

RESEARCH ARTICLE

Health Performance Empirical Evaluation on Urban Housing Floods in Odosida, Ondo city, Nigeria

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Abstract

Natural occurrence of streams, rivers and flowing water attract emergence of urban housing along river bank is to tap water for domestic, irrigation, industrial use; deposition of minerals and nutrients for agricultural purpose. Consequences caused by recent events of floods in the urban centers are not limited to socio-economic, environmental loss but also increase in health challenges with loss of life. Flood itself cannot be held responsible for the catastrophe but the activities of people, society and urban housing encroaching on natural space of lowland, wetland, prone areas, also; landscape reshape to reclaim beaches by cutting off hills fosters thereafter, destruction of life and property. The study therefore identified the consequences of urban housing flood in three areas. Quantitative method including frequency tables, histograms, pairwise ranking, chi-square and analysis of variance (ANOVA) were also used to interpret the data collected. The result shows that disease occurrence is significant to urban housing flood; correlation between flood and marginalization to adequate housing quality; and floods is significant to urban housing development. It is clear that vulnerable and flooded prone milieu is mostly occupied by urban poor because of inability to avoid good housing quality and there is high of cases of cholera, malarial, water-borne, measles among residents in the study area. Society is becoming more aware that floods can be controlled to a limited extent; hence, safety against floods must be sought for, to prevent loss of life, properties and socio-economic investment. This paper recommends absolute delineation from vulnerable area, government and property developers should ensure good housing quality, total relocation of urban housing from marginal land and compensation to victims. Studies on comparative evaluation of urban housing vulnerability to flood on highland and lowland; environmental disruption of urban housing in lowland require additional investigation.

Keywords: health performance; safety; vulnerable milieu; urban housing floods; disasters; diseases

Introduction

Natural disasters have caused significant damages to both natural and man-made milieu in recent times. Hence, such hazards are caused majorly by natural forces which include earthquake, tsunami, tornado, landslide, wave and greenhouse effect, land submergence, typhoons/hurricanes/willy-willies, smog and among others (Ogunbodede and Sunmola, 2014). Not only but also flood which is surface water covering a previously dry area. Flood is a destructive water-related hazard and is mainly responsible for the loss of human lives, infrastructure damages and economic losses (Ogunbodede and Sunmola, 2014; Ogundeji and Fadairo, 2018; Fadairo and Ganiyi, 2012). Urban flooding generation is caused by natural

multifactorial mechanisms such as geomorphological (the formation and structure of the Earth surface such as texture and type of soil, rock), physiographic (the natural features of the earth's surface such as topography) and climatic conditions (rainfall, humidity, precipitation) all affecting the hydrological (the properties, distribution, use, and circulation of the water on Earth and in the atmosphere) processes, the generation of floods and in addition to negative impact of urbanization growth in recent time (Fadairo, 2013; Basorun and Fadairo, 2012; Amao, F. L., 2012; Ogundeji and Fadairo, 2018; Onibokun, 1972). Recently, there are numerous studies on mitigation to flood damage due to record of an increase in its frequency, magnitude, and intensity (Douglas et al., 2010; Pitt, 2008).

Also, Studies have shown that natural causes of flood can only be reduced to minimal effect in as much as rainfall, coastal, low land or flooded prone area and other natural element would be difficult to adjure. Aside the natural sources of flooding such as heavy, prolonged rainfalls and bank overflows, there are anthropogenic (relating to or resulting from the influence of humans on the natural world) causal factors of flooding (Taiwo, O. J., Agbola, B. S., Ajayi, O. and Wahab, B. W., 2012). This paper investigates the inevitable existences of lowland areas within the urban centres and health associated prevalent diseases. Aside intense rainfall events that generate flash floods, the man made effect and activities on the earth surface such as tillage and deforestation in the rural, also increase's in concrete constructions and pavements in the urban centres. It is a clear statement that vulnerable and flooded prone milieu is mostly occupied by urban poor because of inability to avoid good housing quality, the study area shows that the features of prescience had made the occupier to abandoned and relocated to high or non-prone area.

