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RESEARCH ARTICLE

Environmental Impact on Childhood Survival Among Rural Women in Nigeria: Logistic Model Approach.

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ABSTRACT

Introduction: Globally, the reduction of childhood mortality is a major objective to meet the health-related targets of the Sustainable Development Goals 2030. Studies have shown that childhood mortality is high in developing countries like Nigeria, especially in rural areas. This study identifies environmental factors associated with childhood survival among rural women in Nigeria.

Method: This retrospective study analyzed the 2018 National Demographic and Health Survey data. Women aged 15 – 49 years who lived in rural areas and had a child between 12-59 months old were included in the study. The number of children who died or were alive for each woman was the primary outcome. A logistic model was employed to identify the associated factors.

Results: Childhood mortality in rural Nigeria was approximately 23%. Child survival was linked to the types of toilet facilities, distance to the water source, households with motorcycles, and the materials used for floors and roofs ($p < 0.05$). The sex of the head of household, type of mosquito bed-net, cooking fuel, households with televisions, and wall materials were also significantly associated with childhood survival ($p < 0.05$). Additionally, electricity and the age of the household head had a significant correlation with childhood survival in the southern part of the country ($p < 0.05$).

Conclusion: The identified risk factors must be addressed to enhance childhood survival. This intervention will improve the environmental conditions for rural women, which will ultimately play a crucial role in achieving one of the Sustainable Development Goals of reducing childhood mortality.

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INTRODUCTION

One of the major health goals of the Sustainable Development Goals (SDGs) for child survival is to significantly reduce preventable deaths of newborns and children under five years of age by the end of 2030. Therefore, all countries should aim to lower neonatal mortality to as low as 12 per 1,000 live births and under-five mortality to no more than 25 per 1,000 live births by 2030.¹ However, if current trends continue, several countries will not be on track to meet these targets.¹

In a study involving 46 African countries, it was found that many countries are far from achieving the SDGs based on their current estimates of under-five and neonatal mortality. It was also noted that under-five mortality rates will have to be reduced by about 9% annually between 2015 and 2030 to achieve the SDG 3.2 target for under-five mortality by 2030.² Therefore, identifying the local challenges contributing to child mortality and improving child survival and health remains a global challenge that needs to be addressed.³ Many studies have been done to identify factors associated with under-five mortality generally. The education of mothers, sex of the child, region, and maternal age at childbirth, among others, were significantly associated with Under-five mortality (U5M) in Nigeria using NDHS, 2013 data.^{4,5} Other factors associated with infant and child mortality include occupation, geopolitical zones and type of residence.^{6,7} Place of residence (urban and rural) was another major factor significantly associated with childhood mortality in Nigeria and beyond.^{8,9}

Another study on differentials in the determinants of under-five mortality (U5M) in rural-urban Bhutan, Australia, reported that childhood mortality was

higher in the rural than the urban. Likewise, younger mothers from households without electricity and good sanitation experienced higher U5M.⁷ It was reported in a study using 2013 Nigeria Demographic and Health Survey (2013, NDHS) data that women from rural and the Northern part of Nigeria experienced higher child mortality than their counterparts from the southern part of the country. Also, child mortality was higher among women who started childbearing at an early age and with lower educational levels.^{5,10,11} Survival analysis on U5M in Nigeria has shown that married women and households with a rich and middle wealth index experienced higher child mortality than unmarried and households with a poor wealth index. Female children also survived than male children.⁵

In addition, children with large birth intervals survived more than those with short birth intervals, and several children born in a family of 2 or fewer survived more than those born in a family of 3 or more. The size of children at birth had a significant effect on their survival. Children of small size at birth are likely to die more than those of large size.^{5,12}

Studies have shown that rural women experienced childhood mortality more than those in urban areas.¹³⁻¹⁵

One of the reasons why countries are not positioned to meet the targets is due to the inability to generate evidence on the immediate and remote factors that may be responsible for childhood mortality, which may differ from country to country as a result of the socioeconomic and several other local factors peculiar to each country. These factors must be identified and quantified to provide suitable local solutions to address the high child mortality rates in several African

countries.¹However, few studies from Nigeria have examined factors associated with child mortality (12 – 59 months) among rural dwellers, especially environmental factors. Therefore, this study was embarked upon to identify some

environmental factors associated with child mortality among rural dwellers in Nigeria using a logistic model approach. It was also carried out to add to existing knowledge.

