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Environment–Behaviour Dynamics in Informal Settlements and Health Outcomes in Lagos, Nigeria

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Abstract

Rapid informal development is altering residential settings and everyday behaviours, with implications for health. Quantitative data (n = 184) was utilized to analyse the environment-behavior dynamics that link housing problems, infrastructural inadequacies, and health hazards in Lagos informal settlements. The findings show that widespread perceptions of poor housing, weak design, and restricted services influence hygiene behaviours and exposure to environmental dangers. Malaria, respiratory infections, and mental stress were common and behavioural adaptation and governance weaknesses seem major mediators. The study concludes that integrated housing-health interventions, improved infrastructure, and participatory upgrading are critical for creating healthier, more resilient informal urban communities.

Keywords: Informal urban expansion; Housing quality; Environmental health; Environment–behavior

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1.0 Introduction

Nigeria's metropolitan population is quickly growing, with Lagos State in the forefront of demographic, economic, and spatial upheaval. Urban growth continues to outpace infrastructural development and formal housing supply, increasing reliance on informal settlements in peri-urban districts including Ikorodu, Ibeju-Lekki, and Badagry (Jowell et al., 2025; Muoghalu, 2025). Housing growth in these places

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is primarily self-built, poorly controlled, and plagued by insufficient water, sanitation, drainage, and waste services (Ayeni et al., 2025; Olufadewa et al., 2025). While urbanisation creates economic opportunity, it also poses unequal environmental and health concerns.

Recent research shows that built environment features such as housing quality, density, ventilation, sanitation, and infrastructure influence behavioural patterns and daily interactions with urban environments (WHO, 2023; UN-Habitat, 2024). Overcrowding, floods, inadequate waste management, and heat exposure all have an impact on hygiene practices and coping strategies in informal settlements, contributing to malaria, diarrhoea, respiratory illnesses, and psychosocial stress (Hughes, 2025; Olufadewa, et al., 2025).

Despite increased scholarship, housing and public health are frequently studied separately or at metropolitan dimensions, with little emphasis on environment-behavior interactions in peri-urban settings. Empirical research that include spatial, behavioural, governance, and health dimensions are sparse, limiting evidence-based slum upgrading and health planning.

This study takes an environment-behaviour approach to investigate how built environment characteristics influence people' conduct and health outcomes in Lagos informal settlements. Its objectives are to: (i) Investigate the impact of housing quality and infrastructure provision on residents' environmental behaviours, such as hygiene practices, water storage patterns, sanitation use, ventilation habits, and waste management techniques.(ii) Analyse the relationships between WASH access, ventilation, drainage, housing quality, and the incidence of malaria, diarrhoeal diseases, respiratory infections, skin infections, and mental stress. The study tackles the need for integrated housing-health frameworks that understand the reciprocal relationship between environment and behaviour, as well as supporting sustainable urban growth and inclusive planning in Lagos.

2.0 Literature Review

Rapid urbanisation continues to transform Lagos, where housing demand outstrips supply and informal settlements spread throughout peri-urban corridors (Jowell et al., 2025; Hughes, 2025). Population increase, rural-urban migration, land market exclusion, and inadequate governance are all contributing factors (Ayeni et al., 2025; Muoghalu, 2025). While geospatial studies map urban expansion, experts argue that geographical data alone cannot account for behavioural adaptation and experienced environmental realities (UN-Habitat, 2024; Korah, 2024). Environment-behaviour theory offers a perspective on how physical settings influence human behaviour and well-being. Housing quality, sanitation, ventilation, and neighbourhood circumstances have an impact on daily routines, hygiene practices, and coping mechanisms (WHO, 2023; UN-Habitat, 2024). Flooding, garbage mismanagement, and inadequate housing are examples of environmental stressors in Lagos that increase vulnerability and exposure to health risks. However, research in Nigeria rarely look at behavioural adaptations such as water storage, informal garbage disposal, and home spatial reconfiguration.