At a time, dwellings were typically constructed on higher land, while lower grounds were used for farming. Riparian peoples benefited from floods sediment which enriched the soil with nutrient and irrigation for agriculture. Hence, people lived in harmony with floods (Kundzewicz et al., 2014) in the past. The frequency and consequences of extreme flood events have increased worldwide. The key impetus for these increase are the world's population growth, the increase in socioeconomic activities in flood-prone areas and significant climate change, which occurred in almost all countries of the world (Ogundeji & Fadaïro, 2018; Bouwer et al., 2017). On the other hand, the steady growth of impervious surfaces and reduction of forestation increases floods. Moreover, the exponential increase in development, expansion of urban areas to nearby rivers and encroachment to river path or prone area exacerbate flooding and simultaneously increases the impact (Nardi, F., Annis, A., Biscarini, C., 2018; Samela, C., Albano, R., Sole, A. and Manfreda, S., 2018).

Therefore, there is a need for strategic applications basically to "control human influences on floods occurrence" and also to evaluate the impact of such events. Hence, the research area is the human influences which are construction of housing and its subordinate amenities which covered suppose forested land usually through which amount of water percolate is disavowed in the urban centers. The accumulation of this water together with the sewage from these homes becomes a treat that yield to flooding. The activities of man on the natural surface that are attributed to flooding includes roofs, pavements, roads, concrete works, bridge constructions, dams, wastes, sidewalks, parking lots (Kundzewicz, 2004), extensive asphalted or concrete landscape, drainage, coastal or river path backfilling (beach reclaiming), irrigations and or

rechanneling of river path, urban housing and building construction are among other influences.

Statement of problems

Flooding has become a common feature in Nigeria not only in the low-lying coastal areas but also in the hinterland as well as the wetland regions (Ogunbodede and Sunmola, 2014). The population growth and urbanization activities have exerted pressure on available marginal and flood prone lands to the extent that a larger proportion of lowland and river basins have been encroached by people (Ogundeji and Fadaïro, 2018). These activities on such encroachment include housing and its adjoining amenities which include poor drainage system, pavement that reduces infiltration, discriminative refuse disposal and with blockage of water path. The results of such man influence amount to surface water and floods effect. Water is universal solvent. Hence, floods deteriorate if not damage both man-made (bridge, roads, houses and other urban structures) and natural structures (loose soil, contaminate drinking water, destroy greenery). Man also extend marginal milieu to usable territories, Ogunbodede and Sunmola (2014) explain that urbanites reshaped both natural and cultural landscapes by leveling off hilly areas to fill valleys, reclaiming beaches, wetlands and hinterland (a case study of Leki community in Lagos, Nigeria) into usable business ventures; thus, making large areas of artificial land in the urban environment and simultaneously with erection of different magnitude of urban structures occupying this new land irrespective of whether such lands have the capacity to retard inflow of water or not. Aside recorded economic impact, Oriola (2000) and Sewel (1969) also confirmed the environmental damage induced by man's exploitation.

Research question

From the foregoing objectives, these research questions are pertinent:

1. What are the causes of urban housing flood in the area?
2. Is marginalization to adequate housing quality also contributed to urban housing flood?
3. Does impervious feature of urban housing have effect on flood intensity and magnitude?
4. What are prevalent illness experiences by the respondents in urban housing flood milieu?

Aim

This paper aim at identifying health effect with level of productivity against urban housing floods in the lowland of Odosida in Ondo city.

Objectives

The specific objectives are to;

- i. Examine the general causes of urban housing flood in Odosida area.
- ii. Assess lowland (prone) area within the urban centres and its vulnerability to floods
- iii. Evaluate the increase in development, expansion of urban areas and other anthropogenic (activity of man) factors and its significance to excessive floods.
- iv. Evaluate effect of floods on human health.

Research hypothesis

In line with the research question 3 and 4 of this work, the following hypotheses are postulated:

H₀: Disastrous Flood is significant to urban housing development

H₁: Flood disastrous is not significant to urban housing development

H₀: The average diseases occurrence (mean) is the same. That is, the disease occurrence is significant to urban housing flood within the study area.

H₁: The average diseases occurrence (mean) is not the same. That is, the disease occurrence is not significant to urban housing flood within the study area.

