Impact of Household Use of Fuelwood for Cooking on the Health of Women in Nigeria.

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Abstract

The study assessed the impact of cooking with fuel wood on the health of women among households in Nigeria using secondary data on National Demographic Health Survey [DHS] (2018-19). The study employed descriptive statistics, Logistic and Tobit regressions.

The result showed that the mean household size is 6, with 66% of the households having only one woman. Also, 86% of the household heads are male, with an average age of 44years. The poorest class has the highest frequency of wealth classification of 29%. The health symptoms recorded include cough by 35%, shortness of breath 33% blocked nose 24%. The coefficient of the proportion of women in the household, sex of household head and the coefficient of poor/poorer household are all positive and significant at 1% to the likelihood of using fuelwood. The results also revealed that cooking with fuel wood significantly causes shortness of breath at 5% level.

The study concludes that some of the households' socio-economic characteristics strongly influence the likelihood of household choice for fuelwood. Moreover, blocked nose and chest symptoms, including shortness of breath, are the major respiratory problems experienced by women who cook with fuelwood. It is therefore recommended that policies aimed at poverty reduction, efficient energy utilization and the sensitization on the harmful effect of cooking with fuel wood to both rural and urban households should be employed.

Keywords: Household, fuelwood, cooking, health, women

Introduction

Households in developing countries use wood, charcoal and other solid fuels (mainly agricultural residues and coal) as their sources of cooking fuel and are often burned in open fires or poorly functioning stoves.[1]

In Nigeria, the pattern of energy demand shows that the household sector is characterized by various energy sources with records of high use of dirty fuels. About 86% of rural households and a high proportion of urban poor households depend on inefficient energy sources.[2] These inefficient energy sources result in incomplete combustion that release minute substances detrimental to human health in the household environment.[3]

Indoor air pollution is associated with the use of solid fuels which, when exposed to it has been implicated, with various degrees of certainty, as a causative factor in several adverse health outcomes. In total, around 1.6 million deaths a year could be attributed to indoor air pollution of this type globally.[4] Similarly, among the rural women and children who have had long time exposure to biomass combustion, a good number present with chronic obstructive lung diseases. Other ailments include heart diseases, acute respiratory infections, low birth weight, eye disorder, conjunctivitis, blindness and cancer.[5] Often Chronic Obstructive Pulmonary Disease [COPD] caused by exposure to smoke from biomass fuels are seen in women with the presence of lower Body Mass Index (B.M.I.) and more clinical symptoms.[6] Thus, the implication to this means there is a strong correlation between the high elemental concentration of aerosol particles, increased mortality and high morbidity in biomass users .[7]

Despite the availability of alternative clean sources of cooking, wood fuel remains the primary fuel in many States of Nigeria among women cooking in both indoor and outdoor kitchen locations. Moreover, cooking with such energy is one of the causes of respiratory diseases. There are a lot of studies conducted on the health implication of cooking with inefficient energy sources. To mention but a few [8] looked at the prevalence factors associated with the use of alternative energy sources for cooking, attitude, as well as barriers. While[9]examinedthe quality of air at a cooking point, Carbon dioxide (Co_2)concentration in-breath and Carboxyhemoglobin (CoHb) in a village in Ogun state. However, these studies did not analyze the extent to which the health implication impended the health of the women cooking with fuelwood, as well as

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specify the significant health symptoms caused by the smoke emanating from the use of wood fuel.

This study, therefore, bridges a gap in research by considering a broader/macro perspective in terms of the study area. It examines the socio-economic characteristics of the households that cook with fuel wood in Nigeria, determines the factors that influence the choice of fuel wood for cooking, identifies the major respiratory ailments reported by the women and assesses the health impact of wood fuel used in cooking.