Inadequate housing and WASH conditions have been linked to communicable diseases in numerous studies. Poor ventilation and overcrowding aggravate respiratory infections, whereas poor sanitation contributes to diarrhoea and cholera (WHO, 2023). Flooding and stagnant drainage increase malaria risk in Lagos (Muoghalu, 2025; Olufadewa et al., 2025). Recent research focuses on psychosocial stress, heat exposure, and climate-related health concerns (Jowell et al., 2025). Governance is a major factor influencing environmental circumstances. Policy implementation is hampered by fragmented institutions and resource restrictions, while arguments over eviction-driven redevelopment and participatory upgrading options continue (Muoghalu, 2025; UN-Habitat, 2024).

Evidence suggests that community-led upgrading improves environmental stewardship and service uptake (Bongwa & van Dijk, 2021). Four major deficiencies remain: limited integration of environmental-behavioral theory, methodological fragmentation, insufficient attention to climate-related health hazards, and inadequate empirical evaluation of governance measures. Although existing literature on informal settlements in Lagos provides important insights into housing deficits and public health vulnerabilities, four major deficiencies remain. This study addresses these gaps through a deliberately structured environment–behaviour-informed research design that integrates spatial, behavioural, governance, and health dimensions within a unified analytical framework. In addition, the study combined environmental behaviour theory, the socio-ecological model, the Health Belief Model, and social determinants of health perspectives.

According to the environment-behaviour theory, physical environments influence and affect human behaviour. People's daily activities, routines, and perceptions interact with spatial conditions, resulting in dynamic feedback loops that influence both wellbeing and risk exposure.Overcrowding, a lack of sanitation, inadequate drainage, and poor ventilation all have an impact on inhabitants' behaviours in Lagos' informal communities. These behavioural adjustments, in turn, influence exposure to health hazards and people' perceptions of environmental risks. Instead of assuming a linear cause-effect relationship between housing conditions and disease incidence, this study employs environment-behavior theory to explain how environmental constraints, household practices, and adaptive routines work together to mediate health outcomes (UN-Habitat, 2024).

The socio-ecological paradigm emphasises that human behaviour, interpersonal interactions, community norms, institutional environments, and public policy all interact to influence health outcomes. This approach assists in situating environmental-behavioral dynamics within larger sociopolitical contexts. For example, inhabitants' everyday sanitation habits are influenced not just by physical infrastructure (environmental layer), but also by community norms and government actions (institutional/public policy layers). SEM enables researchers to investigate how individual behaviours interact with environmental circumstances and larger governance institutions to influence health outcomes.

The Health Belief Model proposes that people's health-related activities are influenced by their views of susceptibility, severity, advantages, and obstacles to certain health hazards. Residents in informal settlements may adapt to repeated environmental dangers, changing how they perceive risks and take preventive measures. HBM explains why certain populations may underestimate the severity

of unfavourable housing circumstances (risk normalisation) and maintain dangerous behaviours (for example, unsafe water consumption and informal garbage disposal).

According to the structural and social determinants of health theoretical perspective, health outcomes are influenced by broader social, economic, and structural forces such as poverty, governance quality, land administration, service access, and policy frameworks (UN-Habitat, 2024). The idea explains how structural factors such as poor governance, inequitable land allocation, and exclusion from formal infrastructure affect environmental conditions and, consequently, inhabitants' behaviours and health risks. Structural variables explain why some populations (such as women and children) have disproportionate health burdens in Lagos' informal settlements. These theories conceptualises the pathway (Figure 1). The relationship between informal expansion, environmental deficits, behavioural adaptation, and health outcomes is influenced by governance, socioeconomic position, and infrastructure provision.