Background to the study

Urbanization is basically continued growth of urban centre, swelling and increase in population concentration in the city (Bakare, 2017). Urbanization is fast impacting its negative consequences on most of the cities as a result of rapid urban development/land use change in the form of massive road/building construction, removal of soil surface for infrastructure purposes, drainage/canal construction, deforestation and soil surface pavement (Ogundeji and Fadiro, 2018), altogether have increased the runoff in addition to rainfall and snowmelt, thereby increases the risk of flooding in the cities (USGS, 2011; Nirupama and Simonovic, 2006).

As urban population comes to represent the larger proportion of the world population likewise urban floods will account for an increasing part of total flood impact (Jha, Robin and Jessica, 2012), hence the urgent need to examine the circumstances surrounding flood disaster cannot be over-emphasized. Bakare (2017) explained that devastating urban areas, unplanned development in floodplains, ageing drainage infrastructure, increased paving of soil surface and other impermeable surfaces, with lack of flood risk reduction activities contribute to flood disaster impacts (Jha, et al, 2012).

Housing quality in the survey area

Lowland area in Odosida is experiencing poor housing quality, deplorable basic facilities, high level of housing deterioration, as well as growing incidence of slum due to an increase in surface water for long period of time. The dwellers built home not only on the high land but also on the available low land as a result of urban expansion without a fore knowledge of the future treat. The study shows that low-income earners are the dominant and house owner of the environment. Most of the occupants narrated that the land were allocated to them in the period of dry season and only to discovered that the land is at the receiving end for surface and running water from the whole Odosida community.

Housing problems in Nigeria

Developing countries are characterized with an uncontrollable growth of the urban population often caused by lack or poor infrastructural amenities and poor economic conditions in the rural areas has opined by Ogundeji and Fadiro (2018). The proportion of the Nigerian population dwelling in urban centres has increased from 7% in 1930s, 10% in 1950, 20% in 1970, and 27% in 1980 to 35% in 1990 (Okupe, 2002). There is occurrence of overcrowding on existing housing, rural-urban drift that has caused squatter settlements in cities with 60% of Nigerians houseless (Ogundeji and Fadiro, 2018; Olayiwola, 2012; Federal Government of Nigeria, 2004). Majority of the houses is also constructed with second-hand materials, build on illegal land (Adeyeni, 2015), marginal or flood prone area (Ogundeji and Fadiro, 2018). They are badly maintained and lack the basic necessities of life like sanitary facilities, light, air and privacy (Agbola, 1998). Researchers on housing studies conclude that urban centres in the country are characterized by high-density buildings, sanitary problems, air pollution, surface water, noise and solid wastes (Filani, 1987; Agbola, 1998). Olotuah (2002) estimate 2.3 million urban dwelling units to be substandard, 33% of urban houses considered to be physically sound while 44% and 19% require minor and major repairs respectively to bring them to normative.

Thomas (2017) specifically discusses housing problems in Nigeria under the following sub-headings; Housing finance problem, Low housing investment, High cost of houses and rent, Inadequate access to buildable land, Mismatch in Housing Goal and Real Achievement, and Building materials problems.

Housing Finance Problem - Nubi (2008) narrates the popular method of housing finances in Nigeria which are through personal savings, loans from friends, relatives, commercial banks and other mortgage institution. These sources are no longer assuring and sustainable especially

for the low income earners and the inflation rate in Nigeria (Agbola, 1998) for procurement of land, material, wages and building services bills.

Low Housing Investments -According to the 1996 Nigerian national report of the Habitat II conference, the level of housing investment as a proportion of GDP in Ibadan and Kano was low as 5.9% and 28.41% respectively and resulted from housing being a long-term low profit yielding investment when compared to other short-term fast profit such as manufacturing and transport (Agbola, 1998). In addition, limited access with high-interest rates on housing loan partly characterized the problem of low investment in Nigeria (Olayiwola, 2012).

High Costs of Houses and Rent - The combined problems of finance, rising costs of building materials and low housing investment have brought about housing shortages. For instance, the unit price of a three-bedroom bungalow (Bakasi type) built by the Federal Housing Authority in Abuja increased from #1.65 million in 1998 to about #3.5million in the year 2003 and about 10.8million in year 2012 (Thomas, 2017).

Inadequate Access to Buildable Land - Lands in prime locations in the urban centres are beyond the reach of low and medium income households in Nigeria (Thomas, 2017) prior to the promulgation of the land Use Decree No.33 of 1978 where land allocation was vested in the Governor or the local government Chairman (Okupe, 2002) compare to Adeleye (2012) enunciation on traditional land tenure system which was with ease.

