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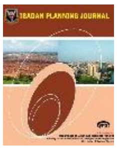

Urban Planning Failures and the Spatial Dynamics of Building Collapse in Lagos, Nigeria

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Abstract

Rapid urbanisation and weak regulatory enforcement have intensified the incidence of building collapse in Lagos, posing significant threats to urban health and safety. This study examines the spatial dynamics, socio-economic drivers, and public health implications of building collapse across 17 Local Government Areas between 2018 and 2022. A mixed-method approach integrating Geographic Information Systems (GIS) and survey data from 429 stakeholders was employed. Spatial analysis using the Average Nearest Neighbour (ANN) revealed a statistically significant clustered pattern of collapse incidents (z= -4.1521; p < 0.01), confirming non-random distribution. High-risk concentrations were identified in Lagos Island, Mushin, Ebute-Meta, and Ikeja areas characterised by high population density (exceeding 20,000 persons/km^2), informal construction, and limited regulatory oversight. Approximately 27% of surveyed buildings were non-compliant with the 2019 Lagos State Building Control Regulations, while structures aged 30 – 59 years dominated vulnerable zones. Survey findings indicate widespread awareness (95.5%) of collapse incidents, with 50.9% of respondents directly experiencing or witnessing events. Reported impacts included fatalities (79.7%), property loss (70.4%), physical injuries (63.3%), displacement (56.6%), and psychological distress (52.1%). ANOVA results confirmed significant spatial variation in perceived health impacts (p < 0.05) and government response effectiveness (p<0.05). Although 79.7% acknowledged existing safety policies, only 38.4% considered enforcement effective. The findings demonstrate that building collapse in Lagos is both a spatially clustered infrastructural failure and a public health crisis, underscoring the need for strengthened regulatory enforcement, spatial risk mapping, and health-sensitive urban planning interventions.

Keywords
Building collapse, urban risk, public health, urban sustainability, spatial analysis

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1. Introduction

Building collapse is a multidimensional urban crisis that is a classic example of the intersection between structural failure, spatial inequality and public health risk. In many cities in the Global South, and particularly in Nigeria, the repeated collapse of buildings are reflections of systemic governance failures, weak regulatory enforcement and growing socio-spatial disparities (Akinyemi et al., 2016). Yet, despite human impact and urban development implications, the phenomenon has received little attention from a spatial health perspective. This study places the phenomenon of building collapse in the context of wider phenomena related to urban vulnerability, disaster risk, and spatially mediated health inequities, responding to the calls for this type of integrative research that puts the health implications of urban infrastructural failures at the forefront of the research agenda (WHO, 2010; UNDRR, 2015).

Numerous studies documented the causes and effects of collapse in buildings. Structural failures are often associated with inferior building materials, poor architectural design, lack of supervision at the site, improper maintenance and failure to adhere to building codes (Oloyede et al., 2010). The role of regulatory failure is also critical, especially from a rapidly urbanizing context of persisting gigantist urban expansion while governance frameworks often fall behind (Patel et al. 2019). In Nigeria, corruption, lack of institutional oversight, and informal building practices contribute to the further risks generated by poor quality (Anosike, 2021)..

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Research has mysteriously pointed to spatial concentration of collapses in dense urban centers and informal settlements where poverty and lack of regulations go hand in hand (Lee et al., 2018; Mbah et al., 2018). For example, Lagos, Abuja and Port Harcourt have been subjected in identifying the most vulnerable cities in Nigeria, with Lagos simply recording 700 - 1900% more collapse occurrences than others (Akinyemi et al., 2016). This is the reflection of the dynamics of land speculation and overcrowding, coupled with infrastructural stress, wherein the developers flaunt the planning laws in the process of making a quick and wild profit. Moreover, climate change and extreme weather events have been blamed as new contributing factors to the problems of structural vulnerability (Wang et al., 2017).

While there is a rich engineering and policy literature, there are very few studies explicitly addressing the implications of building collapse in relation to urban health. The collapse of buildings is not only a cause of injury and mortality but also an impetus for displacement, mental health disorders and interruption of access to key services such as water, sanitation and healthcare (Smith & Johnson, 2020; Bamigboye, et al., 2019; WHO, 2018). These outcomes are especially borne out in marginalised groups, perpetuating existing urban health inequities (Wisner et al., 2004). In a closely populated, metropolitan area such as Lagos, where informal housing is tucked next to high-rise housing developments, the health risks from building collapse play out both in terms of acute trauma but also from chronic stressors (psychosocial).

Theoretical approaches to understanding the collapse of buildings in urban space usually draw on urban ecology and models of spatial structure at the city. The concentric zone model (Burgess, 1925) provides some answers about the clustering of the intensity of land use and the age of buildings in inner-city areas, where the fatigue of regulation is greatest, and infrastructure is most degraded. However, in Lagos, this model is useful for understanding why there have been more frequent collapses in the older, overcrowded neighbourhoods. Conversely, the multiple nuclei model (Harris & Ullman, 1945) is used to explain the polycentric spatial pattern of the urban form in Lagos, with the operation of different zones for industrial, commercial, and residential activities which operate semi-autonomously and the underlying regulatory and infrastructural conditions in varying parts of space. This multiplicity of centres brings variable risk profiles where peri-urban zones lack basic regimes of inspection, for example.

Furthermore, the Disaster Risk Management (DRM) framework is a holistic lens through which risk can be assessed, which integrates hazard, vulnerability and exposure (UNISDR, 2012; Akande et al., 2016). However, GIS-based approaches to DRM have gained greater popularity, enabling researchers and planners to spatially determine areas of high risk, to determine building integrity and to model emergency response strategies (Zlatanova & Fabbri, 2009; Zhou et al., 2018). Spatial analytics such as Average Nearest Neighbor (ANN), Moran's I etc. have been applied in understanding the clustering and the pattern of risk such as in Post earthquake studies and urban disaster assessment (Park et al, 2024; Wang, et al., 2013). Yet, in Nigeria, such techniques have rarely been applied for the evaluation of structural failure and its health consequences, which is a glaring lacuna in the literature.

