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Levels and Trends in Household Source of Cooking Fuel in Nigeria: Implications on Under-Five Mortality

Samuel Olugbemisola W*, Ajayi Mofoluwake P, Idowu Adenike E and Ogundipe Oluwatomisin M

Department of Economics and Development Studies, Covenant University, Ota, Nigeria

***Correspondence:** Samuel Gbemisola W, Department of Economics and Development Studies, Covenant University, Ota, Nigeria, Tel: +234-8087880025; E-mail: gbemisola.samuel@covenantuniversity.edu.ng

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Abstract

Background: Studies have shown that characteristics present in the neighbourhood where children are raised might likely influence the mortality risks of such children. Cooking fuel can be regarded as one of the environmental factors determined by the socioeconomic background of the household, but the nexus between this and the health outcome of under-five children had received little attention.

Objective: This study seeks to examine the levels and trends of source of cooking fuels among households in Nigeria as implied on under-five mortality.

Methods: The data used was the Nigeria Demographic and Health Survey (NDHS)-Child Recode file of 2003, 2008 and 2013. The method of analysis used was the descriptive approach which includes cross tabulation, charts and tables. The chi-square statistic was used to show the significance of the association between the variables of interest in the study.

Results: The percentage of U-5 children who lived in homes where wood was used as cooking fuel was about 80 percent. The findings from this study show that there was a highly significant relationship between type of cooking fuel and under-five mortality in Nigeria (P<0.001). The poorest and the poorer represented the highest percentage among the households that used wood and agric. crop/dung for cooking. Environmental factor such as type of cooking fuel is significantly associated to socioeconomic characteristics of the household where the child lives, some of which includes wealth status and place of residence as discussed in the result.

Recommendation and conclusion: The study found that, there has not been a major improvement in the source of cooking fuel in households where under-five children are raised and this contribute in determining their health outcomes. Therefore, the government of Nigeria needs to provide reliable power supply (electricity) for household consumption. Also, gas fuel must be made available and affordable for household consumption.

Keywords: Cooking fuel; Under-five mortality; Households; Nigeria; Environment; Levels and trends; Acute respiratory infection

Background

Studies have shown that characteristics present in the neighbourhood where children are raised might likely influence the mortality risks of such children [1,2]. For example, children raised in economically and socially deprived communities might be more exposed to the risk of under-five mortality compared to those in developed communities [2]. Poverty makes children from less privilege households vulnerable to inadequate water, poor sanitation, air pollution, undernourishment, etc., which are some of the risks of mortality unlike those who were born to better off families. As a result of this exposure, they suffer diverse diseases [3-5].

Cooking fuel can be regarded as one of such environmental factors determined by the socioeconomic characteristics of the household [6-8]. The nexus between type of cooking fuel and the health of humans had in most cases received little or no attention. Type of cooking fuel used in the household where the under-five children are raised played a major role in determining their health outcomes. For example, the location of the kitchen in the household might generate indoor pollution which might contaminate the air these children breathe in [9]. In some instances households might use two or three types of cooking fuel with varying levels of risk due to non-affordability or accessibility of the other.

Indoor air pollution (IAP) emanating from burning solid fuels (wood, charcoal, animal dung, coal and crop waste) for cooking and home heating remains a major environmental and public health challenge in developing countries. Worldwide, approximately 4.3 million people have died as a result of illnesses attributed to IAP; these deaths include 534,000 children who are under-five in age. Most of the deaths occur in low- and middle-income countries, including Nigeria. Children under-five years of age are one of the vulnerable groups most likely to experience ill health caused by solid fuel use, as they are with their mothers while they are cooking [10].

In Nigeria, more than 70 percent of households depend on solid fuels for cooking which exposed children living in such homes to emissions of harmful biomass smoke [7,11]. The culture of most ethnic groups in the country require that the

mother backs her infant or young child when cooking. This practice is said to significantly increase the risk of the child having acute upper or lower respiratory tract infections, asthma and pneumonia- which is the number one under-five killer disease in Nigeria (United Nations Children's Fund, 2015). Therefore, this study seeks to examine the levels and trends of source of cooking fuels among households in Nigeria as implied on under-five mortality.

Materials and Methods

Table 1 Measurement of variables in the NDHS data (Child recode file).