Table 1: Environmental factors associated with childhood mortality: Experience of Rural women aged 15-49 in the whole of Nigeria

Characteristics	Estimate (β)	Z-value	AOR[Exp(β)] CI,95%	Characteristics	Estimate (β)	Z-value	AOR (Exp(β)) CI,95%
Intercept	1.089	1.451	2.971(0.736, 15.183)				
Source of Drinking Water				Household Has Radio			
Other source (Ref.)	(ref.)	(ref.)		No (ref.)	(ref.)	(ref.)	
Piped/tap	-0.061	-0.613	941(0.777, 1.145)	Yes	0.039	0.616	1.040(0.919,1.175)
Household Has Electricity				Household Has Television			
No (ref.)	(ref.)	(ref.)		No (ref.)	(ref.)	(ref.)	
Yes	0.023	0.314	1.023(0.888, 1.179)	Yes	0.344	4.093	1.411(1.197,1.664)
Type Of Toilet Facility				Household Has Motorcycle/ Scooter			
Flush Toilet (ref.)	(ref.)	(ref.)		No (ref.)	(ref.)	(ref.)	
No Facility	0.023	0.189	1.023(0.804,1.296)	Yes	0.166	2.622	1.181(1.043,1.336)
Pit Toilet Latrine	-0.307	-2.702	0.736 (0.587,0.917)	Main Floor Material			
Time To Get Water Source				cement/carpet	(ref.)	(ref.)	
<10min (ref.)	(ref.)	(ref.)		Natural/ Earth/sand	-0.089	-1.319	0.915(0.801,1.044)
11-15min	0.100	0.937	1.105(0.898,1.366)	Other	0.714	2.665	2.042 (1.233,3.541)
16- 20min	0.333	2.686	1.395 (1.099,1.788)	Main Wall Material			
21-25min	0.044	0.178	1.045(0.656,1.726)	Cement/ Cement	(ref.)	(ref.)	
26-30	0.320	2.747	1.377(1.100,1.736)	block			
31-900	0.162	1.57	1.176(0.962,1.444)	Others	-0.348	-4.693	0.706 (0.611,0.816)
Water in Premises	0.087	1.171	1.091(0.944,1.261)	Main Roof Material			
Sex Of Household Head				Natural (ref.)	(ref.)	(ref.)	
Female (ref.)	(ref.)	(ref.)		Other	0.724	2.548	2.063(1.157,3.543)
Male	-0.707	-7.347	0.493 (0.408,0.595)	Roofing shingles	1.366	3.099	3.920(1.683,9.615)
Type Of Mosquito Bed Net(S) Slept Under							
No nets (ref.)	(ref.)	(ref.)					
Treated nets	-0.222	-3.652	0.801 (0.711,0.902)				
Untreated nets	-0.374	-1.189	0.688(0.377,1.306)				
Age of Household Head							
≤19 (ref.)	(ref.)	(ref.)					
20-34yrs	-0.328	-0.473	0.720(0.154,2.581)				
35-49yrs	0.157	0.23	1.170(0.253,4.122)				
50- 64	0.387	0.566	1.473(0.319,5.174)				
≥65yrs	0.361	0.525	1.435(0.310,5.078)				
Type Of Cooking Fuel							
Charcoal wood	(ref.)	(ref.)					
Gas	0.435	1.783	1.545(0.979,2.557)				
Kerosene	0.383	1.665	1.467(0.954,2.357)				
Others	-0.506	-3.488	0.603 (0.454,0.803)				

Adjusted Odds Ratio –AOR; Significant at 5%, Significant at 1%, Significant at 0.1%

Methodology

The study was carried out in Nigeria, a country in West Africa. It is located between the Sahel to the north and the Gulf of Guinea to the south in the Atlantic Ocean. Nigeria has an area of about 923,769 square kilometres, with a

population of more than 230 million. It has 36 states and the Federal Capital Territory, where the capital is located in Abuja. There are six geopolitical zones in Nigeria, namely: North-Central, North-East, North-West, South-East, South-South, and South-West.¹⁶

This is a retrospective study, where data from the 2018 Nigeria Demographic and Health Survey (2018 NDHS) were analyzed. This is secondary data for women aged 15 to 49 years with children aged 12 to 59 months. The study for the 2018 NDHS was a two-stage stratified design. The 36 states and the Federal Capital Territory were stratified into rural and urban. The 1625 women who had complete data in rural areas were used in this study. The complete study design and data collection method are found in the 2018 NDHS report (2018 NDHS).¹⁶ The outcome (dependent) variables (Y) were the number of children aged 12 to 59 months who were alive (Y2) and the number who died (Y1) per woman. Explanatory or independent variables were as used by 2018 NDHS tools include: Source of drinking water, Household has electricity, Type of toilet facility, Time to get to water source, Sex of household head, Type of mosquito bed net(s) slept under last night, Age of household head, Type of cooking fuel, Household has radio, Household has television, Household has motorcycle/scooter, Main floor material, Main wall material and Main roof material.