Materials and Methods

Study Area

The study area is Nigeria which lies between latitudes 4º 12' 40.37'' N to 13º51' 36.50 '' N of the equator and longitudes 2º 45' 47.735'' E to 14º42' 55.123'' E of the Greenwich meridian. Nigeria spans over an area of 923,768 sq. km (356,669 sq mi), extending 1,127 km (700 mi) East to West and 1,046 km (650 mi) North to South. The country has 36 states and a projected population of 214, 312, 387at the end of 2019.[10]

Sources of Data

This study utilizes 2018 Demographic and Health Survey [11] for Nigeria by National Population Commission (N.P.C.) and I.C.F. International (2018) which covered the entire population residing in non-institutional dwelling units in the country. The survey adopted cluster sampling frame of Enumeration Areas (E.A.s) used for the 2006 population census in Nigeria. The data set considered a total of 904 cluster zones, 372 urban areas and 532 rural areas and a sample of 40,680 households based on random sampling.

Model Specification and Method of Estimation

Descriptive Statistics

Descriptive statistics was used in describing the characteristics of the data sets through the use of frequencies, mean and standard deviation. Hence, it presents the socio-economic factors of the household heads and their respiratory symptoms.

Logistic Model

Logistic regression procedure was used to determine the socio-economic factors affecting wood fuel consumption in Nigeria and the implication of cooking indoor or outdoor on the health of women in Nigeria. The choice of the model was informed by the fact that it is the appropriate statistical technique for analyzing models of dichotomous dependent variables[12]. The equation is presented in this form:

$\ln[p/(1-p)] = \alpha+\Sigma (\beta_k)(X_k)$, where p is the probability that a household uses fuel other than wood to cook. p/(1-p)is the odds that a household uses an energy source other than wood to cook. α is a constant term, β_k represents the effects parameters of the explanatory variables, and X_k represents the explanatory variables in the model. Coefficient in a logit model give the change in the log-odds of using alternative fuel for a unit change in the explanatory variables.

Results

The descriptive results show that about 45%of the households have 5-8 members with a mean size of 6 and also 66% have one wife with a mean of 1. The household gender with the highest frequency is male with 86% and about 34% fall within the age group of 31-43 years with 44years as the average age. The

Table 1: Household Socioeconomic Factors and Respiratory Symptoms

Variables	Frequency	Mean	St. dev
Size			
1-4	36	6	3
5-8	45		
9-12	13		
13-16	4		
>=17	2		
Women			
1	66	1	0.8
2	24		
3	7		
4	2		
>=5	1		
Sex			
Male	86	0.9	0.3
Female	14		
Age			
18-30	19	44	14
31-43	34		
44-56	28		
57-69	14		
>=70	6		
Wealth index			
Poorest	24	-29025	85807
Poorer	23		
Middle	21		
Richer	19		
Richest	13		
Place of Cooking Food			
Indoor	54		
Outdoor	44		
Respiratory Symptoms			
Cough	34	0.9	0.06
Shortness of breath	33	0.9	0.1
Blocked nose	24	0.7	0.4
Blocked chest	5	0.2	0.3
Blocked nose and chest	4	0.1	0.3

Source: DHS,2018.

Table 2: The Socioeconomic Determinants of Fuel Wood Consumption in Nigeria

Variable	Coefficient	standard error	t value	p>[t]
Constant	2.769	1.287	2.08	0.037**
Womenhh	1.896	0.0348	5.46	0.000***
Sex	1.595	0.053	2.99	0.003***
Age	-0.299	0.011	-26.94	0.000***
Richest	-0.186	0.0063	-29.1	0.000***
Richer	-0.676	0.109	-6.15	0.000***
Middle	-0.298	0.111	-2.68	0.005***
poor/poorer	0.48	0.165	2.91	0.004***
log likelihood	-6726.4			
chi2 value	9506.5			
prob chi2	0.000***			

Source: DHS,2018.