There is a further gap in the absence of integration between spatial diagnostics and public health outcomes. While some studies examine the economic or regulatory consequences of building collapse (Fagbenle & Oluwunmi, 2010; Adebowale, et al., 2016), few have considered how such events affect patterns of vulnerability to health and the access to emergency services and inequalities in health outcomes. International efforts to strengthen building codes; such as those used after the 9/11 collapse of the World Trade Center and those recommended by the National Institute of Standards and Technology (NIST 2021) emphasize the nexus of health security within building integrity. However, these standards have as yet to be translated in any meaningful way into risk reduction strategies in much of sub-Saharan Africa.

This study addresses some of these research and practice gaps by providing a spatial-health evaluation of building collapse in Lagos, Nigeria. It takes a geospatial approach to plot the incidence, distribution and health ramifications of building collapses from 2018 to 2022. It further examines the socio-economic and environmental influences that have led to structural failure, belongingness of residents and residents, X-ray of the effects on the well-being of residents and the effectiveness of the government response strategies using the Revised Lagos state Building Control Agency (LABSCA) Regulations 2019 as a benchmark.

The objectives of this study are fivefold; that is, (1) to analyze the spatial distribution of collapsed buildings in Lagos Metropolis, (2) to investigate the geographical and socio-economic factors affecting collapse events, (3) to determine the perceived public health and psychosocial effects of the collapse incidents, (4) to identify and map areas that are prone to future collapsed using regulatory criteria, and (5) to assess the spatial variation of the perceived adequacy of governmental response. To guide this inquiry, the study poses the following research questions:

- What spatial and socio-economic patterns characterise the incidence of building collapse in Lagos?
- How do collapse incidents affect urban health and human well-being across different zones?
- Which areas are most vulnerable according to regulatory benchmarks, and how do responses vary spatially?

The research further tests three hypotheses:

- H_1: The spatial distribution of building collapses in Lagos is not random but clustered.
- H_2: There is significant variation in the perceived public health impact of building collapse across different parts of the city.
- H_3: Perceptions of government response differ significantly across spatial and socio-economic contexts.

2. Materials and Methods

Study Area

Lagos Metropolis, the largest and most densely populated urban centre in Nigeria, was used as the study area. With an estimated population of over 15 million, and a land area of about 3,345 square kilometers, Lagos is the spatial quintessence of rapid urbanisation, infrastructural decadence and socio-economic inequality. The fragmented morphology of the city; comprising a mixture of commercial islands, informal settlements and high-density mainland districts, offers it as an interesting case study for the assessment of the spatial determinants of building collapse and their implications for urban health. The study area consists of 17 local government areas (LGAs), which represent a complete cross-section of the diversity of the socio-economic and infrastructural LTs present in the metropolis. Figure 1. Map of Lagos Metropolis depicting the 17 Local Government Areas that were included in the study. This spatial framework was used to analyse the distribution of incidences of building collapse and to evaluate the urban vulnerability in different socio-economic zones.

Research Design and Approach

This study employed a cross-sectional and mixed-method study design that united both quantitative spatial analysis and perception data collected by surveys. A spatial-epidemiological method, based on disaster risk and urban health frameworks, was used to guide the investigation of building collapse incidents and determinants and related health risks. The use of Geographic Information Systems (GIS) was central in mapping the location of collapse, in modelling spatial patterns and high-risk zones against regulatory benchmarks.

Data Collection

Both primary and secondary sources of data have been used. Primary data were gathered using a structure questionnaire to a stratified sample of stakeholders, i.e. government parastatals, real estate developers, professionals in the built environment, landlords, and tenants. A total of 429 valid responses were obtained from among the 17 LGAs. Respondents provided information on building conditions, incidence of collapses (if any), perceived causes, health impacts and evaluated government response.

Secondary Data were collected from official records of Lagos State Building Control Agency (LABSCA) and Lagos state emergency management agency (LASEMA), Media reports and academic literature found on the occurrence of building collapse between the period of 2018-2022. These records were geo-referenced for the purpose of obtaining a database of the location of the collapse suitable for spatial analysis. Regulatory parameters from the LABSCA Revised Regulations 2019 were taken as a benchmark to check structural compliance and to highlight areas of increased vulnerability.

Sampling Technique

A purposive and stratified sampling technique was adopted in order to ensure that different occupational groups and administrative zones were represented. Stakeholder categories were chosen based on their proximity to and/or influence on the built environment, i.e., regulatory enforcement, construction, property management, residential occupancy. Within each LGA, sampling of respondents was conducted as representative of the land use patterns and housing typologies, such that a representative sample dataset for the area was obtained.

