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Architecture – Research Article

# A Study of Housing Elements and Potential Home Injury Risks in Selected Public Housing Estates in Lagos State, Nigeria

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**A B S T R A C T**

In general, injuries have been related to different elements and parts of the home environment. That is home injury is potentially connected with primary parts of the home environment. Home wounds might result from different, simultaneous and united causes including physical, underlying, environmental, conduct, way of life, and social variables. Home injury depicts the sorts of injuries that happen in the home and its prompt environmental elements. This study examined housing elements and potential home injury risks in selected public housing estates in Lagos State, Nigeria with a view to informing design decisions for safer housing. This study aims to explore the housing elements—both architectural and environmental—that may contribute to home injury risks in selected public housing estates in Lagos State. By identifying key risk factors, the study hopes to inform policy interventions and promote safer residential environments. Systematic sampling method was employed to select 315 housing units from 8938 units in 3 purposively selected low-income estates (the largest) for questionnaire administration. Ethical approval and clearance were sought from a recognized research ethics review board/committee. Informed consent will be obtained from all participants and confidentiality and anonymity will be strictly maintained. Findings revealed that housing plays a critical role in public health and wellbeing, especially in rapidly urbanizing cities like Lagos, Nigeria. While public housing estates are established to provide affordable shelter, poor design, substandard construction, and inadequate maintenance may contribute to unintentional injuries at home. Injuries such as falls, burns, electric shocks, and poisoning often go underreported, especially in low-income communities, yet they significantly affect quality of life and productivity. The study recommended Policy and Planning (Integrating injury prevention into housing design standards); Maintenance Protocols (Regular inspections and quick repairs); Community Education (workshops on home safety) and Design Improvements (Use of non-slip materials, better lighting, child-proofing measures. The study concluded by emphasizing the link between poor housing design/maintenance and injury risk, and highlights the need for government and stakeholders to prioritize safe, habitable housing.

## INTRODUCTION

Housing elements are the actual attributes, including spaces, materials, parts, items, and other fixed or joined highlights of the home climate that might be related to home injury chance and event. Models are floor, step, entryway, window, roof, wall, bath, cupboard, nail, cover, patio, wall, and counter. Injury is one of the premier reasons for bleakness and mortality universally, and home is one of the most widely recognized places for inadvertent injuries. Home climate is a main area of injury-related dismalness and mortality, and is frequently connected with event of injuries (Kilic et al. 2017).

It is critical to concentrate on home injury since homes are huge settings for unexpected injuries, which are significant reasons for death and handicaps in and around the home climate. Throughout the long term, home-related injury has turned into an issue of extraordinary worry among researchers, levels of government, strategy creators and strategy producers in numerous nations, being one of the significant reasons for horribleness and mortality in low and center pay nations of the world. Home is where many individuals invest the majority of their energy, and in this manner assortment of injury happen among individuals, everything being equal, with the most elevated frequency being among youngsters and old persons (Kopjar and Wickizer 1996). According to (Gulliver, Dow, and Simpson 2005), in New Zealand, most injuries to kids under age five happen in the home. Comprehensively, injuries can be either purposeful or accidental. Purposeful injuries are typically brought about by brutality (Krug et al. 2002). Unexpected injuries incorporate those brought about by street car crashes, falls, consumes or singes, harming, electric shock, suffocating and blended causes (Runyan et al. 2005). Even though injuries happen in different settings, the home is a critical setting for injury, and unexpected injury specifically, subsequently the term ' Unintentional Home Injury' (UHI). Close to traffic-related injuries, home is the second most normal spot and second driving reason for deadly injuries (Runyan et al. 2005). What's more, home injuries bring about large numbers of the clinical crisis cases every year. Bergland and Wyller (2004) observed that injuries are 6th driving reason for death in grown-ups of 65 years old or more and falls are the main source of such injuries. By and large, there is thusly a developing help for and thoughtfulness regarding expansive and cooperative endeavors to forestall or rescue home injuries and their risks (Gielen, McDonald, and Shields 2015). It is against this foundation that this study plans to look at the peculiarity of home injury comparable to the housing elements that comprise potential home injury risks, utilizing the setting of public housing (public-private climate) which has some proportion of homogeneity-the selected public housing estates in Lagos state, Nigeria.

**Problem statement/justification/rationale for the study**

There is adequate research proof to show that the home is perhaps of the most well-known setting where injuries happen; subsequently, the home climate has gotten significant research consideration regarding unexpected injury (Kerr 2007; (Newcombe et al. 2005). Home is frequently viewed as a place of refuge by a great many people, might potentially be a perilous spot where non-lethal and, surprisingly, deadly injuries habitually happen. This is particularly valid for specific at-most-risk gatherings like kids and the old, though many individuals seem not to know about the risks inside their homes. By and large, injuries have been related with assorted elements and parts of the home climate. Among the examinations that relate injuries to housing elements, (Keall et al. 2008) estimated the connection between home risks recognized through building assessment and home injury events; and found that tending to home injury dangers might be powerful in the decrease of injury event. (WHO 2009) affirms the lack of injury-related examinations from low and center pay nations. Then again, a significant part of the accessible data from the created world spotlight on deadly injuries, and doesn't typically recognize injuries emerging from elements in home settings from different structures and reasons for injuries, Then again, notwithstanding the high extent of injuries that happen at home, there is restricted data accessible on injury risk from home-grown, home-based exercises, particularly with regards to a non-industrial nation like Nigeria, where information on injuries overall and home injuries specifically are very uncollated. Nonetheless, while broad examinations have been finished on different reasons for injuries and injury risk factors, physical, primary or ecological factors, for example, housing elements that could comprise home perils have not been satisfactorily inspected, thus a hole in writing and this review.This research is legitimate because, it is critical to concentrate on home injury since homes are huge settings for accidental injuries, which are significant reasons for death and handicaps in and around the home climate (Runyan et al. 2005). Recognizing home dangers and home injury risks will assist with illuminating plan choices for solid housing. Extra information on home injury and housing elements would be helpful to the wide cluster of experts, for example, modelers, inside planners, home manufacturers, fire administration and clinical benefits suppliers, who establish or oversee home conditions and connect with inhabitants. Despite efforts to provide affordable housing, many estates may have design flaws or poor maintenance leading to injury risks.