Mismatch in Housing Goal and Real Achievement - Thomas (2017) opined one major problem of adequate housing in Nigeria is the mismatch between housing goal and real achievement which were marred by low pace of construction, high costs of building materials, budgetary shortfalls, poor coordination, use of unrealistic standards and problems of land acquisition.

Building Material Problem - Olotuah (2006) explained the efforts to boost local production by the Nigerian Building and Road Research Institute (NBRRI) established in 1978 for that purpose has not achieved much. The high cost of foreign building materials is one of the major problems militating against adequate housing supply (Onibokun, 1986; Agbola and Onibokun, 1990; Agbola, 1993; 1998).

Characteristics of coastal areas housing

Their local topography limited the amount of land suitable for development and as such put land prices at a premium (McLean and Shen, 2006). Physical isolation of wetland, lowland and coastal towns has been often a significant barrier to economic growth, development and regeneration

(Thontteh, 2014). However, complete relocation could be the best solution as regeneration would not be enough to reduce effect of flooding.

Floods growth and its effect

Floods are the most common natural disasters and represent 40% of all natural disasters between years 1985-2009 (Soukopová and Furová, 2012). Also, Kundzewicz (2004) affirmed that floods have killed annually on average more than 12,700 people worldwide, affected 60 million others and caused 3.2 million people to become homeless (Kundzewicz, 2004). UNICEF (2022) acknowledged that since September 2022, worst floods in a decade affected 2.8 million people of which an estimated 60 percent are children across 34 of the 36 states in Nigeria with over 1.3 million and 600 people displaced and have died respectively in relation to flooding. Thus, increases the attention of researchers to the consequences of floods and measures that could be developed to reduce economic effects (loss) of flood (Munich, 2005). Studies explained that flood-prone areas were initially attractive for socioeconomic activities through provision of water resources for domestic purpose, irrigation, industrial use, minerals and nutrients for agricultural production which also encourages urban development (Smith and Ward, 1998). Increasingly number of housing in the urban vulnerable centers also increases the number of casualties. Aside the deduced socio-economic losses by many researchers (Ogundeji and Fadairo, 2018), there is need to put an end to poor health and loss of lives which cannot be quantified. Bangladesh and China have recorded at least 2,5 million fatalities in the last 100 years in major floods which has drastically reduces human production and inversely reduces the economic output of a country. The nature cannot be held responsible for floods and it harmful effect, but the people, society and the urban housing taken natural space from water and put themselves in her way (MŽP SR, 2010). The flood as a natural hazard has effect on the stability of society. If more urban housing, society and people are to dwell in vulnerable areas with more businesses to settle down in these areas, then the more intensive effect a flood event will have upon society (Seifert, 2012). Damage to infrastructural lifelines in the community includes water supply, sewerage and drainage, gas and power supply, telecommunication, roads and railways. Hospitals, schools and fire brigades are essential facilities that got damage too. However, direct damage (costs for repair, replacement of damage facilities, equipment) and indirect damage (loss of revenue by the network operator, delay costs) to the affected structures are the reciprocal loss. (Dutta et al., 2003; Scawthron et al., 2006).

Background information about the study area

The physical geography of the area, apart from communities located in the upland are plain, all other communities fall within the lowland because of its proximity to Core Business District (CBD) and its economic advantages. The lowland consists of rivers, creeks, estuaries and stagnant swamp covers. The region falls within the 'tropical wet and dry climate which range between March and October and dry season comes between November and February respectively with mean annual rainfall of about 1615mm. The annual mean temperature is 27°C, with a maximum of 30°C. Ondo town is the most populated city in Ondo state after Akure and with 113,900 during the 1991 population census, located on latitude 06°30'N and longitude 04°45'E. The town is bounded on the north by Ile-Oluji/Okeigbo local government area and on the east by Idanre local government area why on the south-west is Odigbo local government area (Ogundeji and Fadairo, 2018). Identification of three different points after reconnaissance survey of Odosida area that are lowland are flooded, often resulted to disruption of transportation, communication, structural damage to buildings and loss of lives and properties.

