

CLIMATE CHANGE AND URBAN CHILDREN'S HEALTH: A CASE STUDY OF IBADAN SOUTH WEST LOCAL GOVERNMENT, NIGERIA

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Abstract: Climate change and human health are intricately linked. The impact on children's health is particularly enormous because of the uniqueness of their bodies' physiology and dependence on adults for protection. This study determined the perception of women about the impact of climate change on health status of their children and analyse the factors influencing children's medical bills. Data were collected with the use of simple random sampling and analysis was done using descriptive and Tobit regression methods. Results show that 49.45% of the children normally fall ill once in at least 4 months while 31.87 were falling sick at least one time in 3 months. Skin infection is the common health problems among children during dry season, which catarrh was most reported (71.43%) during wet season. Tobit regression results show that age (-ve), household size (+ve), per capita expenditure on food (+ve), per capita other expenditure (-ve), falling sick often (+ve), wet season sickness (+ve), cough (+ve), catarrh (-ve) and malaria (+ve) significantly influenced children's medical expenses ($p < 0.10$). It was recommended that subsidy for children malaria treatment, provision of more mosquito nets and awareness creation on preparedness of households for adverse climatic situations.

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1. Introduction

Climate change is any significant change in measures of climate such as temperature, precipitation, or wind that last for an extended period of time {Intergovernmental Panel on Climate Change (IPCC), 2001}. Global temperature and the frequency of extreme weather events have been significantly altered by climate change. However, though overall variability of weather patterns cannot be denied, some regional projections have shown some variations in amount and timing of precipitation which will increase in some places and decrease in others (Bernstein *et al.* 2007).

Conservative environmental estimates of the impact of changes in climate indicate that they will result in numerous health effects on children. The nature and extent of these changes will be greatly affected by actions that are taken at the global level (Paediatrics, 2007). Available estimates reveal that 66.5 million children around the world were affected by disasters in the 1990s (Penrose and Takaki, 2006). However, in the future, the estimates are as high as 175 million children per year (Save the Children UK, 2007).

Children are always hardest hit by environmental hazards because of their physical, physiologic, and cognitive immaturity (Etzel and Balk, 2003). It had been

emphasized that increasing environmental hazards resulting from climate changes will disproportionately affect children's health (Shea, 2003). It had been submitted that spread of some infectious diseases categorized as vector-borne, food-borne, and water-borne diseases will increase due to climate change. Malaria and dengue fever stand out among the vector-borne illnesses that would be promoted by climate change (Sheffield and Landrigan, 2011).

Children represent a particularly vulnerable group that will suffer disproportionately from both direct and indirect adverse health effects of climate change. Paediatric health care professionals understand these threats, anticipate their effects on children's health and advocate for strong mitigation and adaptation strategies (Bunyavanich, 2003). Children are at increased risk of death and injury from adverse climatic events such as drought, flood and extreme heat because they depend totally on adults for protection. The World Health Organization (WHO) recently estimated that 34% of all childhood illness in the world (compared to 24% of all age illness) and 36% of deaths in children under age 14 are due to modifiable environmental factors. Because of physical, physiological and cognitive immaturity, children are more sensitive than adults to harm

from environmental hazards. Poor children in developing countries will particularly suffer disproportionately because of limited access to health care facilities and insurance (Sheffield and Landriga, 2011).

In many parts of Nigeria, the pattern of rainfall is changing with cases of flooding in many urban areas. Because of poor drainage system and inadequate urban housing development and planning, adverse climatic event in the form of flooding disproportionately affects urban children. However, heavy rainfall is highly correlated with outbreaks of waterborne diseases because of contamination of surface and ground water. About 68% of outbreaks of waterborne disease morbidity in Nigeria over the past 45 years were associated with rainfall above the 80th percentile (WHO, 2007). Infants are at higher risk for complications and hospitalizations from such infections.