**Aims and objectives of the study:**

This study aims to examine housing elements and home injury risks in selected public housing estates in Lagos state, Nigeria to inform design decisions for safer housing & reducing home injury occurrence.

The specific objectives of the research are to:

(i) socio-economic, personal and household characteristics of residents in the selected public housing estates in Lagos;
(ii) examine the influence of socio-economic, personal and household characteristics and housing Elements on home injury risk in the study areas.
(iii) identify and analyze housing elements that constitute home injury hazards in the study area;
(iv) examine the level of home hazards of housing elements and comparison of level of home hazard amongst housing elements in the study area.
(v) To propose strategies for improving housing safety in public housing estates.

**Scope of the study**

Research in other parts of the world has established clear links between poor housing conditions and injury risks (e.g., WHO, 2018; CDC, 2020). In Nigeria, however, this aspect is largely understudied. Public housing projects, though intended for low- to middle-income residents, may inadvertently expose occupants to hazards due to poor architectural design, overcrowding, aging infrastructure, or inadequate maintenance. In Lagos, several housing estates such as Abesan, Iponri and Isolo Housing Estates represent different phases and designs of public housing. Investigating these estates provides an opportunity to understand how specific housing elements—such as staircases, floor materials, lighting, ventilation, and space utilization—either mitigate or exacerbate the risk of home injuries. This


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research will focus on selected public housing estates in Lagos State, specifically:
• Abesan Housing Estate
• Iponri Estate and
• Isolo Housing Estate
The study will include residential buildings, common areas (stairwells, corridors), and external surroundings that may contribute to injury risks.

**Significance of the study**
This research will provide empirical evidence on how housing design contributes to or mitigates injury risk in urban Nigeria. It will inform policy decisions by the Lagos State Ministry of Housing, urban planners, public health officials, and non-governmental agencies. The study could also guide revisions to national building codes and public housing guidelines to include safety considerations.
This study will provide critical insights into the links between housing design and injury risks, particularly in low-income settings. Findings will aid:
• Urban planners and architects in designing safer housing.
• Policymakers in developing housing standards and safety regulations.
• Public health officials in injury prevention strategies.

**Ethical considerations**
Ethical approval will be sought from a recognized ethics review board. Informed consent will be obtained from all participants. Confidentiality and anonymity will be strictly maintained.

**Literature review and theoretical clarifications**

In the developed world, there has been expanding affirmation of the significance and size of the issue of home injuries and the requirement for avoidance. (Gielen, McDonald, and Shields 2015). Housing has come to be viewed as a financial determinant of wellbeing; consequently, the need to look at the chance of planning homes to forestall or decrease injuries, particularly in developing nations, and as to risks of falls and flames. The home is a significant area of injury, particularly for youngsters and the older. Most creators utilize the term 'home injuries' to depict injuries that happen in and around the home climate (Kilic et al., 2016). Others allude to private injuries (HUD 2012; Nagaraja et al. 2005; Vladutiu, Casteel, and Runyan 2008); and home-related injuries (Racaite and Surkeine 2017). As indicated by (Lyons et al. 2006a), the highlights of unsatisfactory housing that increment injury risk include: uncovered warming sources, unprotected upper story window and low ledge level, weak window glass, tricky surfaces, and ineffectively planned steps with deficient lighting, among others. Private perils related with injuries include: falls, harming, consumes, and fire-related injuries, electric shock, gagging, suffocating, suffocation and strangulation, and guns (HUD 2012). Regardless of the broad research on injuries overall and home injuries specifically, there is restricted data on how housing elements could be potential home dangers or chance variables for home injuries. The focal point of this study is to analyze subsequently elements in the home climate that could impact home injury risks across age gatherings.

The meaning of injury is additionally loaded with difficulties and intricacies consequently there is no unmistakable definition. Injuries not at all like most sicknesses should be characterized simultaneously by the causative occasion and the subsequent pathology. A large portion of the public wellbeing focused writing hence depicts the causes and pathologies of injury. The functional meaning of actual injury by the (WHO 2011) alludes to the harm to the body created by energy trades that make generally unexpected noticeable impacts. That is, harm brought about by the intense exchange of energy, whether physical, warm, compound or brilliant, that surpasses the physiological limit or by the hardship of a fundamental component.