Research methodology

Purposive sampling method was used to sample three areas namely Adeyemi College of Education (ACE), Christ Apostolic Church (CAC, Oke-Iye) and University of Medical Science (Unimed Campus) of Odosida Community in Ondo city for information collection. They were wetland and lowland regions that are vulnerable to flooding. Administration of questionnaire to residents to deduct their socio-economic profile, sex, age, distribution, nature of the environment, waste disposal methods in the environment, causes of flood in the milieu, consequences of flood particularly reference to health challenges and solutions to floods in the environment. The interview was successful because of the help from the community chairman and the youth leader in the area. A total of one hundred and fifty (150) respondents were interviewed from the study area. Data collected were summarized and stored in statistical tables and charts. These also include frequency distribution tables and histogram. Relevant mathematical and statistical techniques were used where appropriate for the analysis.

Results and discussions

The physical environment suffers destruction of vegetation, washing away of top soil and water pollution, displacement of wildlife from their natural habitat due to activities that accompany urbanization in the recent times. One of this activities of urbanization is construction of housing and it amenities that has disrupted the natural

surface of the earth crust through excavation, removal of surface soil, diversion of river path, filling up of beach, lowland and lagoon. The aftermath of such activities among others aided the magnitude, intensity and rate of water that ought to have found its way through natural means of “percolation, waterlogged and runoff” but interrupted. Hence, rapid urbanization increases number of roof, housing and pavement in the urban center and thereafter reduces rate or amount of water to be percolated. Also, an encroachment of structures in waterlogged area and obstruction of water runoff path amount to flooding. Fishing, irrigation, deposit of fertile soil for agriculture are among the positive effect associated with urban housing flood and the negative impact include dampness, destruction of properties, lives and land use changes which invariably affect socio-economic, health and environmental dilapidation respectively as a result of alterations to the natural environment.

Socio-Economic characteristics of respondents

The following indicators; income, health, education, occupation and buildings condition were considered to ascertain level of effect of urban housing floods in the environment. Table 1 and Figure 1 shows 62% males and 38% females were interviewed thus; majority respondents are male over female which is a reflection of female marginalization to access housing facility and legal land (Bako, 2012). This experience is a violation of human right and contributes to women’s increasing poverty (UNCHS, 1985).

Table 1: Sex distribution of the respondents

Sex	Opp. ACE	CAC Oke-Iye	Unimed Campus	Total	(%)
Male	30	37	26	93	62
Female	20	13	24	57	38
Total	50	50	50	150	100

Source, Author’s archive

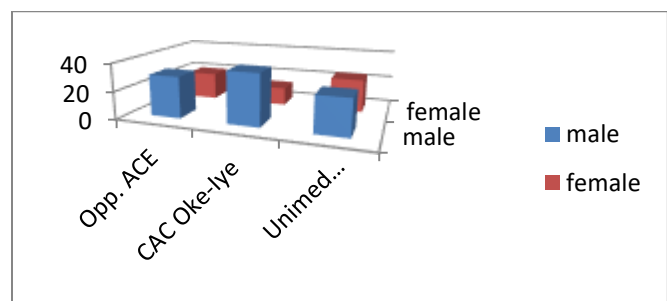


Figure 1: Sex distributions of respondents

Source: Author’s archive

The age distribution of the respondents shows that large number of population comprises youth ranging from; less than 30 years to 40 years of age are residing in the study area as shown in the Table 2 and Figure 2. Hence, requires

adequate accommodation to increase youth productivity being the active population and for economic growth in the urban center.

Table 2: Age distribution of the respondents

Age	Opp. ACE	CAC Oke-Iye	Unimed Campus	Total	(%)
Below 30	21	4	18	43	29
31-40	15	5	12	32	21
41-50	11	24	10	45	30
51-60	3	10	5	18	12
Above 61	0	7	5	12	8
Total	50	50	50	150	100