Furthermore, extremely high temperature favours development of mosquitos, which are carriers of malaria causing vector, *Plasmodium falciparum*. Specifically, malaria causes 350-500 million morbidity annually, and more than one million deaths, mostly in young children. World Health Organization (WHO) (1997) also submitted that 5 million children die annually from diseases linked to air pollution. Compared with adults, children breathe more rapidly and more often play outdoors, leading to greater exposure to pollutants per unit mass. Epstein (2002) states that the potential child health impacts of severe weather include drowning, gastrointestinal disease, malnutrition, and psychological trauma.

The main objective of the study is to determine the impact of climate change on children's health. We specifically assess respondents' perception of climate change impact as a risk or challenge to children's health, identify prevalent health problems, estimate costs associated with children's health problems attributable to climate change and determine the implications of children's health problems on parental income. In the remaining paper, we have presented the materials and methods, results and discussions and recommendations.

2. Materials and Methods

Area of study

The study area is Ibadan South West Local government. Ibadan has a population of 6,617,720. Ibadan, city in south-western Nigeria, capital of Oyo State, located about 110 km (about 70 miles) northeast of Lagos. Ibadan is a major transit point between the

coast and areas to the north. Ibadan South West Local Government is located at Oluyole.

Sources and method of data collection

Primary data were obtained through questionnaires and personal interviews. The questionnaires were administered to parents. The designs of the questions were such that information relating to income of parents, pattern of expenditure on children's health, and other socioeconomic characteristics of the households were collected. Other information captured in the questionnaire include children health problem associated with different weather conditions such as wet and dry season. The sampling population include individual parents in various households across the local government area. The sampling unit is the household that were randomly sampled. A total of 100 households were sampled.

Analytical procedures

The data were analysed with descriptive methods such as frequency counts, percentages and mean. Tobit regression analysis was also carried out to determine the impact of climate change on children's medical expenses. Tobit was preferred because some households recorded zero (0) as children's medical expenses. If ordinary least square method is applied, the estimates will be biased and even inconsistent (Gujarati and Sabgeetha, 2007). Estimated model can be stated as:

$$Y_i = \alpha + \beta_i \sum_{i=1}^n X_i + v_i \quad \dots 1$$

Where α and β_i are the constant coefficient and slope coefficients of the variables. v_i is the error term. Y_i is the total household's monthly expenditure on children's health (₦). The independent variables (X_i) are age of household heads (years), household size, trading (dummy) (yes=1,0 otherwise), per capita food expenditure (₦), per capita education expenditure (₦), per capita other expenditure (₦), fall sick often (dummy) (yes=1,0 otherwise), wet season sickness (dummy) (yes=1,0 otherwise), temperature affects health (dummy) (yes=1,0 otherwise), skin rashes (dummy) (yes=1,0 otherwise), measles (dummy) (yes=1,0 otherwise), smallpox (dummy) (yes=1,0 otherwise), cough (dummy) (yes=1,0 otherwise), catarrh (dummy) (yes=1,0 otherwise), malaria (dummy) (yes=1,0 otherwise), number of children affected by climate change, protects children (dummy) (yes=1,0 otherwise), use first aid (dummy) (yes=1,0 otherwise) and access to free medication (dummy) (yes=1,0 otherwise).

3. Results

Socio-economic characteristics of the respondents

Table 1 shows that majority (42.86%) of the women were traders, while 27.47% were salary earners. Also, the largest percentage (51.65%) of the women was between 28 and 37 years. This is followed by women that were between 18 and 27 years that constitute 23%. Average age is 32.09 years with standard deviation of 6.70. The table shows that women with tertiary education had the highest percentage of 48.35%. This is followed by those with secondary education with 32.97%. Average years of education is 12.91, with standard deviation of 5.039. This implies that the respondents, being urban residents, were largely educated. Also, household sizes of between 2 to 5 had the highest percentage of 87.91%. This is followed by household size 6 to 9 which accounts for 10.99%. Average household size is 3.91 with a standard deviation of 1.396. The majority (80.22%) of the households were earning less than ₦30000. Average monthly income is ₦19979.65 with standard deviation of 18388.19.