For instance, swelling can happen without a trace of a mechanical effect on the body, for instance, on account of a draining problem; in this manner, taken alone, it can't be viewed as an injury. Likewise, there are different occasions, for example, vehicle crashes, that outcome in no pathology, regardless of whether ''casualties'' are brought to a crisis division for perception. Subsequently, the hypothetical meaning of injury should consolidate both reason and result.

The impact of the constructed climate on wellbeing has kept on getting consideration among researchers, government, policymakers and different partners universally, especially about the economic improvement of networks. For instance, (Konadu-Agyemang, J. Michael Noonan, and Deborah McCord 1994) laid out major areas of strength for a between housing, great wellbeing, efficiency and financial turn of events. Of specific consideration is the association between the assembled climate and injuries. Housing has come to be viewed as a financial determinant of wellbeing; subsequently, the need to look at the chance of planning homes to forestall or decrease injuries, particularly in developing nations, and about risks of falls and flames. As per (Lyons et al. 2006), the elements of unsatisfactory housing that increment injury risk include: uncovered warming sources, unprotected upper-story windows and low ledge level, brittle window glass, elusive surfaces, and ineffectively planned steps with lacking lighting, among others. The focal point of this study is subsequently to look at elements in the home climate that could impact home injury risks across age gatherings.

Operational Definitions of Terms
In order to facilitate clearer understanding of the terms used in the body of this study, it is necessary to present some operational definitions, particularly for the following terms:
• Injury: the operational definition of physical injury by the (WHO 2011) refers to the damage to the body produced by energy exchanges that have relatively sudden discernible effects. That is, the damage caused by the acute transfer of energy, whether physical, thermal, chemical or radiant, that exceeds the physiological threshold or by the deprivation of a vital element.

- Intentional Injury: is defined as any injury from specified causes from actions of a person or environment that make a wound or tissue damage to body parts of a human without purpose of harm.
- Unintentional Injury: is defined as any injury from unspecified causes from actions of a person or environment that make a wound or tissue damage to body parts of a human without purpose of harm.
- Home injury: describes the kinds of injury that occur in the home and its immediate surroundings. Home injuries have also been referred to as residential injuries (Nagaraja et al. 2005; Vladutiu, Casteel, and Runyan 2008); and home-related injuries (Racaite and Surkiene 2017).
- Housing Elements: are the physical characteristics, including spaces, materials, components, products, and other fixed or attached features of the home environment that may be associated with home injury risk and occurrence. Examples are: floor, stair, door, window, ceiling, wall, bathtub, cabinet, nail, carpet, porch, fence, and counter.
- Hazard is a set of circumstances that may lead to injury or death. Physical hazards are generally apparent, perceptible and observable.
- Home Hazard is operationally defined as an agent, fixed or attached in a home setting or environment, which has the potential of a harmful feature that could lead to unintentional home injury.
- Risk describes the probability that a given exposure to a hazard will lead to a certain (adverse) health outcome; in this case, home injury.

## Research methods

This study employed primary and secondary data. Primary data were obtained from a field survey of the study area through the use of structured questionnaire, researcher observation and documentation. Three out of 20 low-income public housing estates in Lagos metropolis were purposively selected for the study, namely Abesan, Isolo and Iponri low-income housing estates, being the largest. The sample frame of these 3 estates comprised of 1261 blocks of flats with 8938 housing units. Using systematic random sampling, one housing unit from every 4th block was selected (see table 1).

Table 1: List of Selected Low-Income Public Housing Estates

| Selected Housing Estates | No. of Units | No. of blocks | One unit in every 4th block |
|---|---|---|---|
| Abesan | 4272 | 624 | 156 |
| Isolo | 3664 | 512 | 128 |
| Iponri | 1002 | 125 | 31 |
| Total | 8938 | 1261 | 315 |

This amounted to 156 housing units from Abesan, 128 housing units from Isolo and 31 housing units from Iponri low-income housing estates, giving a sample size of 315 housing units. The questionnaires were administered on the household heads of the housing units to elicit information on their socio-economic and household characteristics, housing characteristics, and patterns of housing transformation. Two-hundred and ninety-five (295) questionnaires, representing 93.6% were retrieved for analysis. The primary data were subjected to descriptive and inferential analysis. Secondary data such as drawings, maps, and reports on the public housing estates were obtained from the Lagos State Development and Property Corporation (LSDPC).

## Results and discussion

Socio-economic, Personal and Household characteristics of Respondents

Table 1 shows the distribution of respondents according to their background characteristics. Distribution according to sex revealed more males (83.2%) than females (16.8%) across all the selected public housing estates. Age group distribution indicates (40.7%) of respondents were in the age group 41-50 years across, followed by (28.9%) of respondents in the age group 31-40 years, while respondents in age group 21-30 years (0.3%) were least represented across all the selected housing estates. Overall, the results indicate more youthful household heads with the largest being the age group between 41 and 50 years. This pattern of age distribution may have an impact on the vibrancy and kinds of activities that might be taking place within these estates.

The presentation of respondents according to marital status revealed more than two thirds of the total respondents from all the selected housing estates were married, followed by respondents who are widower, accounting for (9.6%) and widow (9.4%) of the total respondents. Respondents who are divorced accounted for the least proportion (0.2%). The distribution of respondents according to ethnicity indicates the predominance of the Yoruba ethnic group across all the selected housing estates. The fact that about two thirds (64.0%) of respondents were from the Yoruba ethnic group can be attributed to the fact that this study was conducted in southwest Nigeria, predominantly occupied by people from the Yoruba ethnic group. This was followed by the Igbo ethnic group, accounting for (29.2%), respondents from the Hausa ethnic group accounted for the least proportion (6.8%).