Source: Author’s archive

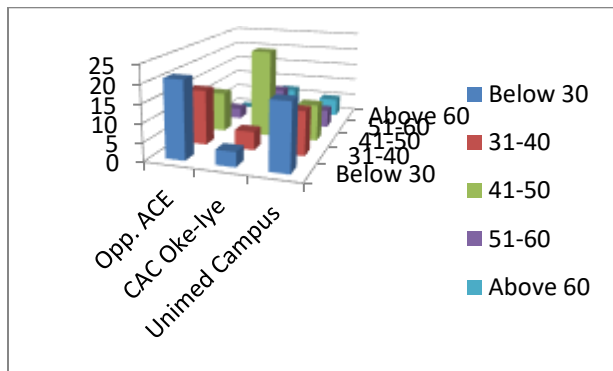


Figure 2: Age distribution of respondents

Source: Author’s archive

Data on respondents’ occupation shows that 40% are civil servants which means 60% of the respondents are not gainfully employed which is a major cause of poverty influence on the respondents to occupied available, avoidable urban lowland area and simultaneously prone to flood. Job opportunities at Unimed, ACE, Wesley University, General Hospital, and Trauma Centre among other Institutions have contributed to the increasing number of civil servant among other occupation in the study area.

Furthermore, Ogundeji and Fadairo (2018) findings shows that about 38.1% of respondents are single while majority of respondents are 61.9% married, this will further increases existing overpopulation, thus compounding the problem and stressing existing housing and infrastructure that are not initially adequate (Olamiju, 2014). Table 4 also shows 59% of the total respondents earn maximum income of 40,000 naira (110 USD) monthly which fall below official poverty line. The income capacity of individual that lives in the urban centre determines the standard of living and the type of housing facility they occupied. It is a clear statement that vulnerable and flooded prone milieu is

mostly occupied by urban poor because of inability to avoid good housing quality (Ogundeji and Fadairo, 2018).

Table 3: Socio-Economic activities of respondents

Occupation	Opp. ACE	CAC Oke-Iye	Unimed Campus	Total	(%)
Civil servant	15	25	12	52	40
Trader	8	10	6	24	16
Student	20	6	18	44	29
Farming	2	3	1	6	4
Poultry	1	2	1	4	3
Unemployed	4	4	12	20	8
Total	50	50	50	150	100

Source: Author’s archive

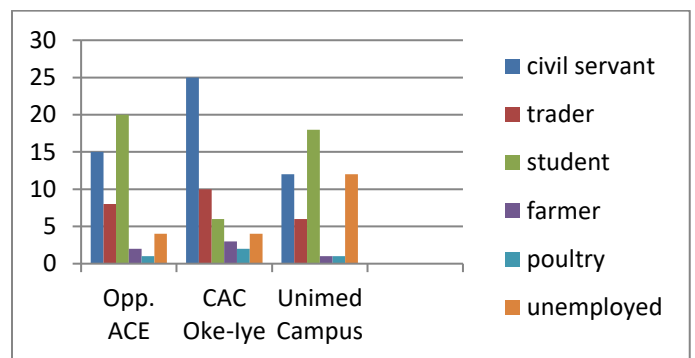


Figure 3: Socio-Economic distribution of respondents

Source: Author’s archive

Table 4: Individual income of respondents

Income	Opp. ACE	CAC Oke-Iye	Unimed Campus	Total	(%)
0-40,000	32	20	36	88	59
40,001-80,000	9	14	6	29	19
80,001-120,000	6	7	3	16	11
> 120,000	3	9	5	17	11
Total	50	50	50	150	100

Source, Author’s archive

4.2 Urban activities and urban developmental structures

The feature of impervious material has increase at same rate with urban development. Different type and form of such activities in urban housing include, concrete work, pavement, interlocking, roofs, shed and housing which has reduced surfaces for percolation of runoff and surface water which then accumulated and degenerated to floods. Table 5 shows damage significance due to urban housing seasonal floods in the study area. Most of the house occupants that responded are male and this reflect female marginalization from accessing good housing qualities (Bako, 2012). This observation contributes to women’s increasing poverty (UNCHS, 1985).

Table 5: Chi-Square table profiling the sex of respondents in the survey area

Variable/House owners	Property destructions		Total	X ² – value
	Yes	No		
Male	74	19	93	0.351
Female	43	14	57	
Total	117	33	150	

Source: Author’s archive

Using chi-square to test statistic occurrence of one variable if it independence on the other or otherwise, let assume;

$$H_0 : \pi_{ij} = \pi_i . : \pi_j$$

$$H_1 : \pi_{ij} \neq \pi_i . : \pi_j$$

Where; H₀ : Disastrous Flood is significant to urban housing

H₁ : Flood disastrous is not significant to urban housing

Where $X^2 = \sum \frac{(\text{observed frequency} - \text{expected frequency})^2}{\text{Expected frequency}} \sim X^2_{(r-1)(c-1), \alpha/2}$

Expected frequency

Degrees of freedom = (c-1) (r-1) = 2(2) = 4

$$X^2_{(r-1)(c-1), \alpha/2} = X^2_{4, 0.05/2}$$

Hence, X² = 0.351 < 9.47

Decision rule

The decision rule is to accept the null hypothesis if the computed Chi- Square value is Lesser than tabulated Chi-Square value otherwise reject the alternate hypothesis.