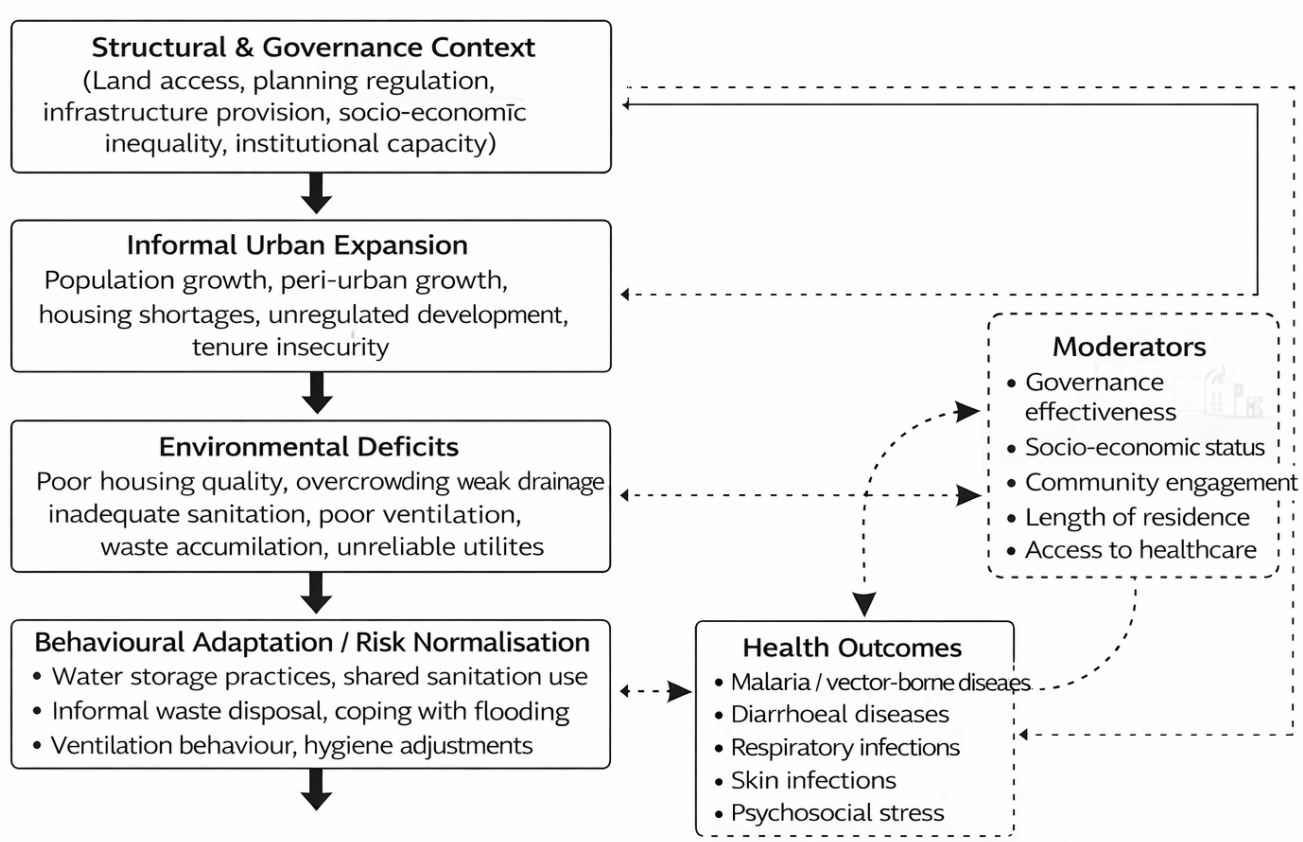

Figure 1: Conceptual framework illustrating the pathway linking informal urban expansion to environmental impact deficits, behavioural adaption processes, and health outcomes in informal settlements, moderated by governance effectiveness

3.0 Methodology

This study used a quantitative research approach to look into the relationship between environment, behaviour, and health outcomes in Lagos' informal settlements. The technique allowed for statistical analysis of the links between environmental factors, behavioural practices, and health outcomes, which is compatible with urban health research that incorporates epidemiological and behavioural insights (WHO, 2023; UN-Habitat, 2024). The study was carried out in selected informal settlements in Lagos, particularly in peri-urban areas like Ikorodu, which are defined by infrastructural inadequacies and significant informal expansion (Jowell et al., 2025; Muoghalu, 2025). The population consisted of adult residents and household heads who had lived there for at least two years. A multi-stage sampling technique was used, including intentional selection of informal communities, stratified random sampling of households, and systematic household selection.