Table 3: Health Impact of Cooking with Fuel wood on Women

Variable	Coefficient	Standard error	T value	p>[t]
Constant	1.049	0.106	9.91	0.000***
Had cough	-0.639	0.119	-0.54	0.591^{NS}
Shortness of breath	0.122	0.064	1.91	0.056**
Blocked chest and nose	-0.051	0.013	-3.63	0.000*
Log-Likelihood	-36756.53			
Chi2 value	0.0017			
Prob Chi2	0.002*			

Source: DHS, 2018

wealth classification index shows that the poorest households constitute the majority with 29% and a mean wealth index of - N29,025. Majority (54%),cook in an indoor location. The major respiratory symptoms recorded included cough with 34%, shortness of breath 33% and blocked nose 24%.

The results on the household's likelihood to choose fuel wood for cooking in Table 2 showed that the log-likelihood value is greater than one and is significant at 1%. The findings also revealed that all the coefficient of the variables considered i.e. proportion of women, sex, age and wealth classifications (richest, richer, middle and poor/poorer) are positive and significant at 1%.

From Table 3, it can be observed that the log-likelihood value of the model is significant at 1%. This indicates that the variables are fit for the equation. Thus, it determines the relationship between the smoke from cooking with fuel wood and its impact on the health of women. The respiratory symptoms assessed in the study revealed that the cough had a negative and an insignificant coefficient, while, the coefficient of shortness of breath and blocked chest and nose were positive and significant at 5% and 1% respectively.

Discussion

The mean household size obtained from this study coincides with the findings of[6] and the average number of women in the households and the gender of the household head in the study were similar to the results of[2] for Nigerian households. Also the wealth classification of the households agrees with the findings of.[16] With regards to the use of fuel wood, it was reported to cause some acute and chronic respiratory symptoms such as cough, shortness of breath, blocked nose, blocked chest and nose and chest together. These results were consistent with other studies.[13, 14 &15.]

Furthermore, the findings revealed that the proportion of women in the household influences the use of fuel wood for cooking. This indicates that *ceteris*

parabus an addition of a co-wife in a household would increase the likelihood to use fuelwood. It could be attributed to the fact that an increase of one more wife, means more financial burden on the existing household income. Thus, the household head would have no other option being the financial supporter as reported by,[16,17] than to resort to the use of a cheaper energy sources, which would further burdens the health statues of the households.

Similarly, the sex of household head reveals that if the household head is male, the likelihood of using fuelwood for cooking would be high. This agrees with the findings of.[2] The reason for such could be narrowed down to the fact that the role of the household head as expected by the cultural norms of Nigeria includes that of the bearing of the financial burden of his household. Hence, with all things being equal, a household headed by man would prefer to use fuel wood to save more cost from buying expensive alternative fuels.

Also, the older a household head becomes the lesser the likelihood of using fuelwood. This means that as the age of household head reaches a certain level, he/she will be more likely to use alternative sources of energy than fuel wood for cooking. Implying that the older the household head the more conscious he becomes about the disastrous effects associated with continuous usage of fuelwood. Hence, he would use his life savings or retirement benefits for the consumption of less harmful energy sources. This agrees with the findings of.[16]

Furthermore the wealth classification shows that poor/poorer house holds are more likely to use fuelwood. However, as the household's wealth status improves the possibility of using fuelwood declines. When a household head's wealth status improves his economic status also increases, hence less use of fuel wood. This conforms to the energy ladder theory and the findings of.[17]