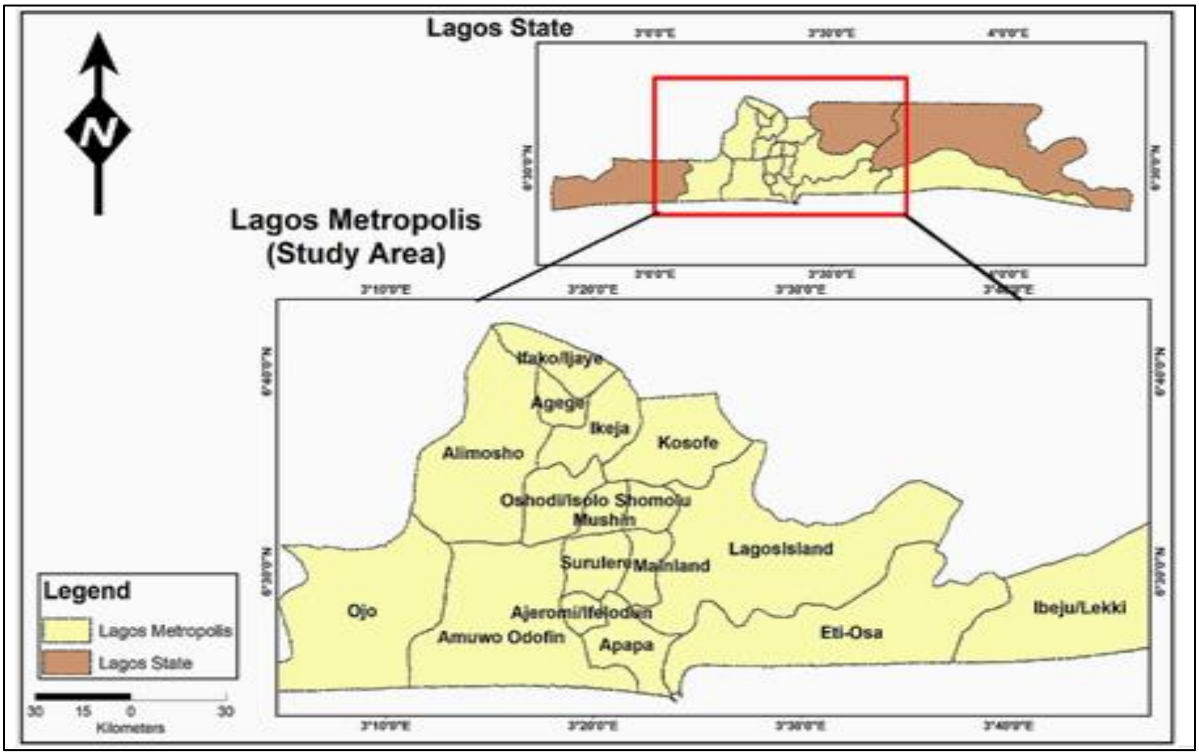


Figure 1: Map of Lagos Metropolis showing the 17 Local Government Areas

GIS and Spatial Analytical Techniques

Spatial data processing and analysis were done with ArcGIS software. Coordinates of collapse incidents were geocoded and analysed using Average Nearest Neighbour (ANN) function to see if there were any clustering tendencies. Moran's I was used to determine the presence of spatial autocorrelation, to test the hypothesis of non-random distribution of building collapse across the city. Kernel Density Estimation (KDE) was implemented for hot spots of collapsing frequency visualization and for multi-scalar vulnerability check, the overlay analysis of result was implemented using population density and housing typology data sets.

Additionally, proximity between high-risk buildings and important urban health resources (i.e. hospitals and emergency response centres) was evaluated with the Network Analyst tool in ArcGIS. This provided support for the evaluation of the spatial responsiveness of health and safety infrastructure in case of collapse incidents.

Quantitative and Statistical Analysis

Survey data were coded and analysed with the help of the statistical package, SPSS to obtain descriptive statistics and conduct inferential tests. The method of analysis used to test hypotheses about the variation in the perceived effects of building collapse and government response among the various socio-economic and spatial categories was performed by using the technique of Analysis of Variance (ANOVA). Chi-square tests were further used to determine the association between demographic variables and awareness level or risk perception.

3. Results

Spatial Distribution of Building Collapse in Lagos Metropolis

The structural patterns of building collapse events that occurred in Lagos Metropolis between 2018 and 2022 revealed a strongly clustered distribution of building collapses, especially distant in more ancient and densely built districts (Figure 2). Lagos is a coastal megacity and the commercial capital of Nigeria that includes a mix of formal and informal urban structures in 17 local government areas (LGAs). Using Geographic Information Systems (GIS), the areas that is most affected were identified as Lagos Island, Mushin, Ebute-Meta, and Ikeja. The Average Nearest Neighbour (ANN) analysis resulted in a nearest neighbour index value <1 (z-score = -4.1521, with p value < 0.01), which indicates statistically significant clustering of collapse incidents (as opposed to their random occurrence) (Figure 3). This finding supports Hypothesis 1, which states that the collapses of buildings in Lagos are spatially clustered.

