified 2-stage sampling procedure to select 38,948 women aged 15 – 49 years following a list of Standard Enumeration Areas as contained in the sampling frame of 2006 Population Census. The analysis was restricted to 7811 live-born children delivered by 8,558 couples within the 5 years before the survey. A detailed description of this procedure is reported elsewhere.^[4] Weights were constructed to correct for over sampling and under sampling and to ensure national representativeness.

Ethical Approval

The Ethical permission to use the data for this study was obtained from Opinion Research Corporation (ORC) Macro International, Incorporated, Calverton, USA. Meanwhile, the approval for survey procedure and instruments for the 2013 NDHS were already approved by the Ethics Committee of ORC Macro Inc and by the National Ethics Committee of Federal Ministry of Health, Nigeria.

Variables of Interest

Outcome Variable

The outcome variable is the number of under-five mortality in both rural and urban areas defined as the number of live-born children that died before their fifth birthday.

Exposure Variables

Two variables were considered here: Maternal education and Household wealth status.

Maternal Educational Level: Though in NDHS 2013, maternal educational level was classified into 4 groups^[15], however in Nigeria, anyone who is having secondary and above is assumed literate.^[4,15] Therefore, in this study educational level is classified into 2 groups: Lower than secondary with 21461 women representing 55% and secondary and above with 17485 women representing 45%.

Maternal Household Wealth Index: DHS does not collect data on direct measure of income.^[4,15] The wealth index serves as a proxy for measuring the long term standard of living and is based on household's ownership of consumer goods like cars, bicycles, dwelling characteristics, type of drinking water source that are related to a household's socioeconomic status.^[4,5] A more detailed description of the construction of wealth index is reported elsewhere.^[4] In view of the above, wealth index was categorized into three. Women from 'Poor household' were 7,132 (poorest group); women from 'moderate poor household' were 7,428 (poor group); and women from 'not poor household' were 24,388 (Middle, richer and richest groups) representing 18.3%, 19.1% and 62.6% respectively.

The other exposure variables considered in the analysis is the linkages between maternal education level and maternal household wealth status: 'more education and poorest household', 'more education and moderate poor household', 'more education and not poor household' 'more education and poorest household', 'more education and moderate poor household', 'more education and not poor household'.

Statistical Data Analysis Methods

Three levels of analyses were adopted:

- First, at the univariate level, percentage frequency distribution of the study sample was used to show the distribution of respondents by their characteristics.
- Second, bivariate analysis was used to determine the relationship between exposure variables, some

selected confounding factors and under-5 mortality using Pearson chi-square test.

- At the third level, a logistic analysis was employed on the following models: Models 1 and 2 (a univariate model) examine the independent effects of all the principal exposure variables on under-five mortality in both the rural and urban areas. Model 3 examines the linkage effects of the two principal variables on the U5M in both the rural and urban areas. Stata version 14 for academic users^[16] was employed to carry out the analysis.

RESULTS

Table 1 shows the percentage distribution of the principal and some background variables as used. The analysis shows that the survival rate of children from rural area (93.90%) is slightly lower than what was recorded for the urban area (93.96). More women in rural area had no education, while in urban more than 2/3 had secondary education and above. The number of women in rural area that are from poor household are more than 10 times higher when compared with women in urban area. The proportions in terms of age distribution for both rural and urban were almost the same for all age groups. More women in urban area are working with 63.25% compare with 60.70% in rural area. The highest proportion of women in this survey came from the rural North West with 37.61% followed by 29.54% from urban South West. The proportion of women of reproductive age who had no child in urban area is more than those in rural area with 23.63%. Women in rural area have given birth to more children (34.36%) than those in the urban area (22.32%).

Table 1: Percentage Distribution of the Principal Exposure and other Background Variables.