Decision

The Chi Square calculation was 0.351 which is less than the critical value of 9.47; so therefore, the null hypothesis cannot be rejected if calculated value is less than the table value. In other words, there appear to be a significant association between the two variables: flood damages effect is significant to increasing numbers of urban housing.

General physical condition of the respondents

The general condition of the body, especially in terms of presence or absence of illnesses, injuries, or impairments of the respondents is explain in Table 6, the common ailments and disease experience by people. Malaria is the most infectious disease caused by parasite that can be transmitted by the bite of infected mosquitoes, very common in the tropical, characterized by recurring chills and fever. Other diseases associated with flooding include catarrh, cold, diarrhea, skin disease, typhoid, dysentery respectively. Aside the level of poverty, health challenge contributed to poor production of the urban economic value and loss of lives. Table 8 indicates the pair-wise ranking tools showing most prevalent diseases in hierarchical strength. There could be generally high increase in number of cases of cholera, malarial, water-

borne related, measles among residents in the study area. Prevalent disease within the study area is significant to urban housing floods. This is clearly shown in the analysis of variance (ANOVA) presented in Table 7.

Table 6: Common diseases within the study area

Diseases	Opp. ACE	CAC Oke- Iye	Unimed Campus	Total
Skin disease	6	8	7	21
Dysentery	5	8	5	18
Diarrhea	10	9	11	30
Catarrh	15	11	13	39
Asthma	2	3	4	9
Cold	12	9	13	34
Tuberculosis	4	7	6	17
Typhoid fever	6	6	7	19
Malaria	17	16	18	51
Total	77	77	84	238

Source, Author’s archive

Table 7: Variance ratio to test significance of mean square treatment

Source of variation	DF	SS	MS	F
Treatment on disease	2	3.630	1.815	0.088
Error	24	492.444	20.519	
Total	26	496.074		

Source: Author’s archive

Where; DF= Degree of freedom

SS= Sum of square

MS=Mean of Square

F= F-calculated (F-cal)

H₀ : The average diseases occurrence (mean) is the same.

H₁ : The average diseases occurrence (mean) is not the same.

However, F-crit is the table value of F_{v1, v2, α/2}

Where; V1 is the freedom of degree treatment = 2

V2 is the degree of freedom error = 24

α is the level of significant = 0.05

$$F\text{-crit} = F_{v1, v2, \alpha/2} = F_{2, 24, 0.05/2} = F_{2, 24, 0.975}$$

Decision rule

Since F-cal < F-crit, decision rule is to accept null hypothesis and to reject alternate hypothesis.

Decision

Thus, F-cal (0.088) is less than that of the table value. Hence, the treatment is equal, therefore the hypotheses is hereby accepted. The disease occurrence is significant to urban housing flood within the study area.

Table 8: Pair-wise ranking of disease

Flood problems	1	2	3	4	5	6	7	8	9	Ran k
1 Malaria	X									1 st
2 Skin disease	1	X								5 th
3 Dysentery	1	5	X							7 th
4 Diarrhea	1	5	3	X						3 th
5 Catarrh	1	5	7	5	x					2 nd
6 Asthma	1	5	7	6	5	x				9 th
7 Cold	1	3	7	7	6	4	x			4 rd
8 Tuberculosis	1	7	3	8	6	6	6	X		8 th
9 Typhoid fever	1	7	3	9	4	2	2	2	X	6 th
Frequency	8	5	7	0	1	2	4	3	6	