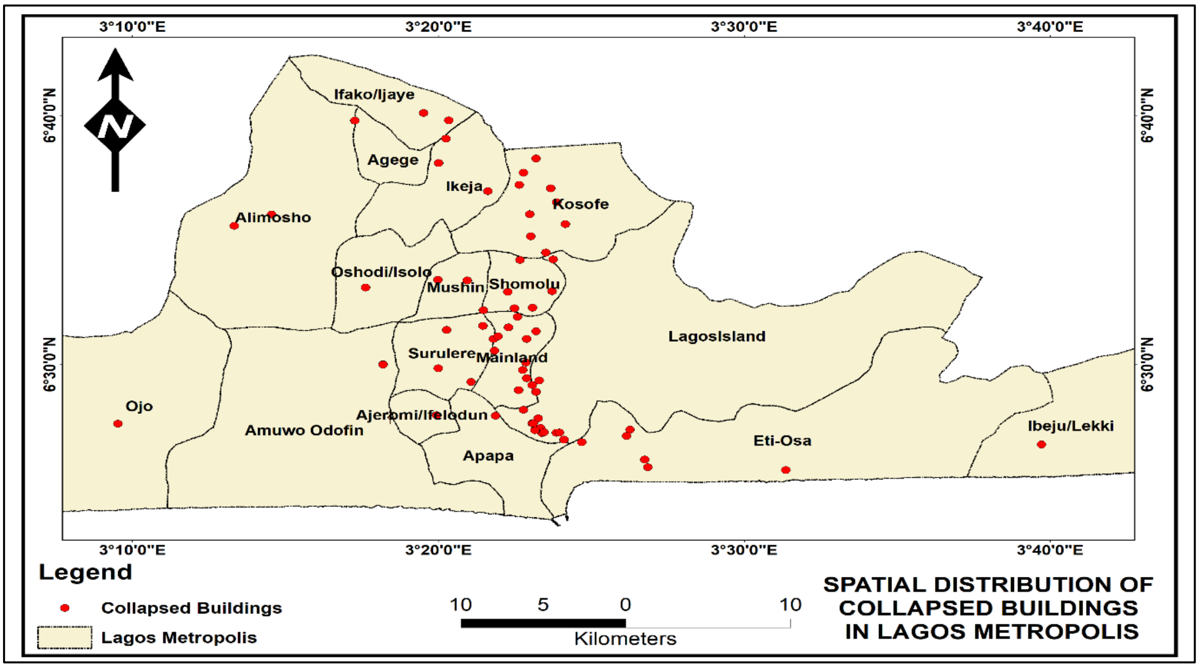
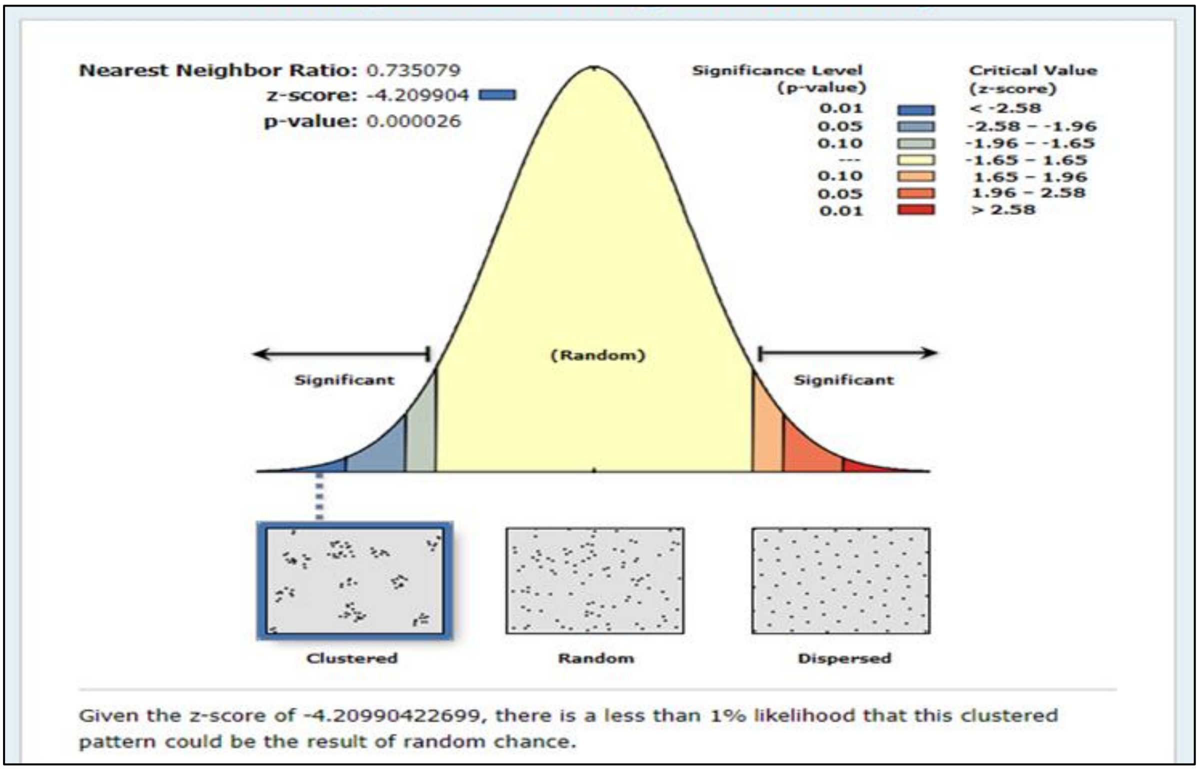


Figure 2: Map showing the spatial distribution of collapsed buildings in Lagos Metropolis (2018–2022).



Given the z-score of -4.20990422699, there is a less than 1% likelihood that this clustered pattern could be the result of random chance.

Figure 3: ANN summary confirming statistically significant spatial clustering of collapse incidents.

Geographical and Socio-economic Factors Influencing Collapse

The combination of environmental and socio-economic risk factors was suggested by survey results and spatial overlays. Most of the collapse incidents were in the areas with high population density, informal construction and low regulatory oversight. Key contributing factors, according to respondents, were lack of supervision during construction (76.6%; 28% poor supervision and 78.6%), use of materials proving faults (73.2%), and enforcement of building code at the institutional level (68.4%). Many affected areas were also on reclaimed wetlands or on flooded land - conditions that have higher structural vulnerability (Figure 4). Lagos's socio-economic bloc displays the stark urban inequality: whilst central districts such as Victoria Island are dominated by high-rise commercial buildings, a lot of Lagos's inhabitants live in overcrowded, unregulated accommodation. These inequities, in terms of both socio-spatial and different sorts of inequalities, play out in the data: low-income and informal neighbourhoods disproportionately experienced structural failures. Table 2-3 provides a summary of the perceived causes of building collapse and key Indicators of high-risk building collapse areas as classified by the various stakeholder groups in Lagos Metropolis.