Statistical Package for Social Sciences (SPSS) version 23 and the R package were used for analysis. The

response Variables Y_1 and Y_2 were used in the model. In this study, a logistic regression model was used to identify the environmental factors associated with childhood survival. The results are presented for the north and south zones. A P-value of less than 0.05 was statistically significant.

The Logistic regression model is given as:¹⁷

$$\text{Log}\left(\frac{\nu}{1-\nu}\right) = \omega_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \dots + \beta_k x_k$$

or

Probability of death is:

$$P(Y = 1|x) = \exp(\beta_0 + \beta_1 x_1 + \dots + \beta_k x_k) / (1 + \exp(\beta_0 + \beta_1 x_1 + \dots + \beta_k x_k))_{18}$$

Where: ν is the probability of occurrence of child death for children of ages 12-59 months. ω_0 is constant.

$\beta_1, \beta_2, \beta_3, \beta_4, \dots, \beta_k$ represent the regression coefficients for independent variables $x_1, x_2, x_3, x_4, \dots, x_k$. The k-th in this study is 14 since 14 independent variables were considered.

Ethical considerations

Ethical approval for data collection for the NDHS was documented in the 2018 NDHS report (2018 NDHS).¹⁶

Table 2a. Environmental factors associated with childhood mortality Experience of Rural women aged 15-49 in Northern and Southern Nigeria.

Characteristics	North Estimate (β)	Z-value	AOR[Exp(β)] CI,95%	South Estimate (β)	Z-value	AOR[Exp(β)] CI,95%
eIntercept	0.844	0.914	2.326(0.395,15.795)	1.145	2.419	3.142(1.267,8.147)
Source of Drinking Water						
Other source (Ref.)	(ref.)	(ref.)		(ref.)	(ref.)	
Piped/tap	-0.092	-0.795	0.912(0.728,1.148)	-0.187	-0.907	0.829(0.559,1.256)
Household Has Electricity						
No (ref.)	(ref.)	(ref.)		(ref.)	(ref.)	
Yes	-0.071	-0.845	0.931(0.789,1.099)	0.384	2.383	1.468(1.071,2.015)
Type Of Toilet Facility						
Flush Toilet (ref.)	(ref.)	(ref.)		(ref.)	(ref.)	
No Facility	-0.171	-0.973	0.843(0.592,1.182)	0.462	2.230	1.587(1.060,2.391)
Pit Toilet Latrine	-0.442	-2.608	0.643(0.457,0.889)	0.080	0.447	1.083(0.763,1.534)
Time To Get Water Source						
<10min (ref.)	(ref.)	(ref.)		(ref.)	(ref.)	
11-15min	0.046	0.389	1.047(0.834,1.320)	0.272	0.894	1.313(0.743,2.461)
16- 20min	0.218	1.554	1.244(0.949,1.647)	0.282	0.974	1.326(0.769,2.405)
21-25min	0.149	0.407	1.161(0.581,2.478)	-0.550	-1.536	0.577(0.294,1.208)
26-30	0.124	0.877	1.132(0.861,1.502)	0.195	0.835	1.215(0.776,1.941)
31-900	0.064	0.515	1.066(0.839,1.361)	-0.110	-0.499	0.896(0.585,1.388)
Water in Premises	0.131	1.581	1.140(0.970,1.341)	0.033	0.176	1.034(0.714,1.504)
Sex of Household Head						
Female (ref.)	(ref.)	(ref.)		(ref.)	(ref.)	
Male	-0.550	-4.564	0.577(0.454,0.729)	-0.320	-1.559	0.726(0.486,1.086)
Type of Mosquito Bed Net(S) Slept Under						
No nets (ref.)	(ref.)	(ref.)		(ref.)	(ref.)	
Treated nets	-0.228	-3.246	0.796(0.694,0.913)	0.074	0.517	1.077(0.815,1.429)
Untreated nets	-0.382	-1.023	0.682(0.334,1.461)	-0.730	-1.144	0.482(0.147,1.899)
Age of Household Head						
≤19 (ref.)	(ref.)	(ref.)		(ref.)	(ref.)	
20-34yrs	-0.414	-0.594	0.661(0.1412,3.85)	-0.889	-2.430	0.411*(0.203,0.857)
35-49yrs	-0.022	-0.031	0.978(0.211,3.460)	-0.149	-0.591	0.862(0.521,1.402)
50- 64	0.250	0.364	1.284(0.278,4.524)	-0.093	-0.415	0.911(0.579,1.400)
≥65yrs	0.175	0.253	1.191(0.256,4.237)	-	-	-
Type of Cooking Fuel						
Charcoal wood	(ref.)	(ref.)		(ref.)	(ref.)	
Gas	-0.299	-0.693	0.742(0.332,1.834)	0.542	1.714	1.719(0.957,3.336)
Kerosene	-0.646	-1.207	0.524(0.195,1.660)	0.318	1.173	1.374(0.828,2.407)
Others	-0.429	-2.899	0.651*(0.488,0.872)	-0.318	-0.329	0.728(0.120,6.134)