On the effects of fuel wood on the health of women, cough as a respiratory symptom is not related to cooking with fuel wood which is in contrast to the study of [18]which postulated a positive prevalence in relation to the use of fuel wood among women. Similarly, [13] also reported that the use of fuelwood exposes women to chronic cough and chronic phlegm. The lack of relationship between cough and cooking with fuelwood is in line with the finding of[19] who opined that most of the respondents did not consider this respiratory ailment suffered by them as a severe problem probably because health problems from air pollution are known to be subtle.Furthermore,[20] revealed that there was no significant difference between those cooking with fuelwood and non-fuel wood users when it comes to cough as an ailment. Interestingly, shortness of breath is related to cooking with fuel wood implying that the more the number of women who cook with fuelwood, the more they are affected by shortness of breath. Thus, a 1% increase in the number of women that cook with fuel wood would increase the incident of shortness of breath by 19%. This corresponds with the previous findings of.[21] With regards to blocked chest and nose, the result shows that the lesser the number of women who cook with fuelwood, the lesser the health implication of blocked nose and chest. Thus a 1% decrease in the number of women who cook with fuelwood, would reduce the ailment by 36%. This result is similar to previous studies[22,23], considering that the marginal effects of these respiratory problems, blocked nose and chest, reduces drastically, followed by shortness of breath then coughs as the number of women who cook with fuelwood reduces.

Conclusions

The findings presented suggest that some of the household's socio-economic characteristics strongly influence the likelihood of the choice for fuelwood. Economic status affects the likelihood of household fuelwood consumption in the country. However, cough is not a determinant of a respiratory problem experienced by women who cook using fuelwood. While, block nose and chest, as well as shortness of breath, are the significant health implications experienced by women in both urban and rural settlements of Nigeria.

Recommendations

There is a need for policies to be directed towards poverty reduction through provision of social security insurance scheme. Also, effective and efficient energy policies are needed to accelerate the transition to clean and healthy energy sources. Furthermore, sensitization awareness and education should be given to both rural and urban dwellers on the health implication of cooking with fuel wood by engaging community health workers and health educators on a regular door to door health campaigns and the use of media advocacy for disseminating health information.

References

1. Vitali, F., Parmigiani, S., Vaccari, M., & Collivignarelli, C. Agricultural waste as household fuel-Techno-economic assessment of a new rice-husk cook stove for developing countries. *Waste management*. 2013 Dec 1;*33*(12): 2762-2770.

2. Maina, Y. B., Kyari, B. G., & Maina, M. B., 2019. Households' clean energy demand in Nigeria and Its Implication on the Environment. *Journal of agricultural economics, environment and social sciences*, 2019 Dec 31;*5*(1 and 2): 35-55.

3. Smith, K. R., Rogers, J., & Cowlin, S. C. Household fuels and ill-health in developing countries:2005Retrieved from Association. https://scholar.googleusercontent.com/scholar?q=cac

he:2QdAt2_sIkAJ:scholar.google.com/+smith+rogers +and+cowlin+ 2005&hl=en&as_sdt=0,5.

4. Ezzati, M., &Kammen, D.M.The health impacts of exposure to indoor air pollution from solid fuels in developing countries: knowledge, gaps, and data needs. Environmental health perspectives, 2002 Nov,110(11): 1057-1068.

5. Edokpa, D.A., &Ikelegbe, O.O. Ambient air quality and Human Health in Oil-producing rural communities of Edo State. In Nigerian Meteorological Society NMetS) conference proceedings of 2012. Theme: climate change and variability: saving our tomorrow today (pp.180-185).

6. Cheng, L. L., Liu, Y. Y., Su, Z. Q., Liu, J., Chen, R. C., & Ran, P. X. Clinical characteristics of tobacco smoke-induced versus biomass fuel induced chronic obstructive pulmonary disease. *Journal of internal translational medicine*. 2015 Sep 1;*3*(3): 126-129.

7. Maloni, J. A., Kane, J. H., Suen, L. J., & Wang, K. K. Dysphoria among high-risk pregnant hospitalized women on bed rest: a longitudinal study. *Nursing research*. 2002 Mar 1;*51*(2):92-99.

8. Ozoh, O. B., Okwor, T. J., Adetona, O., Akinkugbe, A. O., Amadi, C. E., Esezobor, C., ...& Mortimer, K. Cooking fuels in Lagos, Nigeria: Factors associated with the household choice of kerosene or Liquefied Petroleum Gas (L.P.G.*)*. International journal of environmental research and public health. 2018 Apri,15(4): 641.