Table 1: Distribution of women's socio-economic characteristics

Socio-economic variable	Frequency	%
Occupation		
Traders	39	42.86
Salary Earners	25	27.47
Self Employed	14	15.38
Professionals	5	5.49
Students	4	4.40
Farmer	1	1.10
Others	3	3.30
Age		
<18	5	5.49
18-27	21	23.08
28-37	47	51.65
38-47	16	17.58
>47	2	2.20
Education		
None	6	6.59
Primary	11	12.09
Secondary	30	32.97
Tertiary	44	48.35
Household size		
2-5	80	87.91
6-9	10	10.99
10-13	1	1.10
Monthly income (₦)		
<30000	73	80.22
3000<50000	13	14.29
50000<70000	3	3.30
>=70000	2	2.20

Source: Field survey, 2008

Perception about climate change and child morbidity

The study probed into the frequency of children morbidity, the season in which they fall sick and perception of mothers on contributions of climate change to children morbidity in the different seasons. Table 2 shows that 49.45% of the children were sick once in 4 months and above. Those who were sick once in 3 months were 31.87%. The table further shows that in dry season, 45.05% of the children fell ill as against 42.86% in wet season. Table 2 further shows the perception of mothers on the contribution of climate change to children's health problem. It indicates that 64.84% of the respondents believed that climate change contributed to their children's health problem, while 26.37% indicated otherwise.

Table 2: Children's sickness time, season and types

	Frequency	%
Morbidity frequency		
Monthly	12	13.19
Once in 3 months	29	31.87
Once in 4 months and above	45	49.45
No response	5	5.49
Seasonal morbidity		
Dry Season	41	45.05
Wet Season	39	42.86
No Response	11	12.09
Morbidity influenced by climate change		
Affected	59	64.84
Not Affected	24	26.37
No response	8	8.79
Common Sickness in dry season		
Skin Rashes	40	43.96
Measles	21	23.08
Small Pox	9	9.89
Common sickness in rainy season		
Catarrh	53	71.43
Cough	65	49.45
Malaria	45	12.09

Source: Field Survey, 2008

The table also indicates that skin rashes are common health problems among children during dry season. This is followed by measles and then smallpox that represent 23.08% and 9.89% respectively. However, during wet season, catarrh was most reported with 71.43%. This is followed by cough and malaria that were indicated by 49.45% and 12.09% of the respondents respectively.

Access to free medication

Table 3 shows that majority of the respondents did not have access to free medication. The table also reveals that cost of treatment does not reduce 64% of the respondent's eagerness to hospital treatment.

Table 3: Access to free medications and restrictions due to hospital bills

Access Availability	Frequency	%
<i>Access to free treatment</i>		
Available	22	24.18
Not Available	69	75.82
<i>Affected by cost</i>		
Affected	33	36.26
Not Affected	58	63.74

Source: Field Survey, 2008

Factors influencing households' medical bills on children

The results of Tobit regression are presented in table 4. The results indicate that the model produced a good fit for the data since the log likelihood function parameter is statistically significant ($p < 0.01$). The computed sigma is also statistically significant ($p < 0.01$). We will Focus only on the parameters that are statistically significant, which are age ($p < 0.10$), household size ($p < 0.01$), per capita expenditure on food ($p < 0.01$), per capita other expenditure ($p < 0.01$), falling sick often ($p < 0.10$), wet season sickness ($p < 0.05$), cough ($p < 0.05$), catarrh ($p < 0.05$) and malaria ($p < 0.05$).

The parameter of age is with negative sign (-160.61) showing that as the age of household heads increases by one year, their children's health expenses significantly decrease by ₦160.61 This is expected because the as the household heads grow older, they are expected to have fewer number of children and spend less on their medical expenses. The results also indicate that as household size increases by one person, medical expenses on children increases by ₦1295.86. This is also expected because increase in the size of household members may imply having more children in that household. Also, infection of one child by one ailment may imply that every other child or person in that household will be infected and require some medication. This will no doubt increase the expenses on medical care.

Also, as households' per capita expenditure on food increases by ₦1.00, their children's medical expenses significantly increase by ₦2.14. It should be noted that conventionally, food expenditure is a proxy of

income, which should be positively correlated with children's medical expenses because wealthier households are able to spend more on their children health. However, increasing the per capita amount of money spent on other households' needs ₦1.00 will lead to ₦2.12 reduction in children's medical bills. This is also expected because if there is the need to treat a child for illness, some other not so essential needs of the households can be forgone.