The distribution of respondents according to religious affiliation revealed that (71.0%) of respondents across all the selected housing estates, were Christians, followed by respondents who practiced Islam, accounting for one quarter (25.1%) of the total respondents across all the selected housing estates. Furthermore, educational background and the academic qualification of respondents, affect the choices that residents of a house make on housing. A more educated resident is expected to make more-informed choices. The distribution of respondents according to educational attainment indicates approximately half (49.9%) of the total respondents surveyed across the selected housing estates had vocational education, followed by first degree holders, accounting for (30.4%), while those who possessed postgraduate degree accounted for (17.1%) of the total respondents surveyed. The distribution of respondents according to income category revealed more than half (55.5%) across all the selected housing estates belonged to the middle-income group, followed by respondents belonging to the high-


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income group (26.6%), while respondents from the low-income group accounted for the least proportion (17.9%) of the total respondents. The result of the analysis also showed more than half (54.0%) have spent between 2-3 years in their apartment, with over three quarter (88.3%) admitting they will live in their present apartment for as long as possible. Block of flat constitute majority (99.8%) of the building type, while majority (44.7%) were previously living in a single dwelling before moving into the housing estate.

Table 2. Socio-Demographic Characteristics of Respondents

| **Variables** | **Selected Housing Estates** | | | | |
|---|---|---|---|---|---|
| **Sex** | **Abesan LIH** | **Iponri LIH** | **Isolo LIH** | **Ijaiye MIH** | **Total** |
| Male | 340 (81.9) | 77 (82.8) | 277 (83.9) | 69 (87.3) | 769 (83.2) |
| Female | 75 (18.1) | 16 (17.2) | 53 (16.1) | 10 (12.7) | 154 (16.8) |
| **Age group** | | | | | |
| 21-30 years | 2 (0.5) | 0 (0.0) | 0 (0.0) | 1 (1.3) | 3 (0.3) |
| 31-40 years | 133 (32.0) | 16 (17.2) | 102 (30.9) | 14 (17.7) | 265 (28.9) |
| 41-50 years | 171 (41.2) | 50 (53.8) | 122 (37.0) | 30 (38.0) | 373 (40.7) |
| 51-60 years | 80 (19.3) | 26 (28.0) | 69 (20.9) | 25 (31.6) | 200 (21.8) |
| 61-70 years | 29 (7.0) | 1 (1.1) | 37 (11.2) | 9 (11.4) | 76 (8.3) |
| **Marital Status** | | | | | |
| Single | 15 (3.6) | 0 (0.0) | 2 (0.6) | 0 (0.0) | 17 (1.9) |
| Married | 297 (71.6) | 78 (83.9) | 273 (82.7) | 66 (83.5) | 714 (77.9) |
| Widow | 50 (12.0) | 6 (6.5) | 24 (7.3) | 6 (7.6) | 86 (9.4) |
| Widower | 49 (11.8) | 8 (8.6) | 24 (7.3) | 7 (8.9) | 88 (9.6) |
| Divorced | 0 (0.0) | 1 (1.1) | 1 (0.3) | 0 (0.0) | 2 (0.2) |
| Separated | 4 (1.0) | 0 (0.0) | 6 (1.8) | 0 (0.0) | 10 (1.1) |
| **Ethnic Group** | | | | | |
| Yoruba | 242 (58.3) | 64 (68.8) | 235 (71.2) | 46 (58.2) | 587 (64.0) |
| Hausa | 148 (35.7) | 20 (21.5) | 73 (22.1) | 27 (34.2) | 268 (29.2) |
| Igbo | 25 (6.0) | 9 (9.7) | 22 (6.7) | 6 (7.6) | 62 (6.8) |
| **Religion** | | | | | |
| Christianity | 299 (72.0) | 58 (62.4) | 237 (71.8) | 57 (72.2) | 651 (71.0) |
| Islam | 110 (26.5) | 27 (29.0) | 77 (23.3) | 16 (20.3) | 230 (25.1) |
| Traditional | 0 (0.0) | 8 (8.6) | 16 (4.8) | 5 (6.3) | 29 (3.2) |
| Atheist | 6 (1.4) | 0 (0.0) | 0 (0.0) | 1 (1.3) | 7 (0.8) |
| **Total** | **415 (45.3)** | **93 (10.1)** | **330 (36.0)** | **79 (8.6)** | **917 (100.0)** |

