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MULTIPLE VULNERABILITIES AND URBAN HEALTH CHALLENGES FROM EXTREME WEATHER EVENTS IN ILORIN, NIGERIA.

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ABSTRACT

One of the poorly explored areas of differentials in the impact of climate related events is how a single climatic event produces several dimensions of vulnerability and how a web of adaptation strategies also evolves. This study examines multiple dimensions of vulnerability generated by rainstorm and flood events and the challenges these pose to health of residents of Ilorin within a five year period. Between 2002 and 2006, there were about 22 flood/rainstorm events in Ilorin, the capital city of Kwara State, Nigeria. During the period, about 480 houses were destroyed involving about 1061 households. Structured questionnaires were administered in a survey that involved 300 households sampled from the victims of flood/rainstorm disaster during the period under review. The sampling was designed purposively to include at least 120 female headed households or 40% of all households sampled for the study. Data were also obtained from secondary sources particularly from the State Emergency Management Agency. The result shows that the occupations of respondents vary from trading to farming and civil service. Many female heads also combined one or more of these activities to earn a living. The livelihood types available to the study population were affected one way or the other by the disaster. During and immediately after the flood events, 32% of the sampled households reported that incidence of malaria increased while fresh cases of diarrheal were reported among children not older than five years in 47% of the sampled households. Furthermore, 38% of households changed their health care options from the orthodox to unconventional health care options. Only 5% of female headed households benefitted from the relief material distributed through government intervention. The study proposes a paradigm shift in urban disaster management from the tangible house renovation to the less tangible, albeit more devastating, livelihood reconstruction.

Keywords: Rainstorm, Climate Change, Cities, Vulnerability, Gender, Institutional Intervention.

1.0 INTRODUCTION

Climate related disasters had served to complicate the urban vulnerability landscape; particularly as this may affect the health of residents of cities in Sub-Saharan Africa. In this region, 'city divide' is an important feature of the contemporary disparity. This refers to the growth of disparities between the affluent and the income-deprived as exemplified in the residential pattern in these cities. Housing structures in the inner parts of these cities are typically weak and are therefore vulnerable to a magnitude of stress from extreme weather events and may experience significant devastation at the slightest change in the climatic parameters

The connection between extreme weather event and vulnerability on health of city dwellers is complex. One way to view this connection is to note that environmental, social, economic characteristics of city dwellers vary and that a magnitude of stress produced by climatic events can (and do) indeed have varying consequences for the health and other human livelihood sectors. This is also capable of producing a complex wave of webbed impacts in the human social systems. The implication of this is that a small change in one component of the social system induced by extreme weather event like flooding or rainstorm do produces impacts in different aspect of human life and

the impact produced also vary (sometimes significantly) among urban residents. This is referred to here as multiple vulnerabilities and the study examines the health related ways by which a single extreme weather event may pose challenges to urban dwellers in Nigeria. The study reports a case study of victims of flood and rainstorm events in Ilorin, Nigeria. The specific objectives of the study includes to examine the socio-economic characteristics of flood victims in Ilorin metropolis and the implications of dwelling conditions on the intensity of impacts during flood and rainstorm events. This is with a view to determining how these characteristics combine to reinforce the vulnerability of urban dwellers during meteorological events.

1. VULNERABILITY AND EXTREME WEATHER EVENTS: SOME CONCEPTUAL ISSUES

The concept of vulnerability (as used here) does not connote the sense of resistance as may exist in ecology texts (see Begon et al., 1990), but the sense of resilience; suggesting ability of adaptation, ability to return to an original resting state or achieve a new equilibrium after a shock (see Watson et al., 1996). When the concept is applied to climate or extreme weather events, it is defined as a "state of increased probability of adverse outcomes for a given environmental exposure" (Woodward et al., 1998).