Table 2: Perceived Causes of Building Collapse in Lagos Metropolis by Stakeholder Group (in %)

Cause of Collapse	Government Officials	Developers	Professionals	Landlords	Tenants	Overall (%)
Use of substandard materials	81.6	78.2	75.4	69.5	61.2	73.2
Poor supervision during construction	87.0	81.6	78.3	74.2	62.5	76.6
Lack of regulatory enforcement	79.0	74.1	68.9	66.7	52.1	68.4
Structural design flaws	65.0	70.4	74.8	55.1	48.9	62.8
Corruption in the approval process	70.3	64.2	59.7	52.3	46.8	58.7
Conversion/modification of buildings	59.4	63.5	61.1	49.8	41.2	55.0

Table 3: Key Geographical and Socio-Economic Indicators in High-Risk Building Collapse Areas, Lagos Metropolis

Indicator	High-Risk LGAs	Typical Characteristics
Topography	Lagos Island, Mushin	Low-lying, flood-prone, waterlogged areas
Land Use Type	Ebute-Meta, Ketu, Agege	Mixed residential-commercial; high-density housing
Construction Quality	Ajegunle, Surulere	Predominance of informal buildings with weak structural integrity
Housing Type	Ikeja, Lagos Mainland	Tenement and older low-rise structures
Population Density	Mushin, Alimosho	Very high (over 20,000 persons/km²)
Income Level	Ajeromi-Ifelodun, Ifako-Ijaiye	Low- to middle-income households
Regulatory Oversight	Badagry, Ibeju-Lekki	Limited enforcement of planning/building codes
Access to Emergency Services	Epe, Ikorodu	Delayed or distant emergency and health service access

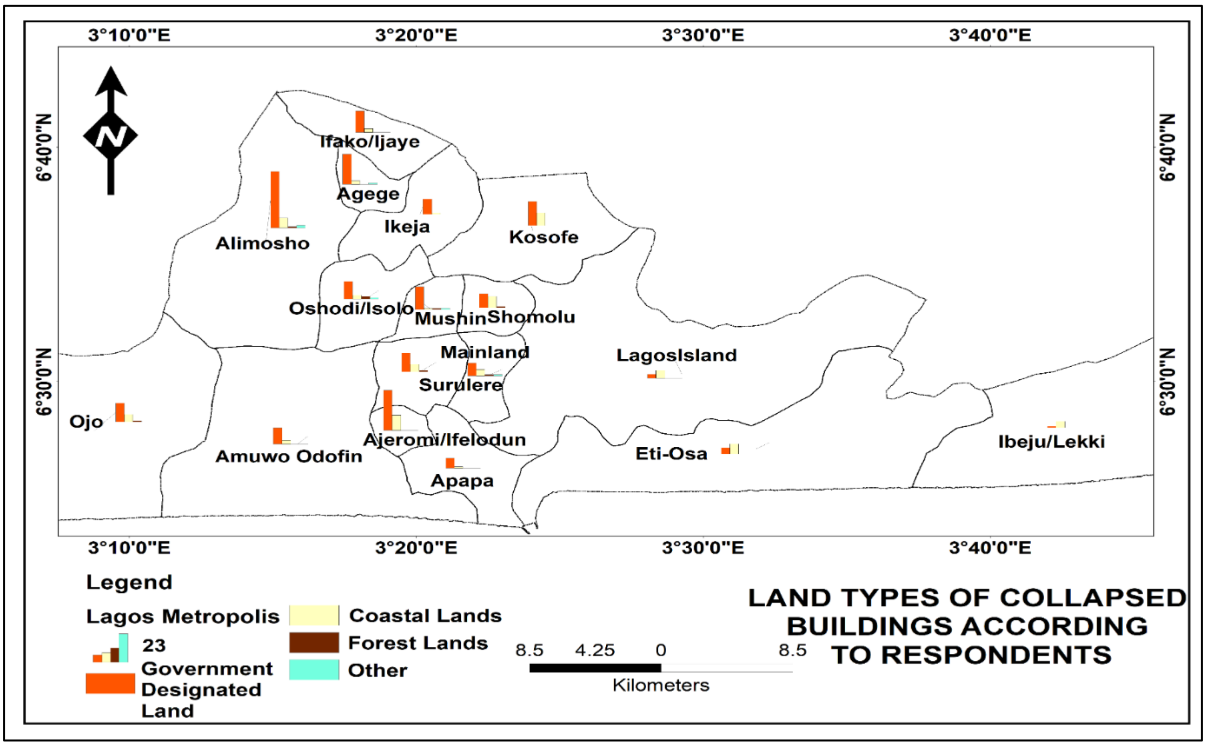


Figure 4: Types of land associated with collapsed buildings, as reported by respondents.

Perceived Public Health and Socioeconomic Impacts

Respondents recognised the public health implications of building collapse. Of the 429 people who were surveyed - tenants, landlords, professionals and public officials - 95.5 per cent knew of incidences in their communities, and 50.9 per cent said they had witnessed or experienced a collapse. The most generally perceived effects were fatalities (79.7%), injuries (63.3%), loss of personal property (70.4%), and displacement (56.6%). In addition to those direct consequences, many of the respondents identified long-term psychosocial consequences, including trauma and housing insecurity. Table 4 summarises reported public health and socioeconomic impact from building collapse.

Table 4:Reported Public Health and Socioeconomic Effects of Building Collapse in Lagos Metropolis

Effect Type	Description	% of Respondents Reporting
Fatalities	Loss of life resulting directly from collapse incidents	79.7%
Physical Injuries	Bodily harm requiring medical attention	63.3%
Loss of Property	Destruction of personal belongings and househol assets	70.4%
Displacement	Forced relocation or homelessness following collapse	56.6%
Psychological Distress	Trauma, fear, and anxiety triggered by collapse experiences	52.1%
Loss of Livelihood	Disruption to employment or income-generating activities	44.8%
Educational Disruption	School closures or loss of learning due to displacement	38.5%

Analysis of variance (ANOVA) indicated that perceived levels of health and social impacts significantly differed depending on where one lived ($p<0.05$) and it found that residents in central and mainland LGAs had higher levels of distress than others. These results support Hypothesis 2, which predicted spatial heterogeneity in public perceptions of health effects of collapse. Table 5 provides a breakdown of the results from the ANOVA test that showed there is variation in the perceived impact.