Background Variables	Rural		Urban	
	N	%	N	%
Child survival status				
Alive	9,776	93.96	9,182	93.90
Not alive	628	6.04	596	6.10
Maternal Educational level				
No Education	16,192	71.86	5,269	32.11
Secondary +	6,341	28.14	11,144	67.89
Wealth Index				
Poor	6,720	29.83	410	2.5
Moderately Poor	6,460	28.67	967	5.89
Not poor	9,352	41.50	15,036	91.60
Mat Education/Wealth status				
No education and Poor	6,512	28.90	363	2.21
More education and Poor	208	0.92	47	0.29
No education and Mod Poor	5,441	24.15	695	4.23
More education and Mod Poor	1,019	4.52	272	1.66
No education and Not Poor	4,238	18.81	4,211	25.66
More education and Not Poor	5113	22.69	10,824	65.95
Maternal Age				
15 – 24 years	8,478	37.63	6,098	37.15
25 – 34 years	7,223	32.06	5,387	32.82
35 years +	6,831	30.32	4,928	30.02
Maternal Work Status				
Not working	8855	39.30	6,032	36.75

Working	13,678	60.70	10,381	63.25
Region				
North Central	4,050	17.98	1521	9.27
North East	4,186	18.58	1,579	9.62
North West	8,474	37.61	3,402	20.73
South East	1,327	5.89	3,148	19.18
South-South	3,029	13.44	1,912	11.65
South West	1,464	6.50	4,849	29.54
Children Ever Born				
0	5,323	23.63	6,009	36.61
1 – 2	4,998	22.18	3539	21.56
3 – 4	4,467	19.83	3,202	19.51
5+	7,743	34.36	3663	22.32
Children Living				
0	5,617	24.93	6,132	37.36
1 – 2	5,898	26.18	3,512	23.39
3 – 4	5,364	23.81	3,512	21.40
5+	5,653	25.09	2,931	17.86
Union Status				
Never in union	3,880	17.22	5,445	33.18
Currently in union	17,705	78.57	10,124	61.68
Formerly in union	948	4.21	844	5.15
Age at Marriage				
15 – 24 years	17,672	94.74	9,090	82.88
25 – 34 years	923	4.95	1,805	16.46
35 years+	57	0.31	72	0.66

Interestingly too, more women in rural area marry before 24 years than their Counterparts in urban who marry before that age.

Table 2: Relationship between Childhood Survival, Maternal Education, Household Wealth status and some other background variables by Place of Residence.

Rural				Urban			
Alive	Not alive		Chi. Sq	Alive	Not alive		Chi. sq
Maternal Education Background				Maternal Education Background			
No education	90.80	9.20	34.35**	No education	91.92	8.08	55.16**
Secondary+	93.90	6.10		Secondary+	95.53	4.47	
Household wealth Status				Household wealth Status			
Poor	90.77	9.23	39.30**	Poor	87.54	12.46	63.17**
Moderate Poor	90.01	9.99		Moderate Poor	88.4	11.57	
Not Poor	93.07	6.93		Not Poor	94.59	5.41	
Maternal Education/Household wealth status				Maternal Education/Household wealth status			
No educ./Poor	90.91	9.19	55.59**	No educ./Poor	87.52	12.48	91.68**
More educ./Poor	89.03	10.97		More educ./Poor	87.98	12.02	
No educ./Mod Poor	89.66	10.34		No educ./Mod Poor	87.79	12.21	
More educ./Mod Poor	93.04	6.96		More educ./Mod Poor	92.54	7.46	
No educ./Not Poor	92.19	7.81		No educ./Not Poor	92.98	7.02	
More educ./Not Poor	94.24	5.76		More educ./Not Poor	95.61	4.39	
Maternal Age Group				Maternal Age Group			
15 – 24 years	93.42	6.58	156.34**	15 – 24 years	95.13	4.87	69.81**
25 – 34 years	93.55	6.45		25 – 34 years	95.98	4.02	
35 years+	88.08	11.92		35 years+	91.75	8.25	
Region				Region			
North Central	93.26	6.74	62.25*	North Central	94.86	5.14	31.15*
North East	90.93	9.07		North East	94.62	5.38	
North West	89.88	10.12		North West	93.14	6.86	
South East	90.57	9.43		South East	91.50	8.50	
South-South	93.53	6.47		South-South	94.63	5.37	