9. Oyebanji, F. F., Adeofun, C. O., Adedeji, O. H., Ekpo, U. F., Oguntoke, O., & Ojekunle, O. Z . Assessment of respiratory health impact of fuel wood utilization on exposed rural women in Odeda, southwestern, Nigeria. Global Journal of science frontier research.2013; 13(4).

10. National Population Commission. *Federal republic of Nigeria official gazette no 4:94. Legal notice on Population of the 2006 Census Report. 2007*.

11. Demographic Health Survey.2018 https//dhsprogram.Standard- DHS_2018.cfm?flag=0.

12. Kmenta, J., &Balestra, P. Missing measurements in a regression problem with no auxiliary relations. *Advances in econometrics*. 1986,*5*, 289-300.

13. Kurmi O.P., Semple S., Devereux G.S., Gaihre S., Lam K.B.L., Sadhra S., Steiner M.F., Simkhada, P., Smith W.C., Ayres J.G. The effect of exposure to biomass smoke on respiratory symptoms in adult rural and urban Nepalese populations. Environmental health. 2014 Dec 1;13(1):92.

14. Desalu O.O., Adekoya A.O., Ampitan B.A. Increased risk of respiratory symptoms and chronic bronchitis in women using biomass fuels in Nigeria. Journal of. Brasileiro de.Pneumologia. 2010, Aug;.36(4):441–446.

15. Alim, M.A., Sarker, M.A.B., Selim, S., Karim, M.R., Yoshida, Y., Hamajima, N. Respiratory involvements among women exposed to the smoke of traditional biomass fuel and gasfuel in a district of Bangladesh. Environmental health preventive medicine. 2014 Mar 1;.19(2):126–134.

16. Buba, A., Abdul, M., Adamu, I., Jibir, A., & Usman, Y.I. Socio-economic determinants of Households Fuel Consumption in Nigeria. International Journal of research Granthaalayah. 2017; 5(10),348-360.

17. Maina, Y. B. An empirical analysis of household energy demand and the negative externality of carbon dioxide (CO_2) emission in northeastern Nigeria. *An unpublished Ph.D. Thesis submitted to the Postgraduate school, in fulfilment for the award of the Degree of Doctor of Philosophy in Economics Usmanu Danfodiyo University, Sokoto, Nigeria*.2018 Sep,24;pp.254.

18. Stabridis, O., & van Gameren, E. Exposure to firewood: Consequences for health and laborforce participation in Mexico. *World development*. 2018 Jul 1;107:382-395.

19. Mac: Indoor Air Pollution Create Problems for Rural Areas. 2009. *http://www.lifeofearth.org*

20. Regalado J., Sarker M.A., Selim S., Karim M.R., Yoshida Y., Hamajima N. The Effect of Biomass Burning on Respiratory Symptoms and Lung Function in Rural Mexican Women. American journal of respiratory and critical care medicine. 2006 Oct 15; 174 (8):901–905.

21. Siddiqui A.R., Lee K., Gold E.B., Bhutta Z.A. Eye and respiratory symptoms amongwomen exposed to wood smoke emitted from indoor cooking: A study from southern Pakistan. Energy for sustainable development 2005 Sep 1;9(3):58–66.

22. Solomon O.G., Collins N. N., Sidikat I. K., &Kayode O.A. Gas flaring attendant impact of criteria and particulate pollutions. A case of the Niger Delta region of Nigeria. Journal of King Saud University-Engineering Sciences. 2019 July 1;31(3):209-217,2019.

23. Sana, A., Meda, N., Badoum, G., Kafando, B., &Bouland, C. Primary cooking fuel choice and respiratory health outcomes among women in charge of household cooking in Ouagadougou, Burkina Faso: cross-Sectional Study. International journal of environmental research and public health. 2019 Jan 16; 16(6):1040.