Analysis of sectoral exposure of building collapse in Lagos Metropolis (Figure 5) showed that the private sector is taking the greatest burden of the impact at 79.7% of all given. This includes the residential sector (at 62.5%), where the vast majority of collapses occurred, and mixed-use structures (at 21.7%), which are usually mixed-use and reside/residential. The commercial sector alone accounted for 11.3%, but is also said to belong to the realm of the private.

Table 5:ANOVA Summary: Variation in Perceived Impacts of Building Collapse

Impact Type	F-Statistic (F)	p-Value	Significance
Fatalities	4.87	0.001	Significant
Physical Injuries	3.92	0.004	Significant
Displacement	3.10	0.015	Significant
Psychological Distress	2.84	0.021	Significant
Property Loss	2.01	0.072	Not significant
Educational Disruption	1.76	0.099	Not significant

By comparison, the public sector (institutional buildings, such as schools, healthcare facilities and religious centers) accounted for 20.3% of the reported incidents. Although smaller in numbers, collapses in this sector are often associated with critical infrastructure and disruption of public services with increased social and health consequences.

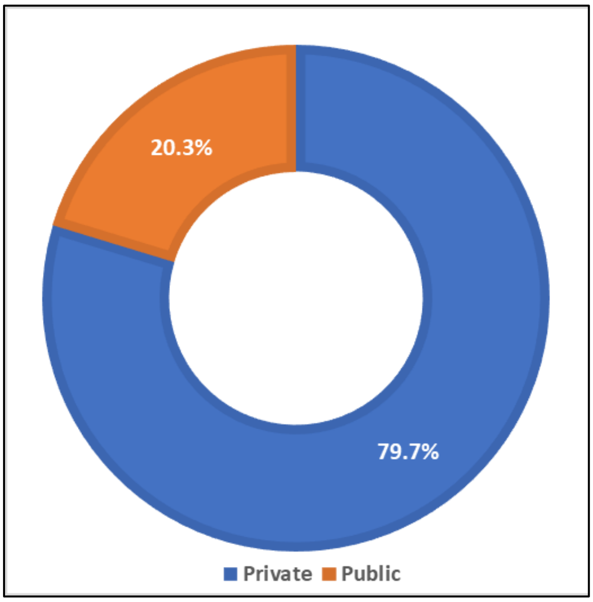


Figure 5: Sectors most affected by building collapse

As shown in Figure 4.25, in that building collapsing occurred mainly in residential areas, 62.5% of the recorded cases were in residential areas. Commercial (11.3%) and institutional (4.5%) land uses were the next-largest with smaller percentages in recreational (3.1%), agricultural (2.8%) and industrial (1.6%) zones. About 14.2% were "other" which represents mixed or unclassified land uses. The distribution indicates that residential zones - which often have a higher population density with often informally developed areas - are affected most, arguing for increased regulatory efforts on such areas.

Mapping of Vulnerable Areas Using Regulatory Standards

To measure structural vulnerability, the study used the Revised Lagos State Building Control Agency (LABSCA) Regulations of 2019 as a measure of structural vulnerability. This framework establishes minimum levels of structural integrity, building materials, and safety protocols. Based on field surveys and visual inspection of structural conditions, about 27 percent of buildings being surveyed were found as non-compliant with these standards.

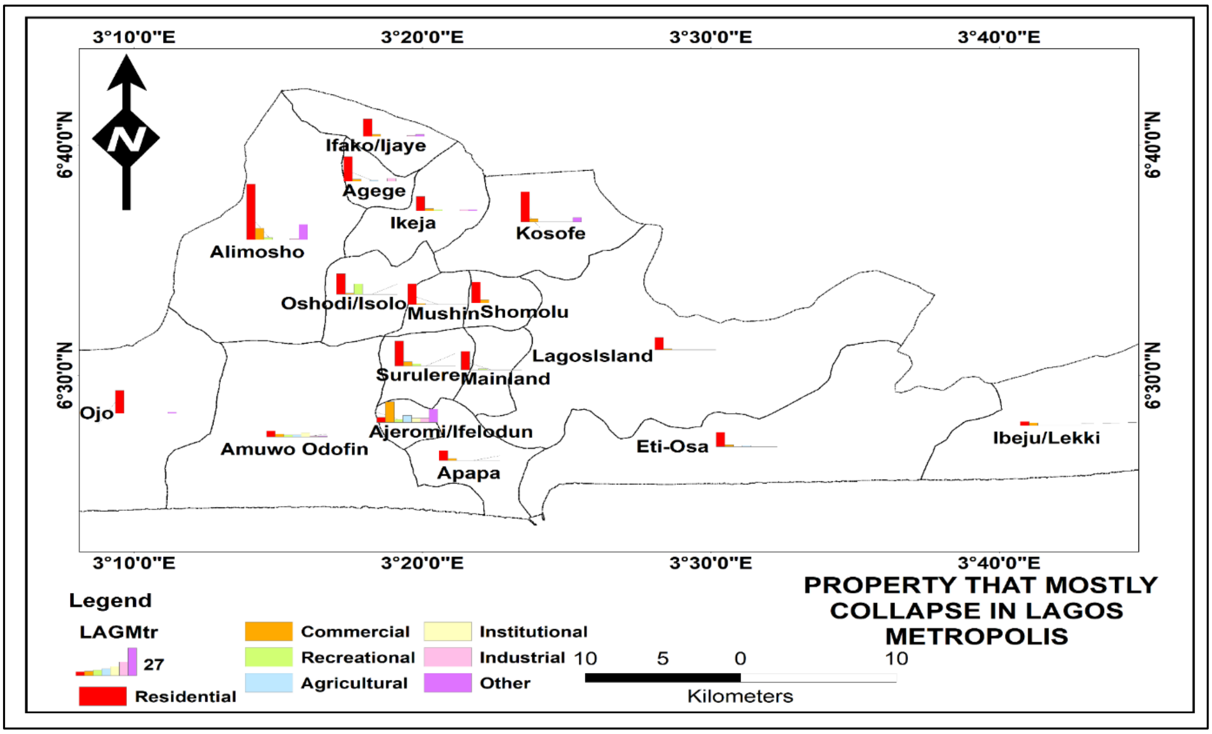


Figure 6: Property types most frequently affected

Table 6: Summary of Key Provisions in the Revised LASBCA Regulations (2019)