RESULTS

Out of 7731 children born by the respondents, 1755 (23%) died. Table 1 shows the results of logistic regression analysis for factors associated with childhood mortality in Nigeria. The results revealed that the source of drinking water, whether the household has electricity or not, the age of the household head, and whether the household has a radio or not had no significant association with child

survival (AOR ranges between 0.72 and 1.47; CI: 0.78 – 5.17; $p>0.05$). Type of toilet facility, time to get water source, sex of household head, types of mosquito bed net(s) slept under, type of cooking fuel, the household has television, motorcycle/scooter, and main floor, wall and roof materials had significant (AOR ranges between 0.60 and 3.92; CI:0.45 – 9.62; $p<0.05$) association with childhood survival.

Tables 2a and b show the results from logistic regression for both the north and south zones. In the North, the source of drinking water, the presence of electricity in the household, the time taken to access water, the age of the household head, the type of cooking fuel (Table 2a), the presence of a radio, and the main roofing material (Table 2b) were not significantly associated with childhood survival (AOR ranges between 0.52 and 2.77; CI: 0.14 – 8.80; $p > 0.05$). Children of women who had pit toilet latrines were less likely (AOR = 0.64, CI = 0.46 – 0.89, $p < 0.05$) to die than those with flush (Table 2a). Women whose household heads were male were less likely (AOR = 0.58, CI = 0.45 – 0.73, $p < 0.05$) to have experienced childhood mortality than those with female household heads (Table 2a). Women who slept under treated nets were less likely (AOR = 0.80, CI = 0.69 – 0.91, $p < 0.05$) to have experienced childhood mortality than those without mosquito bed nets (Table 2a). Children whose households had televisions and motorcycles were 1.4 (AOR = 1.41, CI = 1.15 – 1.72, $p < 0.05$) and 1.2 (AOR = 1.18, CI = 1.03 – 1.36, $p < 0.05$), respectively, more likely to die than those who did not (Table 2b). Women whose main floor material was another type of material (rather than cement/carpet, earth/sand) were 1.9 (AOR = 1.89, CI = 1.07 – 3.51, $p < 0.05$) more likely to have experienced childhood mortality than those who had cement/carpet as the main floor material (Table 2b). In contrast, women whose main wall material was another type of

material (rather than cement/cement block) were less likely (AOR = 0.76, CI = 0.65 – 0.90, $p < 0.05$) to have experienced childhood mortality than those who had cement/cement block as the main wall material (Table 2b).