Households that indicated that their children were falling sick often have their medical bills on children being higher by ₦2420.89. This is expected because for every episode of illness, money has to be incurred. Households that indicated that their children were falling sick more during wet season also incurred medical bills that are higher by ₦2811.74 when compared with those without such experience. This may have resulted from the nature of prevalent sickness during that season, especially cough and malaria, which could sometimes require consultations with medical personnel and expensive drugs.

On the nature of sickness, households with children that were diagnosed to have cough spent significantly higher amount of money (₦2926.33) on children's medical bills. This shows that children's infection with cough requires huge medical bills. This may be as a result of the nature of treatment that is sometimes required. For instance, coughing among children may result from malaria infection and sometimes requiring some expensive antibiotics drugs depending on the nature of sickness. However, households with children that had catarrh spend an amount that is lower by ₦2908.90 on medical bills. This may have resulted from the fact that infection with catarrh requires less expensive drugs. In many instances, mere consultation with a chemist may be all that is required. Previous experience may also inform administration of the right treatments by the mothers. However, households with Children that were infected with malaria have their medical bill being higher by ₦2623.05. This is as a result of the nature of treatment that is required to treat malaria. Because of development of resistance by some malaria parasites to some drugs, malaria sometime requires a combination of two drugs for effective treatment. This always requires a lot of money per episode because in such a case, visiting a doctor is inevitable in order to check the child's case notes for proper prescriptions.

Table 4: Tobit regression results of factors determining children's medical expenditure

Variables	Coefficient	Standard Error	t-value	Probability
Age of household head	-160.61	83.37	-1.93	0.058
Household size	1295.86	443.22	2.92	0.005
Trading (dummy)	-463.74	1023.48	-0.45	0.652
Per Capita Food expenditure	2.14	0.31	6.80	0.000
Per Capita Education expenditure	-0.20	0.23	-0.88	0.380
Per Capita Other expenditure	-2.12	0.77	-2.74	0.008
Fall sick often (dummy)	2420.89	1412.32	1.71	0.091
Wet season sickness (dummy)	2811.74	1119.88	2.51	0.014
Temperature affects health	1378.24	1126.94	1.22	0.225
Skin rashes (dummy)	418.78	1131.05	0.37	0.712
Measles (dummy)	-1745.90	1402.46	-1.24	0.217
Smallpox (dummy)	-404.57	1760.82	-0.23	0.819
Cough (dummy)	2926.33	1120.35	2.61	0.011
Catarrh (dummy)	-2908.90	1317.04	-2.21	0.030
Malaria (dummy)	2623.05	1058.38	2.48	0.016
Number of children affected by climate change	-116.11	701.78	-0.17	0.869
Protect children (dummy)	2077.42	1536.69	1.35	0.181
Use first aid (dummy)	-1246.62	1623.02	-0.77	0.445
Access to free medication (dummy)	-388.53	1209.50	-0.32	0.749
Constant	-3342.17	2877.34	-1.16	0.249
Sigma	4302.60	332.87		

4. Recommendations

The study examined the impact of climate change on children's health in Ibadan southwest local government. Climate change threatens children's health, their welfare, and future. Findings from this study have pinpointed some vital policy issues. First, there is the need to educate the people on the implications of climate change on the health of their children. This is very important because some situations that children are exposed to which often deteriorate their health could be prevented. It was found that some households were scared of seeking medical treatments for their children because of the envisaged large amount. There is therefore the need to ensure functionality of the National health Insurance Scheme (NHIS) and expansion of its coverage to whoever wants to be part of it. This will start with awareness creation and ensuring adequacy of existing health facilities to deliver the needed services. There is also the need for government to provide subsidized treatments for diseases like malaria among children given the upward trend of its incidences as climate changes. This is going to provide some form of relieve to poor households that seek medical

care. There is also the need to ensure that mosquito nets are distributed to households in order to protect children from mosquito bites. This will reduce malaria morbidity among children and save their families some medical bills.

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