Regulatory Area	Summary of Requirements
Construction Notification	Developers are expected to notify the appropriate authority prior to the commencement of construction.
Stage Inspections	Buildings must undergo inspections at various stages (foundation, structure, completion) by certified officers.
Documentation	Submission of approved building plans, soil tests (for multi-storey buildings), and engineering drawings is required.
Professional Oversight	Projects must be supervised by licensed professionals registered with relevant regulatory bodies.
Structural Assessment	Existing or distressed buildings require technical evaluation to determine stability and suitability for occupation.
Site and Setback Standards	Minimum spatial clearances (setbacks) from property boundaries are specified for different building types.
Public Safety Compliance	All buildings must meet basic structural, environmental, and health safety standards as defined by the agency.

Figure 7 shows the distribution of buildings that are structurally vulnerable throughout the study area, with building age used as a proxy for structural integrity. The following map is used to classify the buildings into five age classes: 2 - 10 years, 11 - 21 years, 22 - 29 years, 30 - 38 years and 39 to 59 years. The analysis indicates that buildings between 30-59 years of age (which represent the oldest buildings) are overrepresented in areas with high levels of vulnerability. These buildings are often prior to modern building rules and tend to show visible signs of material fatigue, or a sinking foundation or unauthorised alterations. Zones having a high abundance of buildings in the 22-29 and 30-38 year brackets also exhibit high clustering of vulnerability, especially in areas of high-density residential units with minimum maintenance supervision.

On the other side, it seems that in high-risk zones, more recent buildings (category 2-10 years) are less common, but exceptions for buildings in this group have been found in rapidly growing informal settlements where the quality of construction may be an issue despite the relative recentness. The map clearly shows a spatial correlation between the age of chairs and their structural vulnerability and indicates that the lack of structural management of aging infrastructure, and more specifically applied to those areas with low levels of regulatory enforcement and, therefore, a high public safety and urban health risk.

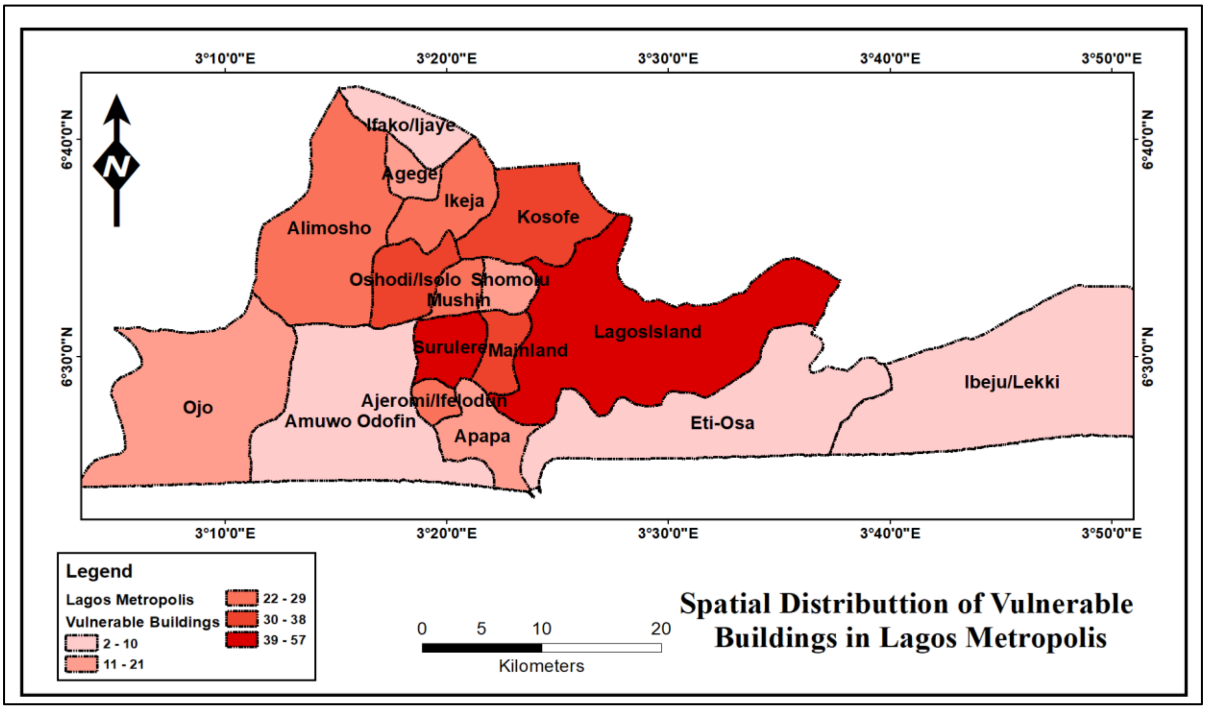


Figure 7: Map showing areas with high concentrations of structurally vulnerable building

Perceptions of Government Response to Collapse Incidents

The study also examined the public's (both residents and professionals) perception of the government's ability to prevent and respond to building collapse. While 79.7% of respondents felt that there are policy frameworks around building safety, only 38.4% felt that the frameworks were effective. Perceptions were highly diverse among the different categories of stakeholders. Government officials tended to give more positive ratings on the implementation of policy than the professionals, developers, or tenants. Summary of stakeholder perceptions and emergency response patterns related to building collapse in Lagos metropolis is given in Table 7.