S/n	Variables	Definition	Coding
1	Place of residence (V025)	This shows where the mother and the child resides	Nominal
			Urban-1; Rural-2
2	Wealth Status (V190)	Household's cumulative living standard. It is calculated through the household's assets such as; televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities.	Ordinal
			Poorest-1; Poorer-2
			Middle-3; Richer-4
			Richest-5
3	Source of cooking fuel (V161)	Type of fuel used for cooking in the household where the child lives.	Nominal
			Agric. crop/dung-1
			Wood/Charcoal/ Coal-2
			Kerosene-3
			Electricity/Gas-4
4	Under-five Mortality (B5)	Question was asked from the mother, if the child was alive as at the time of the survey	Nominal
			Not alive -1
			Alive-2
Source: NDHS, 2003-2013			

The data used were from the Nigeria Demographic and Health Survey (NDHS)-Child Recode file of 2003, 2008 and 2013. This is a nationally representative sample and a cross-sectional data collected through face-to-face interviews from women age 15-49 by the National Population Commission (NPC) of Nigeria and ICF International, USA. Questionnaire was used to obtain information from women who had at least one birth within the last five years before the survey on their fertility preferences, breastfeeding practices, nutritional status and that of their children, vaccination, childhood morbidity and mortality. Information was elicited on total sample size of 6029, 28647 and 31482 children in 2003, 2008 and 2013 respectively out which 843, 3201 and 2886 were reported dead as at the time of the survey [12,13]. The method of analysis used in this study was the descriptive approach through the use of charts, tables and cross tabulation. The Chi-square statistic was used to show the strength and magnitude of association between the variables of interest in this study. The socioeconomic variables used include; place of residence and wealth status, while the environmental factor considered was source of cooking fuel and the outcome variable was under-five mortality. The weighting method of v005/1000000 was applied to correct for under-sampling or over-sampling in the datasets (Table 1).

Results

Figure 1, shows the trend in under-five deaths in rates within the period of 2003-2013. In 2003, out of every 1,000 under-five children reported in the survey 185 were reported dead, while 162 and 128 were reported dead in 2008 and 2013. The result established that there was a decline of 31 percent in under-five mortality within the 10 years period.

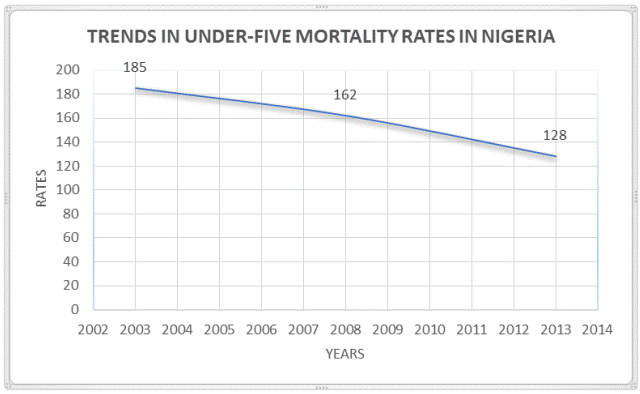

Figure 1 Trends in under-five mortality rates in Nigeria.

Table 2 Under-five morality rates by types of cooking fuel in Nigeria.

	Percentages (%)		
Cooking Fuel	**2003**	**2008**	**2013**
Agric. crop/dung	0.5	0.2	0.5
Wood/Charcoal/Coal	78.9	81	80.4
Kerosene	18.2	16.9	16.8
Electricity/Gas	0.7	1	1.5
Source: NDHS, 2003-2013			

Table 2, shows the percentage distribution of type of cooking fuel among households where the under-five children lives in Nigeria. The result shows that in 2003, 78.9 percent of the households where the children lives used wood/charcoal/ coal as cooking fuel, while 18.2 percent and only 0.7 percent lived in homes where kerosene and electricity/gas were used for cooking respectively. Further, in 2008, 81.0 percent of the children lived in households where firewood/charcoal/coal were used for cooking, while 16.9 percent and 1.0 percent lived in homes where kerosene and electricity/gas were used as cooking fuel. Finally, in 2013 the percentage of those who

lived in homes where wood was used as cooking still lies above 80 percent, but there was a little increase in the number of those who used electricity/gas (i.e., 1.5 percent in 2013, when compared with 1.0 percent in 2008 and 0.7 percent in 2003), while 16.8 percent resides in homes where kerosene was used as cooking fuel.