**LIH=Low Income Housing, MIH=Medium Income Housing

Table 3. Housing Characteristics

| **How long have you been staying in this apartment** | | **Selected Housing Estates** | | | | |
|---|---|---|---|---|---|---|
| | | **Abesan LIH** | **Iponri LIH** | **Isolo LIH** | **Ijaye MIH** | **Total** |
| Less than 1 year | Freq | 18 | 0 | 7 | 0 | 25 |
| | % | 4.3 | 0.0 | 2.1 | 0.0 | 2.7 |
| 2-3 years | Freq | 225 | 53 | 172 | 45 | 495 |
| | % | 54.2 | 57.0 | 52.1 | 57.0 | 54.0 |
| 4-6 years | Freq | 54 | 16 | 24 | 11 | 105 |
| | % | 13.0 | 17.2 | 7.3 | 13.9 | 11.5 |
| More than 6 years | Freq | 118 | 24 | 127 | 23 | 292 |
| | % | 28.4 | 25.8 | 38.5 | 29.1 | 31.8 |
| **How long do you think you will stay** | | | | | | |
| Want to move as soon as possible | Freq | 1 | 0 | 0 | 0 | 1 |
| | % | 0.2 | 0.0 | 0.0 | 0.0 | 0.1 |
| Will move in 2-5 years | Freq | 2 | 0 | 0 | 2 | 4 |
| | % | 0.5 | 0.0 | 0.0 | 2.5 | 0.4 |
| Will stay more than 5 years | Freq | 60 | 5 | 27 | 10 | 102 |
| | % | 14.5 | 5.4 | 8.2 | 12.7 | 11.1 |
| Will live as long as possible | Freq | 352 | 88 | 303 | 67 | 810 |
| | % | 84.8 | 94.6 | 91.8 | 84.8 | 88.3 |
| **Type of building occupied** | | | | | | |
| Detached bungalow | Freq | 1 | 0 | 0 | 0 | 1 |
| | % | 0.2 | 0.0 | 0.0 | 0.0 | 0.1 |
| Block of flat | Freq | 413 | 93 | 330 | 79 | 915 |
| | % | 99.5 | 100.0 | 100.0 | 100.0 | 99.8 |
| Duplex | Freq | 1 | 0 | 0 | 0 | 1 |
| | % | 0.2 | 0.0 | 0.0 | 0.0 | 0.1 |
| **Type of previous apartment** | | | | | | |
| Single dwelling | Freq | 177 | 34 | 160 | 39 | 410 |
| | % | 42.7 | 36.6 | 48.5 | 49.4 | 44.7 |
| Apartment | Freq | 138 | 17 | 62 | 16 | 233 |
| | % | 33.3 | 18.3 | 18.8 | 20.3 | 25.4 |
| Row house/duplex | Freq | 86 | 37 | 106 | 22 | 251 |
| | % | 20.7 | 39.8 | 32.1 | 27.8 | 27.4 |
| Lodging | Freq | 14 | 5 | 2 | 2 | 23 |
| | % | 3.4 | 5.4 | 0.6 | 2.5 | 2.5 |
| Total | Freq | 415 | 93 | 330 | 79 | 917 |
| | % | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

**Influence of socio-economic, personal and household characteristics and housing elements on home injury risk in the study areas**

Each of the independent variable was correlated/associated with the dependent variable to explore the relationship between them. None of the socio-economic and personal characteristic was significantly related with home injury risk. Only one of the household characteristic variables which is number of children between six and eighteen years of age was significantly related with home injury risk. Interestingly all the housing element except ceiling, where positively and significantly correlated with home injury risk. The model explored was significant in explaining the relationship between home injury risks and socio-economic, personal, household characteristics and housing element. The multiple R value (0.895) shows that all the independent variable where well correlated with the dependent variable. The model explained 80.1% variance in the dependent variable by all the independent variables. Of all the independent variables marital status, age, house type and cabinet/heating sources /bathtub has the highest influence by beta value in a decreasing order on home injury risk. Only marital status, religion, ethnic group and employment status significantly predicted home injury risk.

**Dimension of housing elements explored/housing elements that constitute home injury hazards**

The housing elements examined may be observed from table 4. In order to explore the various dimensions of these variables, they were categorized using factor analysis.

Table 4. Variables of housing elements as home hazards

| **Variables** |
|---|
| Floor finish (living area) |
| Floor finish (kitchen) |
| Floor finish (bathrooms)/non-slip surface/mats |
| Floor finish (exterior) |
| Unattached foot-mats/carpets/rugs |
| Ceiling height/Headroom/Ceiling fans |
| Material & Condition of Ceiling |
| Walls – structural condition |
| Windows – breakable window pane |
| Windows – low sill height/no guards |
| Unprotected upper storey windows |
| Projected windows into circulation path |
| Doors – Collision against door swings |
| Bathroom/Shower/Bathtub/ No grab bars |
| Kitchen: very high cabinets require climbing |
| Kitchen – high level cabinets |
| Kitchen equipment: Heater/Cooker |
| Stairs – uneven steps/poorly designed |
| Stairs – no handrails/in disrepair/too low |
| External Steps handrails – lack/poor condition |
| External Steps: missing treads/steep pathway |
| Nails – exposed, protruding |
| Unsafe electrical wiring |
| Exposed heating sources |

The categories of housing elements explored where windows/walls/doors, stairs, cabinet/heating sources/bathtub, floor finish and ceiling. Overall, it was reported that the sum of all these elements pose low risk. Furthermore, amongst all these elements cabinet/heating sources/bathtub was rated highest in terms of level of risk this was followed by floor finish, windows, walls doors, stairs and ceiling. Most of the residents rated all of these elements as constituting low risk.

Principal components factor analysis, followed by varimax rotation was used to categorize the variables into the most significant factors that summarized them. Factors with eigenvalues greater than 1 were retained (see table 5); which resulted in five factors.