Simply defined vulnerability refers to the capability of the population to be wounded from a perturbation or stress of environmental or socio-economic origins. It is the exposure and susceptibility to harm or damage emanating from environmental conditions like flood, erosion, and other extreme weather events. According to the Intergovernmental Panel on Climate Change (IPCC) in its Third Assessment Report (TAR), Vulnerability is defined as the "degree, to which a system is susceptible to or unable to cope with adverse effects of climate change, including climate variability and extremes... (it is) a function of the character, magnitude and rates of climate

variation to which a system is exposed, its sensitivity and its adaptive capacity" (IPCC, 2001 p.995).

Hence vulnerability is at once relative and undesirable. The impacts of 'change' in environmental parameters function through the crevices of the non-linear vulnerability to the change by individuals and community who are the victims. It is therefore this concept of vulnerability that act to differentiate individuals and is thus the most important concept as far as the debate on the human dimensions of climate change is concerned.

The need to critically examine levels of vulnerability in this case, therefore, stems from three related reasons:

i) Human species have grown to appreciate the fact about the debate on the variations and/or alterations in the basic attributes of climate; it is the variability in the vulnerability that is still poorly understood; whereas this is the root cause of health disparity resulting from environmental change.

ii) It is the events that take place locally that have the greatest impact and similar events may (and do) produce differential impacts on human health; whereas the spatial scale of impact forecasting is often regional. One of the dangers of such impact forecasting at larger resolution is the optimism in the late 1940s that the battle between humans and parasitic/infectious diseases had been decided in a victory for the former to the extent that it was time to close book on infectious diseases (see Fisher, 1994), only to be ravaged by formidable health problems from the 'relics' of ancient scourge such as malaria (Pearce, 1995), tuberculosis (Bloom and Murray, 1990, Brown, 1995), etc) cholera (Glass et al., 1992) and HIV/AIDS (Ainsworth and Over, 1994, Barron and Rudalema, 2001). Today, local happenings are shaped in a complex way by events occurring many miles away because in space, "everything is connected to everything else to the extent that "most events and phenomena are connected, caused by, and interacting with a

huge number of other pieces of a complex universal puzzle. We have come to see that we live in a small world...." (Barabas, 2002).

iii) There is also the tragic reality that the most vulnerable groups are also those that receive the most devastating effects of global environmental change whereas these same groups are the least likely to return to equilibrium when they are devastated. Thus, global environmental change happens to us all, certainly, not equally. Hence, any intervention that takes for granted the pattern of vulnerability is at once frustrated.

In the context of this paper, vulnerability is understood to mean the tendencies of people to be killed, injured or otherwise harmed as a direct consequence of the occurrence of extreme events like storms or floods on the one hand; or the severity of damages to climate-sensitive livelihood resources on the other. It is also hypothesized that because of the variation in the socio-economic background of people, vulnerability to the impact of extreme weather events also varies. Apart from this, the nature of cities in developing countries may also precipitate increased vulnerability for the residents in many respects. For instance, not only that the concentration of people and dwellings produces its own risks, but also because of the dangerous positioning of such residential dwellings and industrial land uses. The capability of this juxtaposition for precipitating disease occurrence is enormous such that the combination of derelict dwelling located on marginal land may increase the susceptibility of the residents to water washed diseases during flood episodes.

Based on the above, the sensitivity and adaptive capacity of human societies are crucial to the degree to which such societies may be vulnerable. By adaptation, we refer to the degree to which adjustments are possible in practice, processes or structures of systems to projected or actual changes in climate. This can be spontaneous or planned in anticipation of changes in conditions (Kasperson and Kasperson, 2001).

Extreme weather conditions present one of the variations to which human and natural systems rarely adapt easily. In other words, spatial and temporal deviations from annual average conditions are common. Social and economic systems like health, transportation and water resource management often adjust to accommodate the deviations from the normal conditions without necessarily causing hardship to the surrounding population of man and animals. It is only during spontaneous and extreme deviations in climate that many of the human and natural subsystems are found wanting and unable to adjust to accommodate the deviations because such changes or their magnitude were not anticipated or planned for.