In the South, the results show that source of drinking water, time to get water source, sex of household head, types of mosquito bed net, type of cooking fuel (Table 2a), household had radio, television and motorcycle (Table 2b) had no significant association with childhood survival (AOR ranges between 0.13 and 1.72, CI = 0.12 – 3.34, $p > 0.05$). In addition, the main floor and wall material were not significantly associated with childhood survival (AOR ranges between 1.04 and 1.39, CI = 0.34 – 5.91, $p > 0.05$) (Table 2b). Children of women whose households had electricity were 1.5 (AOR = 1.47, CI = 1.07 – 2.02, $p < 0.05$) more likely to die than those who did not (Table 2a). Furthermore, Children of women who had no toilet were 1.6 (AOR = 1.59, CI = 1.06 – 2.39, $p < 0.05$) more likely to die than those who had flush toilets (Table 2a). Also, the age (20-34 years) of household heads was significantly associated with low childhood mortality (AOR = 0.41, CI = 0.20 – 0.86, $p < 0.05$) compared to those who were less than 20 years old (Table 2a). Women whose main roof material was other types of material (rather than natural material) were 2.3 (AOR = 2.27, CI = 1.09 – 4.44, $p < 0.05$) more likely to have experienced childhood mortality than those who had natural material (Table 2b).

Table 2b: Environmental factors associated with childhood mortality Experience of Rural women aged 15-49 in Northern and Southern Nigeria.

Characteristics	North Estimate(β)	Z-value	AOR(Exp(β))CI,95%	South Estimate (β)	Z-value	AOR(Exp(β))CI,95%
Household Has Radio						
No (ref.)	(ref.)	(ref.)		(ref.)	(ref.)	
Yes	0.019	0.278	1.019(0.891,1.167)	-0.004	-0.022	0.996(0.711,1.389)
Household Has Television						
No (ref.)	(ref.)	(ref.)		(ref.)	(ref.)	
Yes	0.340	3.301	1.405(1.149,1.722)	0.053	0.312	1.054(0.755,1.472)
Household Has Motorcycle/ Scooter						
No (ref.)	(ref.)	(ref.)		(ref.)	(ref.)	
Yes	0.166	2.319	1.181(1.026,1.358)	0.028	0.178	1.028(0.760,1.396)
Main Floor Material						
cement/carpet	(ref.)	(ref.)		(ref.)	(ref.)	
Natural/Earth/sand	-0.088	-1.224	0.916(0.795,1.054)	0.326	1.353	1.385(0.870,2.240)
Other	0.635	2.108	1.887(1.070,3.510)	0.190	0.265	1.209(0.341,5.912)
Main Wall Material						
Cement/ Cement block (ref.)	(ref.)	(ref.)		(ref.)	(ref.)	
Others	-0.273	-3.288	0.761(0.647,0.895)	0.038	0.172	1.039(0.679,1.612)
Main RoofMaterial						
Natural (ref.)	(ref.)	(ref.)		(ref.)	(ref.)	
Other	1.018	1.786	2.768(0.896,8.803)	0.820	2.309	2.270(1.090,4.436)
Roofing shingles	-	-	-	0.627	1.256	1.872(0.705,5.065)

Adjusted Odds Ratio –AOR; Significant at 5%, Significant at 1%, Significant at 0.1%

DISCUSSION

This study has considered the effect of environmental factors on childhood survival among women in rural Nigeria. Considering Nigeria as a whole, the source of drinking water, the presence of electricity or a radio, and the age of the household head did not have a significant relationship with child survival. This is not in conformity with a previous study in Nigeria using the 2013 NDHS and Kenya, where the source of drinking water was significantly associated with childhood survival.^{9,19}

The type of toilet facility used by the household played a vital role in childhood survival. It was discovered that in Nigeria as a whole and in the north, households with pit toilet latrines experienced significantly less mortality than those with flush toilet facilities. On the other hand, children from households without toilet facilities experienced more mortality than those with flush toilet facilities. Previous

studies in Australia and Nigeria have shown that women who used improved toilet facilities and safe sanitation experienced lower childhood mortality.^{7,9,10} In a household without a toilet facility, excreta will litter everywhere, which may eventually cause cholera. This may affect the health of the mother and child. Also, when a flush toilet is being used and there is not enough water to keep it clean or the closet is not in good condition, different ill-health odors will occur, which may affect the health of the household and may lead to death. However, when households have improved their standard of living and are well-informed about the importance of hygiene and sanitation, childhood mortality will be reduced.²⁰

Time spent getting water sources influences the survival of children. The households that spent 16-20 and 26-30 minutes experienced higher mortality than those with less than 10 minutes to get to a

water source. The distance to the water source will sometimes determine the quantity of water available at any given time. This shows the importance of water and its availability over time in childhood survival. Studies in Nigeria have shown the importance of access to potable water and improved water sources as significant determinants of childhood survival.^{9,10}