Table 5. Total Variance of Housing Elements Explained using the Principal Component Extraction Method

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 10.226 | 42.606 | 42.606 | 10.226 | 42.606 | 42.606 | 4.342 | 18.093 | 18.093 |
| 2 | 2.236 | 9.316 | 51.923 | 2.236 | 9.316 | 51.923 | 3.665 | 15.270 | 33.363 |
| 3 | 2.036 | 8.485 | 60.408 | 2.036 | 8.485 | 60.408 | 3.441 | 14.339 | 47.701 |
| 4 | 1.504 | 6.267 | 66.675 | 1.504 | 6.267 | 66.675 | 3.373 | 14.054 | 61.755 |
| 5 | 1.180 | 4.918 | 71.593 | 1.180 | 4.918 | 71.593 | 2.361 | 9.838 | 71.593 |
| 6 | .889 | 3.704 | 75.297 | | | | | | |
| 7 | .795 | 3.311 | 78.609 | | | | | | |
| 8 | .718 | 2.992 | 81.600 | | | | | | |
| 9 | .564 | 2.351 | 83.952 | | | | | | |
| 10 | .520 | 2.166 | 86.118 | | | | | | |
| 11 | .456 | 1.898 | 88.016 | | | | | | |
| 12 | .406 | 1.690 | 89.706 | | | | | | |
| 13 | .366 | 1.525 | 91.231 | | | | | | |
| 14 | .347 | 1.446 | 92.677 | | | | | | |
| 15 | .310 | 1.290 | 93.968 | | | | | | |
| 16 | .290 | 1.210 | 95.177 | | | | | | |
| 17 | .238 | .992 | 96.169 | | | | | | |
| 18 | .207 | .864 | 97.034 | | | | | | |
| 19 | .164 | .685 | 97.719 | | | | | | |
| 20 | .136 | .567 | 98.286 | | | | | | |
| 21 | .129 | .537 | 98.823 | | | | | | |
| 22 | .111 | .462 | 99.285 | | | | | | |
| 23 | .096 | .398 | 99.683 | | | | | | |
| 24 | .076 | .317 | 100.000 | | | | | | |

Only one variable 'Carpet fold/Rug insecure/no skid-free backing' which loads strongly on more than two factors was dropped. A KMO value of 0.86 showed that the items in each factor were adequate. Also, the Bartlett's test of sphericity showed a positive result ($p < 0.01$), implying that the variables were correlated highly enough; a possibility for factor analysis. The extracted factors explained about 71.59% of the total variance amongst the variables examined. After the factors were rotated, the first factor accounted for 18.09% of this total variance, the second factor accounted for 15.27% of the total variance, the third factor accounted for 14.34% of the total variance, and the fourth factor accounted for 14.05% of the total variance, while the fifth factor accounted for 9.84% of the total variance.


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Table 6. Principal Component Analysis (PCA) Categorization of Housing Elements

| Factors | Item loading in each factor | Loadings | Cronbach's alpha |
|---|---|---|---|
| ***Factor 1*** ***Walls and openings*** | Windows – breakable window pane<br>Unprotected upper storey windows<br>Windows – low sill height/no guards<br>Projected windows into circulation path<br>Doors – Collision against door swings<br>Walls – structural condition | 0.786<br>0.843<br>0.765<br>0.810<br>0.471<br>0.689 | 0.90 |
| ***Factor 2*** ***Stairs*** | Stairs – uneven steps/poorly designed<br>Stairs – no handrails/in disrepair/too low<br>External Steps handrails – lack/poor condition<br>External Steps: missing treads/steep pathway | 0.781<br>0.870<br>0.815<br>0.806 | 0.94 |
| ***Factor 3*** ***Kitchen-bath elements*** | Bathroom/Shower/Bathtub/ No grab bars<br>Kitchen: very high cabinets require climbing<br>Kitchen – high level cabinets<br>Kitchen equipment: Heater/Cooker<br>Nails – exposed, protruding<br>Unsafe electrical wiring/Electrical hazards<br>Exposed heating sources | 0.525<br>0.518<br>0.468<br>0.695<br>0.589<br>0.809<br>0.755 | 0.88 |
| ***Factor 4*** ***Floor finish*** | Floor finish (living area)<br>Floor finish (kitchen)<br>Floor finish (bathrooms)/non-slip surface/mats<br>Floor finish (exterior)<br>Unattached foot-mats/carpets/rugs | 0.803<br>0.865<br>0.759<br>0.722<br>0.515 | 0.86 |
| ***Factor 5*** ***Ceiling*** | Ceiling height/Headroom/Ceiling fans<br>Material & Condition of Ceiling | 0.784<br>0.809 | 0.75 |

The Cronbach alpha reliability coefficient was used to test the internal consistency of the general housing elements scale (α=0.94), and latent factors. The results showed that the scale and subscales were reliable. Table 5 presents a summary of the items, latent variables (factors), and Cronbach's alpha coefficient. The first factor has six items loading strongly on it; the second has four items loading on it, the third has seven items with strong loadings on it, the fourth has five items loading on it, while the fifth has two items loading on it. The five most important factors that describe how the housing elements were evaluated are: walls and openings; stairs; kitchen-bath elements; floor finish; and ceiling.

**Level of home hazard of housing elements and comparison of level of home hazard amongst housing elements**

The dimensions of home injury risks determined were collision, fall-off and trip injuries; fire and electricity related injuries, fall hit and slips related injuries. Most resident reported that the home injury which occurs constitute low hazard. Amongst all the various home injuries, fire and electricity related injuries was rated highest in terms of level of hazards, this was followed by; fall, hit and trip injuries and collision, fall-off and trip injuries. Most resident reported that the level of hazards associated with all the three categories of home injury risk were low.