Thomas et al (2005) developed a conceptual model of the ways in which adaptation and coping with major livelihood disturbances, including climate extremes, may be constructed. According to them, the responses that can occur at the household level are influenced by motivators and barriers to the decision process. This includes aspects of the household's behavioural intention and context, such as available assets (capital and resources), cohesion, values and ambition, social structures, networks and flows of information, altruism, self-efficacy, and individual experience and knowledge. All these contribute to what actually take place in the 'response space' which is also affected by the locational context in terms of environmental resources and other opportunities, and external socio-political factors.

Identifying what occurs (and why) in the response space is important in terms not only of outcomes (adaptation or coping) but also in terms of the potential to identify whether adaptation has generic characteristics. This would allow the processes of adaptation to be understood and their potential transferability into the future and to new contexts, to be assessed. It is therefore important to identify critical elements within the response space in terms of how people behave and have learned in respect of recent historical and current

Frequent rainstorms and flooding in Ilorin has made it one of the most vulnerable cities in Nigeria in the recent past not only because the number of such incidents had increased in the last few years but also because the severity had translated into extensive damage to properties and livelihoods of the people.

4.0 DATA AND METHOD:

The data required for this study include the number and location of victims of extreme weather events in Ilorin metropolis between 2002 and 2006. In the city of Ilorin, the most frequent extreme weather events are flooding and rainstorms. These two phenomena often occur together; although each may also occur separately. Thus, the number of households affected by either flooding or rainstorm or both during the period under review were used as surrogate for the victims of extreme weather events. A cross-sectional study of this group was carried out through a structured questionnaire that sought to elicit information on the socio-economic and demographic characteristics of the sampled victims as well as their experiences during the first few weeks following the flood and/or rainstorm that affected their homes. Data on the recorded cases of flood and rainstorm that occurred in Ilorin metropolis during the period 2002 and 2006 were also obtained from the Kwara state office of the National Emergency Management Agency (NEMA). The agency keeps a fairly adequate record of cases of human and ecological disasters by location and number of houses involved for the purpose of distribution of relief materials.

The study involved a sample of 300 households from 480 houses that were recorded by NEMA. This sample was achieved by numbering the houses in NEMA's record and randomly selecting the required number of houses. In each house, one household was selected purposively to include at least four female heads in ten sampled households. Thus the structured

questionnaire was administered on 180 male- and 120 female-headed households.

The data obtained from the survey were analyzed using simple parametric and non-parametric statistics. The findings were discussed and inferences drawn for both urban health and disaster management in Sub-Saharan Africa.

5.0 ANALYSIS AND FINDINGS:

5.1 Socio-Economic Characteristics of Respondents

There are usually two categories of factors that determine the nature and severity of flood or rainstorm events in traditional African cities. These are variables relating to the socio-economic characteristics of households occupying different parts of the city; and the nature, type and characteristics of buildings. These two factors are complimentary and are capable of reinforcing each other. This section describes the characteristics of households affected by flood and rainstorm in Ilorin metropolis during the period under review. The gender distribution of respondents is 60% to 40% in favour of male while 57% of the respondents were older than 36 years. About 80% (238 respondents) were married and 14.3% were divorced, widowed or separated. Only 19 respondents (6.3%) were single.

climate variability and change, in order to examine their wider relevance to the adaptation process especially among those whose livelihoods are nature based. Within the conceptual model, individuals and communities have some autonomy to choose adaptation pathways and locate themselves within the adaptation space. The degree to which they are autonomous is, of course, constrained both by the wider economic and political environment but also by antecedent decisions that partly lock them into particular pathways.

3.0 THE STUDY AREA

Ilorin, the capital city of Kwara State, Nigeria, is the setting for this study. The city is located on latitude $8^{\circ} 10'N$ and longitude $4^{\circ} 35'E$ marking a divide between the southern forest Zone and the Northern grassland of Nigeria. The vegetation, in most parts, is guinea savannah interspersed by trees of different species. The dormant streams are Asa, Aluko, Okun, Amule, and Agba. The Asa River is of particular influence on the direction of growth of the city. The situation of the city between the dry North and the wet South of Nigeria gave Ilorin the apt description as the "gate way" between the North and the South of the country" (Adedibu, 1980). The climate is

therefore tropical wet and dry characterized by a distinct wet and dry seasons. The mean annual temperature is about $26.80^{\circ}C$ with five hours average daily sunshine. The mean annual rainfall is about 125mm. It is important to note that the above locational and physiographic characteristics possess (sometimes significant) implications for human health on one hand and economic and social development on the other.