South West	94.53	5.47		South West	95.18	4.82	
Work Status				Work Status			
Not Working	94.89	5.11	4.13	Not Working	94.89	5.11	4.13
Working	93.7	6.3		Working	93.7	6.3	
Children Ever Born				Children Ever Born			
1 – 2	92.46	7.54	75.49**	1 – 2	95.02	4.98	67.08**
3 – 4	93.64	6.36		3 – 4	95.81	4.19	
5+	89.45	10.55		5+	91.32	8.68	
Age at First Marriage				Age at First Marriage			
15 – 24 years	91.4	8.60	6.34	15 – 24 years	93.79	6.21	3.086
25 – 34 years	92.05	7.95		25 – 34 years	94.98	5.02	
35 years +	81.10	18.90		35 years +	94.94	5.06	
In Union				In Union			
Never in union	91.63	8.37	12.19*	Never in union	93.41	6.59	28.84**
Currently in union	91.58	8.42		Currently in union	94.35	5.65	
Formerly in union	88.23	8.59		Formerly in union	89.42	10.58	

Relationship between child survival and selected background variables

Table 2 presents the bivariate distribution of children by survival status and according to some selected maternal and child variables in both rural and urban areas. The proportion of child survival was significantly higher for children whose mothers have secondary education and above than those who have no education in both rural (93.90%, $p < 0.001$) and urban (95.53%, $p < 0.001$) areas. There is also a significant variation in the relationship between child survival and household wealth status. In rural, it is highest for those not poor (93.7%, $P < 0.001$) and unexpectedly followed by those that are poor. However, for urban dwellers, it is significantly highest for those not poor (94.59%, $p < 0.001$) and expectedly followed by those who are moderately poor and poor.

Also, there is a significant variation in the association between child survival and the linkages between maternal education and household wealth status. This is expectedly highest for both rural (94.24%, $p < 0.001$) and urban (95.61%, $p < 0.001$) areas among those who have more education and not poor. In addition, child survival status was significantly associated with some selected background variables, for instance, for maternal age group, it is highest for women of age between 25 and 34 years (93.55%, $p < 0.001$) in the rural and (95.98%, $p < 0.001$) in urban; it was significantly highest ($p < 0.001$) for women in rural South West (94.53%), followed by South-south (93.53%) and then North central (93.26%). However, in urban area, the association is significantly highest for women also from South west (95.18%) followed by women of North central (94.86%) and then South-south (94.63%) and North east (94.62%). For children ever born, is highest for children in group 3 – 4 in both rural (93.64%) and urban (95.81%). Children of women who are never in union survive more than others in rural area (91.63%, $p < 0.05$) and currently in union

from urban area (94.35%, $p < 0.001$). However, the associations between child survival and maternal work status, and age at first marriage are not significant.

Univariate Logistic Analyses

Table 3 presents the results of univariate (unadjusted) logistic analyses of all the principal variables.

Objective 1: To establish the independent associations between maternal education and childhood mortality in both Rural and Urban Nigeria?

Model 1: Maternal education status was found to be directly related to child survival. The odds of child survival among the children of mothers who have more education (i.e. secondary school and above) is increased by 56% and 87% in the rural and in the urban areas respectively when compare to children of mothers who had no education (primary school and below).

Table 3: Logistic Analysis of Maternal education, Wealth status and Childhood survival by place of Residence.

Rural		Urban	
Background Variables	OR (CI)	Background Variables	OR (CI)
Model 1		Model 1	
Maternal Education		Maternal Education	
No education	1.00	No education	1.00
More Education	1.56 (1.32 1.84)**	More Education	1.87 (1.52 2.32)**
Model 2		Model 2	
Household Wealth Status		Household Wealth Status	
Poor	1.00	Poor	1.00
Moderately Poor	0.91 (0.77 1.07)	Moderately Poor	1.09 (0.77 1.53)
Not Poor	1.36 (1.16 1.60)**	Not Poor	2.49 (1.72 3.60)**
Model 3		Model 3	
Maternal education/Wealth		Maternal education/Wealth	
No education/Poor	1.00	No education/Poor	1.00
More education/Poor	0.82 (0.39 1.70)	More education/Poor	1.04 (0.18 5.97)
No education/ Moderately Poor	0.88 (0.74 1.04)	No education/ Moderately Poor	1.02 (0.72 1.45)
More education/ Moderately Poor	1.35 (0.92 1.98)	More education/ Moderately Poor	1.77 (0.77 4.05)
No education/Not Poor	1.19 (0.99 1.44)	No education/Not Poor	1.89 (1.27 2.79)*
More education/Not Poor	1.65 (1.34 2.05)**	More education/Not Poor	3.10 (2.09 4.59)**

Model 2: To establish the independent associations between family wealth status and childhood mortality in both Rural and Urban Nigeria?