The total evaluation of these housing elements was explored. Therefore, residents were scored, from 1 = negligible risk to 5 = very high risk, based on their agreement to the statement questions which are on a Likert scale. These were added up for all the factors to get an individual's housing element risk score. In order to facilitate the interpretation of these scores, labels were given to score groups, along a continuum of weak rating on one end of the scale, to high rating on the other end. Risk scores were calculated for each of the sub-scales and overall scale: risk scores of walls and openings (M = 11.49, SD = 4.62), risk scores for stairs (M = 7.34, SD = 3.62), risk scores for kitchen-bath elements (M = 14.25, SD = 5.63), risk scores floor finish (M = 9.65, SD = 3.27); risk scores for ceiling (M = 3.46, SD = 1.47); and overall risk scores for all the categories of housing elements (M = 45.84, SD = 14.94) (See Table 4.11). The average mean showed that, of all the housing elements categories, the kitchen-bath elements (Avg. M = 2.04) was reported to be the element most hazardous. This was followed by floor finish (Avg. M = 1.93); walls and openings (Avg. M = 1.92); stairs (Avg. M = 1.84) and ceiling was rated least (Avg. M = 1.73).

Table 7. Mean scores of the evaluation of the degree of risk of housing elements and its dimensions

| Scale | No. of Items | M | Avg. M | SD | Min. | Max. |
|---|---|---|---|---|---|---|
| *Housing elements* | 24 | 45.84 | 1.91 | 14.94 | 24 | 82 |
| *Walls and openings* | 6 | 11.49 | 1.92 | 4.62 | 6 | 23 |
| *Stairs* | 4 | 7.36 | 1.84 | 3.62 | 4 | 20 |
| *Kitchen-bath elements* | 7 | 14.25 | 2.04 | 5.63 | 7 | 33 |
| *Floor finish* | 5 | 9.66 | 1.93 | 3.27 | 5 | 19 |
| *Ceiling* | 2 | 3.46 | 1.73 | 1.48 | 2 | 8 |

**Spaces and home hazards in the study area/dimension of spaces explored**

The spaces examined may be observed from Table 7. In order to explore the various dimensions of these variables, they were categorized using factor analysis.

Table 8. Variables of Housing Elements as Home Hazards

| **Variables** |
|---|
| Main entry |
| Living room |
| Dining room |
| Kitchen |
| Store/Storage |
| Games/recreation room |
| Bedrooms (adult) |
| Children's Bedroom(s) |
| Bathrooms/Toilets |
| Children's Bathrooms/Toilets |
| Internal Stairs |
| External Stairs |
| Balcony |
| Courtyard |
| Exterior-paving, drainage, parking |

Principal components factor analysis, followed by varimax rotation was used to categorize the variables into the most significant factors that summarized them. Factors with eigenvalues greater than 1 were retained (see table 9); which resulted in five factors.

A KMO value of 0.79 showed that the items in each factor were adequate. Also, the Bartlett's test of sphericity showed a positive result ($p < 0.001$), implying that the variables were correlated highly enough; a possibility for factor analysis. The extracted factors explained about 67.80% of the total variance amongst the variables examined.

Table 9. Total Variance of Housing Elements Explained using the Principal Component Extraction Method

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 6.198 | 41.323 | 41.323 | 6.198 | 41.323 | 41.323 | 2.779 | 18.525 | 18.525 |
| 2 | 1.669 | 11.127 | 52.450 | 1.669 | 11.127 | 52.450 | 2.734 | 18.226 | 36.751 |
| 3 | 1.256 | 8.371 | 60.820 | 1.256 | 8.371 | 60.820 | 2.678 | 17.851 | 54.602 |
| 4 | 1.047 | 6.983 | 67.803 | 1.047 | 6.983 | 67.803 | 1.980 | 13.201 | 67.803 |
| 5 | .909 | 6.063 | 73.866 | | | | | | |
| 6 | .686 | 4.575 | 78.441 | | | | | | |
| 7 | .618 | 4.122 | 82.563 | | | | | | |
| 8 | .536 | 3.575 | 86.138 | | | | | | |
| 9 | .499 | 3.325 | 89.463 | | | | | | |
| 10 | .463 | 3.089 | 92.551 | | | | | | |
| 11 | .324 | 2.158 | 94.709 | | | | | | |
| 12 | .266 | 1.775 | 96.484 | | | | | | |
| 13 | .202 | 1.348 | 97.832 | | | | | | |
| 14 | .178 | 1.190 | 99.022 | | | | | | |
| 15 | .147 | .978 | 100.000 | | | | | | |

After the factors were rotated, the first factor accounted for 18.53% of this total variance, the second factor accounted for 18.23% of the total variance, the third factor accounted for 17.85% of the total variance, while the fourth factor accounted for 13.20% of the total variance. The Cronbach alpha reliability coefficient was used to test the internal consistency of the general shopping values scale (α = 0.895), and latent factors. The results show that the scale and subscales were reliable. Table 10 presents a summary of the items, latent variables (factors), and Cronbach's alpha coefficient.