Ilorin is a typical traditional African city whose urban history predates colonialism in Nigeria. The city therefore falls into the category of third world cities described as reputed for their dualistic internal structure (Mabogunje, 1968). The physical development of Ilorin also translates into significant change in the population of the city. For instance, from 36,300 inhabitants in 1911, Ilorin has a population of about 208,546 in 1963, 532,088 people in 1991 and a projected population of about 765,791 by the year 2005 at the rate of 2.84% annually. The facts of urbanization, development of the modern commercial/industrial economy and the multiplier effects of these factors on natural increase had combined to produce the changes in population described above.

Figure 1 is a map of Kwara State showing Ilorin.

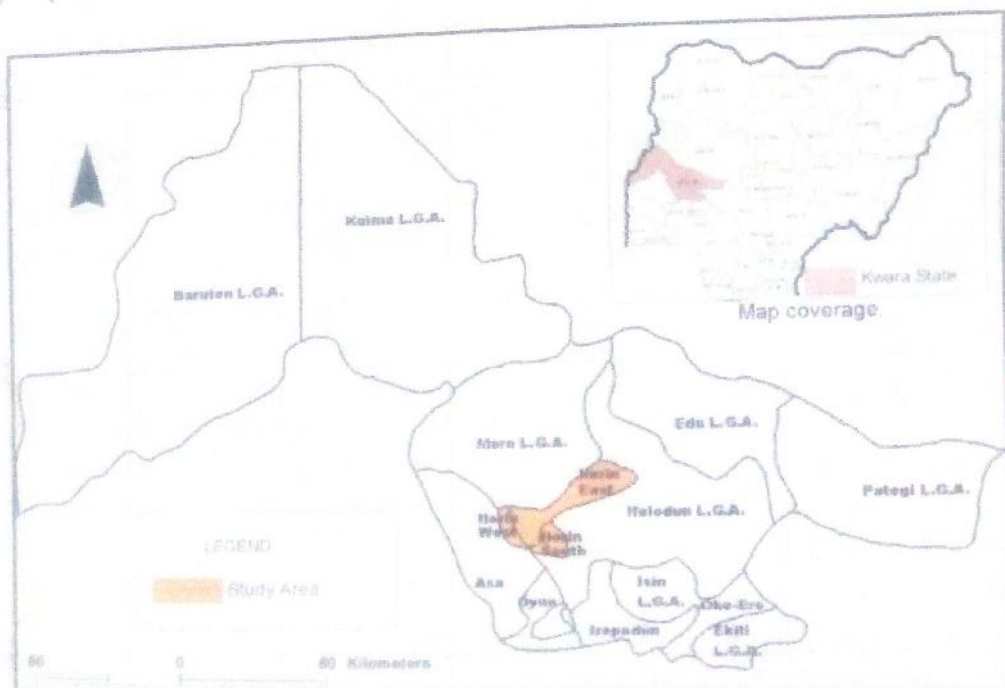


Fig.1: Location of Ilorin, Kwara State.

Table 1: Socio-Economic Characteristics of Respondents

Socio-economic Characteristics		Frequency	Percentage
Sex	Male	180	60.0
	Female	120	40.0
Age	20 and below	15	5.00
	21-35	71	23.7
	36-50	97	32.3
	Above 50	44	14.7
Marital status	Single	19	6.3
	Married	238	79.3
	Others	43	14.3
Education	No formal education	84	28.0
	Primary	71	23.7
	Secondary	101	33.7
	Tertiary	44	14.7
Occupation	Civil servants	102	34.0
	Farming	74	24.7
	Artisan	109	36.3
	Trading	131	43.7
	Unemployed/retired	25	8.3
Household size	1-3	57	19.0
	4-6	113	37.7
	7-10	58	19.3
	10 and above	72	24.0