However, in the household wealth status, childhood survival was significantly higher for those in the category of 'not poor' both in the rural (36%, $p < 0.001$) and urban (149%, $p < 0.001$) when compared with those from 'poor' household. As for the category of 'moderately poor' household, the likelihood that a child will survive in rural slightly decreased (18%) but not significant and in the urban, slightly increased (9%) but also not significant when compare with the reference group.

Model 3: To determine whether the children of women at the nexus of poverty and have no education are more likely to die before five years compare to other women in other group both in rural and in urban areas.

With respect to linkages between maternal education and wealth status, the odds of child survival among the children of mothers who have 'more education and not poor' is significantly increased by 65% in the rural and 210% in the urban when compared with children of mothers who have 'no education and poor' household category. Also, it was observed that the odds of survival for children of mothers in the category of 'no education and not poor' (89%, $p < 0.05$) and in the category of 'more education and moderately poor' (77%, $p < 0.05$) from urban area were significantly more than those in reference category, while in the rural they were not significant.

DISCUSSION

In this study, we have raised three main objectives and the results were revealing. First, maternal education status is no doubt a strong determinant of child survival in both rural and urban areas. This finding reflects the

similar conclusions reported elsewhere [6,7,8,9,10,11,17,18,19], that child mortality decreases as mother educational status increases.^[20] Educated Mothers are said to be more knowledgeable to observe more hygienic and cleaner environment that will enhance child's wellbeing than would mothers who are not educated. In addition, educated mothers have more basic knowledge, attitude and practice of immunization processes than those who are not educated.^[21] However, the effect of maternal education was more pronounced in the urban area than in the rural area.

With respect to the second objective, the analysis indicated that the wealth status of the household a mother lives in has direct effects on child survival status. This agrees with the report submitted by other authors.^[9,22] A plausible reason is that wealth status is directly related to health seeking behavior of mothers.^[23] However, in a more specific finding, child survival rate increases as the wealth status increases in the urban than in the rural. It is established fact that there are more quality healthcare services in the urban than in the rural and this will normally have positive effects on child survival.

The third objective seeks to determine the interaction effect between maternal education and household wealth on child survival. The research has established that children of mothers in the nexus of poverty and are not educated are more likely to die before the age of five than those in other groups in urban area. One striking revelation in this finding is that in the rural area, a child whose mother has no education, but not poor do not have a significantly more chance of survival than a child whose mother is not educated and is from a poor household. However, this was not the case in urban area where it was seen that children of mothers without education and not poor have greater chance to survive than those whose mothers have no education and are from poor household. The implication of this is that

maternal education plays more significant role than household wealth status on child survival in the urban area than it plays in the rural area. The conclusion arrived at here is in line with that reached by UNICEF, 2010 that a child born to a financially deprived and less educated family is at risk of dying within 1 month of delivery because mothers may not be properly nourished at pregnancy, cannot afford to go for ante-natal care nor delivered at a health facility.^[23,24]

Policy Implication

The report from this study has clearly demonstrated that differentials in maternal educational attainment and household wealth status are very strong indicator of child survival in both the rural and urban areas of Nigeria. In view of these findings.

- There is the need for intervention to reduce the disparities in educational attainment existing among women both in the rural and in the urban areas. Negative cultural practices that encouraged withdrawing of girl-child from school for early marriage must in a very strong term be condemned and stopped forthwith across the country.
- Effort should be made to increase the wealth status of families through programs that will help women participate actively in creating wealth for themselves and subsequently increase the wealth of their household.
- Wealthy men married to uneducated women should be encouraged to allow their wives take advantage of many adult literacy programs existing in many city centers.
- Effort should also be made for such centers to be operational in the rural communities. Religious and community efforts can encourage the setting up of such centers towards increasing rural women literacy.

The interpretation from this study is however limited by the fact that in this study we have only considered the independent effect of the two principal variables and their interactions without them being cofounded by other variables. This however can further be explored to find out if the significant effects observed in these principal variables exist after they have been cofounded by other potential variable.

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