Table 3, shows the relationship between type of cooking fuel and under-five mortality in Nigeria. The result, showed that there was a highly significant association between type of cooking fuel used in the household and under-five mortality in Nigeria (P<0.001). In 2003, about 201 and 154 under-five children who died lived in homes where agric. crop/dung and firewood were used as cooking fuels respectively. In the same period households where kerosene and electricity was used only reported 81 and 62 deaths respectively. Though, the magnitude of under-five mortality rates had declined across the categories of type of cooking fuel used in the households, but the number of deaths been reported by homes where agric. crop/dung and firewood still remain very high when compared with homes where kerosene and electricity/ gas are used as cooking fuels.

Table 3 Relationship between type of cooking fuel and under-five mortality in Nigeria.

	Rates (Per 1,000)		
Cooking fuel	**2003**	**2008**	**2013**
Agric. Crop/dung	201	162	141
Wood/Charcoal/Coal	154	121	98
Kerosene	81	68	55
Electricity/Gas	62	44	57
Chi-square	43.46***	127.49***	109.19***
P-value	0.000	0.000	0.000
Source: NDHS, 2003-2013			
Significance level: 0.05*, 0.01** and 0.001***			

Table 4, shows the bivariate relationship between wealth index of the household where the under-five children lives and the type of cooking fuel used. In 2003 the result shows that only the richer and richest households were able to use electricity or gas for cooking (3.5 percent and 96.5 percent respectively). While 2.8 percent, 23.2 percent and 74.0 percent of households classified as middle, richer and richest were able to use kerosene for cooking. About 28.6 percent, 26.8 percent, 23.4 percent and 18.3 percent of poorest, poorer, middle and richer households where the under-five lives used firewood for cooking. Only 2.9 of richest homes used wood/charcoal/coal for cooking. Lastly, 40.0 percent and 32.0 percent of poorest and poorer households used agric. crop/dung for cooking, while 16.0 percent, 8.0 percent and 4.0 percent of middle, richer and richest households used this as cooking fuel.

In 2008, the result shows that about 63.2 percent, 22.4 percent and 12.0 percent of the poorest and poorer households used agric. crop/dung, while 27.2 percent 28.5 percent, 23.3 percent and 16.9 percent of poorest, poorer, middle and richer households used wood/ charcoal/coal for cooking. It was observed that more of the richer and richest households used kerosene and electricity/gas for cooking. In 2013, none of the richest home used agricultural crop/dung for cooking 96.3 percent and 67.7 used electricity/gas and kerosene for cooking respectively. The poorest and the poorer have the highest percentage among the households that used wood and agric. crop/dung for cooking. The chi-square test showed that the association between wealth index and type of cooking fuel used in the household where the under-five resides was highly significant (P-value <0.001) over the 10 years period.

Table 4 Bivariate relationship between wealth index and type of cooking fuel in Nigeria.

	2003					
Cooking fuel	**Poorest**	**Poorer**	**Middle**	**Richer**	**Richest**	**Chi-square**
Agric. Crop/dung	40	32	16	8	4	3694.17***
Wood/Charcoal/Coal	28.6	26.8	23.4	18.3	2.9	
Kerosene	0	0	2.8	23.2	74	
Electricity/Gas	0	0	0	3.5	96.5	
	2008					
Cooking fuel	**Poorest**	**Poorer**	**Middle**	**Richer**	**Richest**	
Agric. Crop/dung	34.9	46.5	18.6	0	0	14698.52***
Wood/Charcoal/Coal	30.8	27.7	21.9	15.6	4	
Kerosene	0	0.4	4.6	24.3	70.7	
Electricity/Gas	0	0	0.4	4.4	95.2	
	2013					
Cooking fuel	**Poorest**	**Poorer**	**Middle**	**Richer**	**Richest**	
Agric. Crop/dung	63.2	22.4	12	2.4	0	17073.71***
Wood/Charcoal/Coal	27.2	28.5	23.3	16.9	4.2	
Kerosene	0.1	0.1	3.8	28.3	67.7	
Electricity/Gas	0	0	0.6	3.1	96.3	
Source: NDHS, 2003-2013						
Significance level: 0.05*, 0.01** and 0.001***						

Figure 2, shows the percentage distribution of Nigerian population by their place of residence. The result showed that the gap between urban and rural residence had remain wide over the 10 years period of the survey. In 2003, out every 100 population in Nigeria 65.0 percent lived in the rural areas, while the remaining 35 percent lived in the urban centers. Although in subsequent years (i.e., 2008 and 2013) the

percentage of rural residents declined (i.e., from 35.0 percent to 28.9 percent), these differences can be considered to be relatively small when compared with the wide gap between the number of people who lived in the rural areas versus urban centers.