Source: Author's Analysis

Out of the total respondents, 28% had no any form of formal education while about 24% had only primary education. This shows that a significant proportion of the victims of flood (51.7%) were barely educated. Moreover, 34% of the

respondents were civil servants; while, (36%) of the respondents were artisans. It is important to not that many heads of households in the sampled respondents combined more than one occupation. For instance, 47% indicated more than one

occupation as their means of livelihood. This is a form of adaptation adopted by households in most parts of the city to cushion the effect of poverty due to low wage either from the civil service or from trading activities. Household sizes also varied from those with between one and three members to those households with more than ten members. In all, household sizes were generally large with 81% of all households involved in the survey having more than four members (see table 1).

5.2 Characteristics of affected Buildings

The results presented in Table 2 shows that more than half (53.7%) of the households

occupied houses that were older than 30 years; 62.3% of the houses were constructed with cement blocks. It is important to note that mud houses constituted about 33.7% of houses affected by flood in rainstorm as indicated by victims in his survey. Most houses were roofed with metal sheets (81.7%). The metal sheets were however old and leaking as may be deduced from the age of buildings in Table 1. More than two third of the houses have their floor made with earthen floor, out of which about 21.3% were not plastered at all. The houses were mostly multi family houses (35.5%). These are house containing many households that were not related by blood.

Table 2: Characteristics of Buildings Occupied by Respondents

Characteristics	Frequency	Percentage	
Age of building (years)	1-10	44	14.7
	11-20	95	31.6
	21-30	47	15.7
	31-40	67	22.3
	42 and above	47	15.7
Materials for External wall	Cement Blocks	187	62.3
	Concrete Bricks	12	4.0
	Mud bricks	101	33.7
Materials for the roof	Asbestos sheets	37	12.3
	Metal sheets	245	81.7
	Tiles	15	5.0
	Wood or Thatch	3	1.0
Material for the floor	Tile	61	20.3
	Concrete	48	16.0
	Plastered earthen floor	127	42.3
	Unplastered earthen floor	64	21.3

Type of dwelling	Detached house	49	16.3
	Multi family house	91	30.3
	Separate apartment	24	8.0
	Rooms in a large dwell	107	35.7
	Others	29	9.7
Nature of ownership	Owner occupied	103	34.3
	Family owned	96	32.0
	Rented house	93	31.0
	Others	8	2.7

Source: Author's Analysis

The implications of the characteristics described above for human health are obvious. The health of households in 'sick buildings' include diseases related to dampness; such as pneumonia and eye irritations.

5.3 Spatial Pattern of Flooding/Rainstorm incidents in Ilorin

An analysis of the Data obtained from NEMA office shows that the impacts of the flooding/rainstorm disaster incidents were more in the traditional, core areas of the city going by the number of properties damaged. This is particularly higher in the frontier native wards of Ogidi, Oloje and Ubandawaki. It should be noted that the traditional, core areas of the city are characterised by high population and the people in these areas are most at risk from

environmental emergencies. This is because basic infrastructures are either not available or old and weak. The houses are also too old or are made of low quality materials.

5.4 Health-Related Impact of Flood and Rainstorm in Ilorin Metropolis:

Flood events are shown to have a broad range of health impacts. For instance, 1(3.3%) reported that a case of drowning occurred in the household during a flood event while 61 households or 20.3% out of the total number of households sampled in the survey reported bodily injuries resulting from their contact with floodwaters. In 197 households or 65.7% of the households used in the survey, the source of domestic water supply was disrupted while fresh cases of diarrhea were reported among children of 141 (47%) households (Table 3).

Table 3: Health-Related Impact of Flood and Rainstorm in Ilorin Metropolis:

Health Related Challenges	Drowning	Bodily injuries	Disruption of clean water supplies	Fresh cases of childhood diarrhe
Frequency	1 (3.3%)	61 (20.3%)	197 (65.7%)	141 (47%)

This is in addition to the psychosocial responses to discomforts from danger, disruptions, illness, displacements and loss of housing or business premises to flood and

rainstorms (see also Ahern and Koats, 2006, McGranahan, 2007).