Table 10. Principal Component Analysis (PCA) Results for Categorization of Spaces

| **Factors** | **Item loading in each factor** | **Loadings** | **Cronbach's alpha** |
|---|---|---|---|
| Factor 1<br>Sleeping and cooking spaces | Kitchen<br>Bedroom (adult)<br>Children's bedroom (s)<br>Bathrooms/Toilets<br>Children's bathrooms/ toilets | 0.621<br>0.63<br>0.703<br>0.809<br>0.610 | 0.90 |
| Factor 2<br>Ad-hoc spaces | Dining room<br>Storage<br>Games/recreation room<br>External stairs | 0.74<br>0.682<br>0.68<br>0.53 | 0.94 |
| Factor 3<br>External space and transition space | Internal stairs<br>Balcony<br>Courtyard<br>Exterior-paving, parking, drainage | 0.588<br>0.519<br>0.827<br>0.800 | 0.88 |
| Factor 4<br>Public space | Main entry<br>Living room | 0.824<br>0.827 | 0.86 |

The first factor has five items loading strongly on it; the second has four items loading on it, the third has four items with strong loadings on it, while the fourth has two items loading on it. The four most important factors that describe how the spaces were evaluated according to level of risk are: sleeping and cooking spaces; ad-hoc spaces; external spaces and internal stairs; and public spaces.

**Level of home hazard in spaces**

The total evaluation of the spaces was examined. Residents were scored, from 1 = negligible risk to 5 = very high risk, based on their agreement to the statement questions which are on a Likert scale. These were added up for all the factors to get an individual's space risk score. In order to facilitate the interpretation of these scores, labels were given to score groups, along a continuum of weak rating on one end of the scale, to high rating on the other end. Risk scores were calculated for each of the sub-scales and overall scale: sleeping and cooking space (M


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= 12.33, SD = 3.78); ad-hoc space (M = 8.14, SD = 3.04); external space and internal stairs (M = 8.28, SD = 3.58); and public space (M = 4.83, SD = 1.68), and overall risk scores for all the spaces (M = 33.44, SD = 9.83) (See Table 10). The average mean showed that, of all sub-scales, sleeping and cooking spaces was rated to be most hazardous (Avg. M = 2.47). This was followed by public spaces (Avg. M = 2.41); external and transition space (Avg. M = 3.71); and ad-hoc spaces (Avg. M = 2.04). See Table 10 below.

Table 11. Mean Scores of the Evaluation of the Degree of Risk of Spaces and its Dimensions

| Scale | No. of Items | M | Avg. M | SD | Min. | Max. |
|---|---|---|---|---|---|---|
| *Spaces* | 15 | 33.44 | 2.23 | 9.83 | 15 | 70 |
| *Sleeping and cooking spaces* | 5 | 12.33 | 2.47 | 3.78 | 5 | 23 |
| *ad-hoc spaces* | 4 | 8.14 | 2.04 | 3.04 | 4 | 20 |
| *External space and transition space* | 4 | 8.28 | 2.07 | 3.58 | 4 | 19 |
| *Public space* | 2 | 4.82 | 2.41 | 1.68 | 2 | 10 |

## Conclusion

The study revealed that housing elements constitute high risk. Therefore, they play a major role in the occurrence of home injury risk in the selected public housing estates in Lagos State, Nigeria Also since residents have stayed in the house for more than 3yrs, it was expected that they had some familiarity with the terrain of their houses. It will also be interesting to explore the influence of housing elements on home injury risk in areas where there are many cases of physical impairment and health challenge. It can be concluded that these home injuries constitute little threat to the health of residents in the study areas. Also, none of the socio-economic and personal characteristics was significantly related with home injury risk. This might be a contextual phenomenon, as such; it will be interesting to compare this result with future studies. Since the number of children between 6 and 8 years was significantly correlated with home injury risk, it is expected that any household with this associated variable is expected to be prone to home injury risk and as such measures should be put in place to curb any occurrence of such. Interestingly, none of the housing elements significantly predicted the level of home injury risk. This means that other studies should pay attention to other variables such as ethnicity, religion, marital status and employment status of resident which proved significant in this study. An in-depth exploration as regards how residents' life styles and values may influence home injury risk will aid useful contribution to knowledge.

**Recommendations**

This study examined housing elements and potential home injury risks in selected public housing estates in Lagos State, Nigeria with a view to informing design decisions for safer housing. The study established among other findings housing elements that are home injury hazards, and possible home injury occurrences in different spaces in the house. However, as a component of safety and public health and in line with the findings of this study it is pertinent to improve the health of the residents by preventing injuries and hence enhancing their quality of life. Therefore, the following preventive measures are recommended: designers and homeowners should pay special attention to design of cabinets, heating sources and bathtub. Also, the type of floor finish specified in the design of built forms should be carefully considered. Since it was discovered that home injury constitutes low hazard. There is minimal level of the occurrence of home injury in the home. It is therefore advised that special consideration be given to the design of fire prone spaces and specification of material and electrical gadget as well as fire escape routes and installation of fire extinguisher. The relevant authorities in the study area should embark on preventive intervention by educating residents about the need to meet a certain preventive measure that are stipulated to reduce the occurrence of fire-related injuries. The study further recommended the following:

- **Policy and Planning**: Integrate injury prevention into housing design standards.
- **Maintenance Protocols**: Regular inspections and quick repairs.
- **Community Education**: Workshops on home safety.
- **Design Improvements**: Use of non-slip materials, better lighting, and child-proofing measures.

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