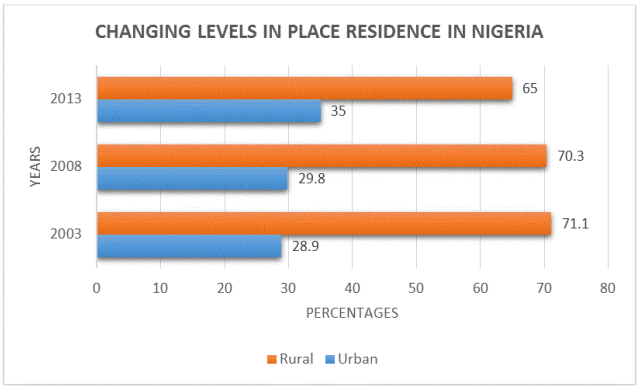

Figure 2 Changing levels by place of residence in Nigeria.

Table 5, shows the relationship between place of residence and type of cooking fuel. The chi-square value of 1145.75, 5902.01 and 7365.26 for the respective years 2003, 2008 and 2013 showed that the association between place of residence and type of cooking fuel was highly significant (P-value<0.001). In 2003, about 89.0 percent and 80.7 percent of the households in rural areas used agric. crop/dung and wood/charcoal/coal for cooking, while only 11.0 percent and 19.3 percent who lived in the urban centers used such for cooking. Further, 68.8 percent and 75.2 percent of households in the urban centers used kerosene and electricity/gas for cooking in the same period.

In 2008, similar to the pattern observed in 2003, about 91.1 and 80.0 percent of the households in the rural areas used agric. crop/dung and wood/charcoal/coal for cooking, while about 74.0 percent and 84.1 percent of those in the urban centers used kerosene and electricity/gas for cooking. Similar pattern was experienced in 2013.

Table 5 Bivariate relationship between place of residence and under-five morality in Nigeria.

	2003		2008		2013	
Cooking fuel	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**
Agric. Crop/dung	3 (11.0%)	27 (89.0%)	5 (8.9%)	50 (91.1%)	11 (6.5%)	151 (93.5%)
Wood/Charcoal/Coal	946 (19.3%)	3947 (80.7%)	4540 (20.0%)	18215 (80.0%)	6170 (24.1%)	19431 (75.9%)
Kerosene	777 (68.8%)	353 (31.2%)	3508 (74.0%)	1230 (26.0%)	4437 (83.0%)	908 (17.0%)
Electricity/Gas	33 (75.2%)	11 (24.8%)	239 (84.1%)	45 (15.9%)	419 (85.4%)	71 (14.6%)
Chi-square	1145.75		5902.01		7365.26	
P-value	0.000***		0.000***		0.000***	
Source: NDHS, 2003-2013						
Significance level: 0.05*, 0.01** and 0.001***						

Discussion

From the results, more than 80 percent of the households where under-five children lives used wood/charcoal/coal as cooking fuel, which expose the children to the emission of biomass smoke. This may partly explain the reason for high prevalence rate of acute respiratory infection (ARI) which leads to pneumonia among under-five children in Nigeria (National Bureau of Statistics, 2014) [11]. This differences in rural -urban residence might be as a result of increase in standard of living in the urban centers, thereby forcing its residents to return back to their villages or rural areas where cost of living is not as high as what is obtainable in the urban centers.

There has not been major improvement in the type of cooking fuels used in households where under-five children are raised and this contribute in determining their health outcomes [7]. Environmental factor such as type of cooking fuel is influenced by socioeconomic status of the households where the child lives, some of which includes wealth status and place of residence as discussed in the result. There is need for urgent attention, particularly in improving the standard of living of care-givers of the under-five children (their parents) so as to achieve the goal 3 as stated in the newly approved Sustainable Developmental Goals.

Also, cooking fuel such as electricity and gas should be made affordable and accessible to households. According to Mestl, et al. [9] households sometimes combined mixture of two or three sources of cooking fuel which has varying degree of risk, due to the fact that they are unable to afford the cost of the previous or access it for purchase.

Recommendations and Conclusion

Findings showed that fewer cases of deaths were reported in households where electricity or gas were used as source of cooking fuels. This study, therefore, recommended that the

government of Nigeria needs to provide reliable power supply (electricity) for household consumption. Also, gas fuel must be made available and affordable for household consumption. All of these are essential if the country will be able to reduce deaths of under-five children to 25 per 1000 or fewer by 2030 as stated in the Sustainable Development Goal 3-target 3.2.

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