Analysis confirmed Hypothesis 3, which shows a significant difference in government response perception between the socio-demographic categories and the spatial context ($p<0.05$). Several respondents were also critical of emergency response coordination and support services after collapse that suggested gaps in institutional preparedness and public trust. An Anova summary about the variation in the perception of government response across Stakeholders groups is given in Table 8.

Table 7: Stakeholder Perceptions and Emergency Response Patterns Related to Building Collapse

Focus Area	Key Findings
Stakeholder Perception of Government Efforts	Majority (79.7%) acknowledge government policies exist, but only 38.4% consider implementation effective. Perceptions vary significantly by stakeholder group.
Satisfaction with Enforcement Measures	Government officials report higher satisfaction levels compared to developers, professionals, and residents, who cite weak enforcement as a key concern.
Stakeholder Suggestions for Improvement	Recommendations include stricter enforcement (45.2%), public education (28.7%), and improved response coordination (26.1%).
Proximity to Emergency/Health Facilities	Many collapsed buildings are located beyond a 5 km radius from emergency or health service facilities, indicating critical gaps in spatial accessibility.
Optimised Emergency Response Route	Route analysis shows delayed access to some high-risk zones from LASEMA headquarters due to poor connectivity and traffic congestion.

Table 8: ANOVA Summary: Variation in Perception of Government Response Across Stakeholder Groups

Response Indicator	F-Statistic	p-Value	Significance
Awareness of government efforts	4.62	0.003	Significant
Satisfaction with enforcement	3.98	0.008	Significant
Perception of policy implementation	5.27	0.001	Significant
Perceived effectiveness of emergency response	2.61	0.045	Significant
Overall perception of government preparedness	1.84	0.112	Not significant

4. Discussion

The results provide a complex narrative of the determination of infrastructural fragility which is not randomly distributed but is patterned based on socio-economic, institutional and spatial variables that determine exposure and resilience in urban contexts. These findings have an important consequence for health-informed urban planning, especially in the context of rapidly urbanizing areas in which informal development is much quicker than oversight by regulatory agencies.

The clustering of building collapse in some sections of the urban areas observed validates the spatial non-randomness suggested in Hypothesis 1, and is in line with urban ecological theories such as the concentric zone model (Burgess, 1925). While in Lagos, older structures and highly vulnerable ones seem to be clustered in inner-core areas and also in areas with old infrastructure, informal housing and less historical public investment. These spatial dynamics are the by-product of physical degradation over time but also a manifestation of spatial injustice, in that lower-income populations disproportionately bear built environment risks manifested in direct health burdens.

Further reinforcing this pattern, it was found that buildings with ages of 30-59 years dominated in the high-risk zones. This finding supports the relevance of the Disaster Risk Management (DRM) framework with its stress on the intersection of hazard, exposure and vulnerability in determining disaster outcomes. Older buildings, especially those constructed before the modern safety codes, constitute the chronic hazards hidden in the fabric of cities and, especially when they are part of the denser residential areas, present a mix of health risks during collapse events.

The relationship between building collapse and urban health as reported by respondents can be clearly shown by the experiences reported. The prevalent and most routinely reported negative impacts of earthquakes, death, injury, displacement, and psychological trauma, reflects the public health dimension of structural failure, which is often not recognised in conventional urban risk assessments. In this regard, the findings are on the global literature which emphasizes on the built environment as a determinant of health (Galea et al., 2005; WHO, 2010). That these impacts differ considerably from locality to locality further supports Hypothesis 2 and hints at the uneven urban vulnerability determined by social, economic and institutional factors.

The application of the multiple nuclei model (Harris & Ullman, 1945) further helps in understanding the burden of building collapse not being limited to one urban core but dispersed over polycentric groupings in which land use and governance capacity varies. For instance, although there were newer constructions in some of the peripheral zones with weak enforcement and informal practices resulting in structural vulnerabilities even in areas which are emerging. This polycentric risk geography requires that the building regulation and emergency preparedness approach gets decentralised and takes a context-specific character.

Government response, although recognised in principle, was seen as inconsistent and patchy and ineffective in different parts of the country and professional groups - supporting Hypothesis 3. Although there are frameworks that prescribe the technical guidelines for safe construction such as the Revised LASBCA Regulations (2019), glaring gaps in enforcement and in the public interest were clearly visible. Moreover, results of spatial analyses demonstrated that many of the collapse sites were far from emergency or health service facilities more than 5 km, which illustrates infrastructural gaps in emergency accessibility. This disconnect between policy and capacity on the ground is a parallel with challenges observed in other megacities of the Global South (UN-Habitat, 2016), where planning ideals can too readily be disconnected from spatial equity or health security.

The stakeholder feedback uncovered in table 7 brings more depth to the picture with many stakeholders in the government expressing a generally positive attitude towards interventions and professionals and residents expressing their concerns about the lack of enforcement, limited awareness and lack of preparedness. These findings highlight the importance of inclusive urban governance (a concept that has been widely supported by international research on planning and public health) as a basis for risk reduction and resilience building.

5. Conclusion

This research adds to an emerging body of literature on spatial planning, structural safety and urban health of building collapse in cities. It provides empirical evidence from Lagos that may be relevant to other cities being faced with understanding rapid city growth, loose development and regulatory voids. The combining of the spatial analysis with health risk assessment allows to provide a replicable framework to identify and prioritize high risk zones for prioritized intervention. Addressing building collapse as a public health issue - as this study suggests - requires more than engineering solutions. It calls for urban health-sensitive policy, sustained institutional reform, better urban spatial planning and strategies for involvement of the public-including and for building more safe and equitable cities. Without such integrated responses, traces of the ill-health consequences of structural failures will continue to be in plain sight, across the urban landscapes of the Global South.

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