Considering Nigeria as a whole, this study identified the sex of the household head as a significant determinant of childhood survival. Studies from Nigeria and other sub-Saharan African countries have reported that households that had Female heads experienced lower childhood mortality than those with male household heads.^{7,10,13,21–23} The result has shown the vital role of women in making decisions about their children's health. The contrary occurred in Northern Nigeria, where children from male household heads experienced lower childhood mortality than those from female household heads. However, this conforms with a study in Ethiopia where households with female heads had higher childhood mortality than households with male heads.¹⁴

In addition, the types of mosquito bed nets slept under played an essential role in childhood survival. Children who slept under treated mosquito bed nets experienced lower mortality than those who didn't sleep under any bed nets in Nigeria as a whole and the Northern part of the country. The implication is that those without treated bed nets were exposed to mosquito bites, which could affect their health and eventually cause illnesses and death. In Kenya, a similar result was obtained from a previous study in a particular part of the country, while those who used insecticide-treated nets

(ITNs) experienced childhood death in another part of the same country.¹⁵

Furthermore, child survival was higher among the children whose household head's age was between 20 and 34 years than among those under 20 in the South. The above shows that those in the age bracket are older and capable of taking some steps that would be an advantage for childhood survival. This outcome was not the same as in a previous study from Afghanistan, where Head age had no significant association with childhood mortality.²⁰

In our study, the type of cooking fuel was also found to be significantly related to childhood survival in Nigeria. Households using other types of cooking fuel had notably lower mortality rates than those using charcoal, gas, and kerosene. However, as expected, households with gas or kerosene would have a lower mortality rate than others; the inverse was the case. This outcome was not in line with a study from Kenya, where mortality was higher in households with high-polluting fuels than in those using low-polluting fuels.¹⁹

Furthermore, households with television sets experienced more childhood mortality than those that did not have television in Nigeria, in the North and South. Unimaginable injury and death can occur resulting from a television set falling onto a child from elevated locations in the home.²⁴ The inverse was reported in a study in Nigeria, where Media exposure significantly reduced childhood mortality.⁹

This study also showed that households with motorcycles/scooters had higher mortality than those without motorcycles/scooters in Nigeria and the north. Motorcycle injuries had a higher proportion of childhood road traffic

injuries in Nigeria.²⁵ Motorcycle and Scooter riders are expected to use safety helmets. Child safety experts advised that a scooter is not an appropriate toy for children under eight years old.²⁶

The main floor, wall, and roofing materials significantly affected childhood mortality. In Nigeria as a whole, as well as in the north, children from households whose main floor material was made of other materials (which are not natural/earth/sand) experienced higher mortality than those with cement/carpet materials. The composition of these types of other materials could be made of materials that can trigger certain illnesses, leading to morbidity and mortality among children. This result was similar to previous studies in that children from households with cement floors survived more than those from earth or sand floors.²³ The household environment has also contributed to child survival. Poor ventilation and the use of suboptimal wall and roofing materials are important risk factors for most chronic respiratory illnesses.¹⁵

The findings of this study hold significance for policymakers. It appears that individuals with flush toilets have higher mortality rates compared to those utilizing pit toilets, potentially due to an inconsistent water supply for flushing waste. While the government is working to combat open defecation, it should also address the need for a steady water supply for households with flush toilets to ensure optimal sanitation outcomes.

The study includes certain limitations that should be considered when interpreting its findings. Birth history data may be prone to retrospective bias and event displacement. Additionally, like many cross-sectional studies, it does not

allow for the inference of causal relationships.

CONCLUSION

The influence of Environmental factors on childhood survival among rural women in Nigeria was examined.

Type of toilet facility, time to get water source, sex of household head, types of mosquito bed net(s) slept under, type of cooking fuel, whether the household has a television, motorcycle/scooter, and main floor, wall, and roof materials were essential factors associated with childhood survival. Policymakers and those in authority should adequately address these factors for improved childhood survival.

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DECLARATIONS

Ethics approval and consent to participate: The study was based on secondary data. However, the ethical approval for data collection for the NDHS was documented in the report.

Consent for publication: Not applicable

Availability of data and materials:

The datasets generated and/or analysed during the current study are available in the DHS program repository, <https://dhsprogram.com/data/availabledatasets.cfm>

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Authors' contributions: KSO conceived the study, did the data extraction, analysis

and wrote the first draft of the manuscript. OOO reviewed the referencing, made substantial input into the intellectual content of the manuscript, and formatted to meet the journal specifications for

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