6.0 MULTIPLE VULNERABILITIES AND INSTITUTIONAL RESPONSE DURING EXTREME WEATHER EVENTS: SOME INFERENCES

A single extreme weather event is capable of generating an interrelated web of impacts in the social, economic and environmental sectors of human life. These stressors are capable of producing, singly or in a complex web, health risks in affected households. For instance, in addition to the health risks identified in Table 3, the health of people impoverished by floods is likely to be affected even if they suffer no direct health effects. More importantly, the flood events affected both the home and business premises of people in 87(29%) households. For this category of people, the flood destroyed both the immediate means of livelihood as well as the available option for adaptation in terms of economic response to the disaster. Moreover, Table 1 shows that affected houses were occupied by 65.7% or 197 households who were not the original owners of the houses. This category of people was faced with the challenge of getting a new accommodation without a refund of the rent paid on the previous house (where this was the case). The response from the government to cushion the effect of the disaster included distribution of relief materials which essentially comprised of building materials, food items and clothing. The target for the distribution of these materials was owners of houses and not heads of households. This indicates that a significant proportion of the affected households may not receive any relief from this source. Aside this, women were not regarded as house owners but their husbands even where women own the house. Thus, only 6 households headed by females or 5% of the total female headed households received relief materials from government sources; whereas 56 female heads or 46.7% of all female headed households sampled in the survey claimed to have lost both housing and business premises.

The implication of this for household health is reflected in the ability to afford minimum health care for household members during disasters like flood. Due to the exposure to sewage materials during flooding, cases of fecal-oral transmitted diseases like diarrhea and cholera increased at a time when households were barely able to afford the cost of feeding and housing, thus 114 households or 38% of the total sampled for this study changed their health care options from orthodox care to other options that were substandard. Indeed, these options are particularly risky for illnesses like diarrhea and cholera with characteristic rapid onset and high fatality within a short period of onset.

7.0 SUMMARY AND CONCLUSION

This study examined the multiple vulnerabilities during extreme weather events in traditional African cities using the example of Ilorin metropolis in Nigeria. The health challenges arising from these vulnerabilities were also highlighted. The study finds that a significant proportion of the victims affected by flood events were vulnerable in more than one perspectives of vulnerability. Institutional supports for victims were also not targeted at the victims but on the owners of houses. Hence only few households received the relief materials after flood events. The physical characteristics of houses and socio-economic characteristics of households combine to increase the vulnerability of households in the metropolis as the housing structures were weak and old while people were poor and with no regular income particularly in the inner city. The health risks were also aggravated through exposure to sewage, collapse of septic tanks as well as the disruption of domestic water sources. Thus cases of diarrhea in children soared.

In conclusion, there is some evidence to support the argument that disaster management response in the city had not addressed the equity dimension of vulnerability which suggests that both lan

or house owners and their tenants experience the impact of disasters and that any relief targeted at the victims must be defined to be inclusive of all victims and to encompass all 'shades' of vulnerability. The need for this paradigm shift is urgent in Africa. Thus, the impact of climate change is likely to worsen the prospects for poverty eradication unless action is taken to become response-capable. This requires a focus on reducing vulnerability, achieving equitable growth and improving the governance and institutional context in which poor people live.

It is also in the interest of urban health in Africa that planning takes cognizance of the seemingly unplannable inner cities of traditional African cities. In these areas, and in most African pre-colonial cities, roads are

narrow, with poor drainage system and often with open refuse sites. These factors combine to block water channels and lead to frequent flooding. Urban administration should therefore intervene to remedy some these deficiencies. It could take advantage of the urban renewal efforts which is, at moment, an individual and random effort in cities. Urban planners should not abandon the inner cities to their fate but intervene to make provision of basic environmental services like toilet, kitchen and bathrooms as part of the renewal effort. Governments could also provide, jointly, such municipal facilities as waste disposal sites and drainage networks. This is in the realization of the reality of climate change and the irreversible nature (at least in short run) of flood and rainstorm occurrence.

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