Source, Author’s archive

A study by Ogundeji and Fadairo (2018) shows large cumulative 77% of rooming and flat system are with no good toilets and kitchen when compare to cumulative of duplex, storey building thus, has further compounded the health condition of residents and are generally occupied by low income earners. Generally, people who build on marginal lands with no title document and infrastructure are considered poor (Nubi, 2008). It is therefore appropriate to state that occupants of flood prone area are the poor in the society (Ogundeji and Fadairo, 2018). Observation shows that 58 buildings (43.03%) have encroached within 30m setback to the river banks while number of buildings that encroached into the statutory 60m setback of seasonal river has increased. Also, the modalities of waste disposal shows 9.5% of respondents use dustbin, 19.9% use incinerator, 23.8% dispose their wastes in drainage and river channels, while over 50% use refuse dumps. This greatly contributes to water flows obstruction, flooding and environmental degradation (washing away of soil, destruction of agricultural land; plants, livestock and properties damage; houses, sheds, electricity) and consequently a health catastrophe in Odosida.

Recommendations

It was discovered that poor economic and income value has an influence on housing quality. This problem are to be solved majorly by the government through housing provision, government acquisition of land, provision of better income opportunity, incentive or relive materials to the affected flooded area among others.

The ANOVA Table also shows that there is significant relationship between illness and flooding in the study area with serious adverse effects on environment and the health of city residents. Hence, total relocation of urban housing from vulnerable or prone area especially environment

characterized with lowland and other delineated area by government for the purpose of safety of life. It is noted that reduction of flood impact is not enough for life safety. Hence, lifes has worth more than wealth (multiple properties) and demand relocation to high ground.

The Land Use Act of 1978 which entrusted all land into the hand of Governor of states in Nigeria has also, automatically added to their responsibility the diligent to study the landmass in compass, to mark out, delineate or restrict urban dwellers from occupying marginal, vulnerable and prone area within the urban centers.

Urban housing flood education is essential, to increase individual interest and awareness of general information on flooding and mitigation devices. Society should have access to weather forecast, news, lowland or vulnerable restricted environment peradventure through different form of publicity.

Absolute control of floods is impossible but partial control through “flood prevention, flood reduction and flood protection”. Therefore, flood protection includes construction of flood walls, dykes (flood embankment), dams and reservoirs to control flood and minimize it effect by regulating its flow or diverting it away from where it could damage properties (Oriola, 2000).

Findings also shows that high proportions of urban dwellers dispose refuse into gutters and other natural water path especially when it is raining. Thus, aggravates flooding. Hence, appropriate mode of wastes disposal by public or government refuse collector should be encouraged.

Free movement of water on channels will reduce flood occurrence during rainy season. The river valley, channels as well as gutters should be properly monitored during rainy seasons to avoid blockages.

Set-back laws must be enforced by planning authorities and related agencies for all structures close to the rivers, valley and lowland in urban areas. A set back to streams for any structure is 30 meters and in a specified cases above 30 meters (Ogunbodede and Sunmola, 2014).

Aside roofs of urban houses, the pavement, interlocking, concrete, asphalt on road and no room for landscape reduces rainfall percolation. This resulted water is added to surface run-off and flood the environment without adequate channel or drainage. Thus, a reduction in concretized surface of urban environment will reduce flood in the urban housing area as more of the surface run off will percolate to join underground water.

Conclusion

Urban housing flood disaster is one of the environmental problems in Nigeria, the impact got aggravated because of people, society and urban housing activities (Ogunbodede and Sunmola, 2014). The havoc in returns did not only include economic loss but also “health challenges and consequentially loss of life”. It is therefore a need for man

and urban housing activities to be harmonized in relationship to the environment so as to reduce flood and its effects on life which is more important to properties. It is a clear statement that vulnerable and flooded prone milieu is mostly occupied by urban poor because of inability to access quality housing. There could be generally increasingly cases of cholera, malarial, measles and water-borne diseases among residents in the study area if flood persist thus, among other recommendations, total relocation of urban housing from vulnerable or prone area especially environment characterized with lowland and other delineated area by government for the purpose of safety of life to higher ground. Researchers' mitigations to the impact of flood would be adequate if in addition, total relocation of urban activities from prone, marginal and vulnerable area. Thereafter, there would be guarantee of safety of life and properties. Furthermore studies on comparative evaluation of urban housing vulnerability to flood on highland and lowland, environmental disruption of urban housing and also, urban housing poor telecommunication challenge on lowland will contribute to knowledge through additional investigation. Conclusively, result shows that there is correlation between flood; and marginalization to adequate housing quality, urban housing and disease occurrence within the study area.

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