A total of 185 questionnaires were distributed with 184 returned (99% response rate). This is in line with Cochran's sample norms and comparable urban health surveys (Olufadewa et al., 2025). The survey instrument had five sections: socio-demographics, built environment conditions, environmental behaviours, risk perception, and self-reported health outcomes. The variables included WASH access, ventilation, waste management, overcrowding, coping techniques, and diseases such malaria, diarrhoea, respiratory infections, skin infections, and mental stress. Items were assessed using a 5-point Likert scale based on WHO housing and health guidelines (WHO, 2023). Pilot tests yielded good reliability (Cronbach's alpha: 0.70-0.82). Data were gathered through face-to-face interviews with professional enumerators, supplemented by outdoor inspections of housing and environmental factors.

Ethical methods guaranteed informed consent and anonymity. Data were examined with SPSS using descriptive statistics and correlation analysis (Kendall's tau-b, Spearman's rho). Kendall's tau-b correlation analysis was used because the study variables were measured using ordinal Likert-scale responses and did not meet the parametric assumptions required by Pearson's correlation. Kendall's

tau-b provides a reliable measure of the monotonic relationship between environmental exposure measures and reported health outcomes in informal settlement settings.The analysis outcome was according to Muoghalu (2025) and Olufadewa et al. (2025), which found that the relationship between built environment, behaviour, risk perception, and health outcomes is mediated by governance, socioeconomic status, and length of residency.

4.0 Findings

The results show acceptable reliability and a wide demographic profile, indicating varying environmental knowledge and coping practices. The demographic profile reveals a diversified respondent base, dominated by working-age people and long-term residents, reflecting their lived experience in informal settlements. Educational and vocational variety indicate varying levels of environmental awareness, adaptive behaviour, and health risk perception all of which are regarded as crucial in environment-behaviour research. According to the findings in Table 1, respondents saw an increase in informal settlements, poor home development, and infrastructure inadequacies.

Table 1: Residents' perceptions of informed urban housing on residence

Variable	SD	D	N	A	SA	Mean value	Decision
Informal settlements are increasing in my area.	12 (6.5)	33 (17.9)	29 (15.8)	48 (26.1)	62 (33.7)	3.63	Agree
Housing structures in informal areas are poorly constructed.	15 (8.2)	32 (17.4)	15 (8.2)	36 (19.6)	86 (46.7)	3.79	Agree
My living environment lacks proper planning and infrastructure.	18 (9.8)	24 (13)	35 (19)	58 (31.5)	49 (26.6)	3.52	Agree
Informal urban expansion contributes to overcrowding in homes.	19 (10.3)	29 (15.8)	28 (15.2)	64 (34.8)	44 (23.9)	3.46	Neutral
Poor housing conditions in my area affect my household's health	16 (8.7)	31 (16.8)	33 (17.9)	37 (20.1)	67 (36.4)	3.59	Agree
Waste management systems in this area are inadequate.	20 (10.9)	33 (17.9)	22 (12)	53 (28.8)	56 (30.4)	3.50	Neutral
Access to clean water and sanitation is limited in informal settlements	27 (14.7)	25 (14.7)	35 (19.0)	48 (26.1)	49 (26.6)	3.36	Neutral
The government has failed to control informal urban expansion in this area	23 (12.5)	26 (14.1)	33 (17.9)	38 (20.7)	64 (34.8)	3.51	Agree

Poor drainage, waste management, sanitation, and utilities were among the environmental issues, as reported in recent urban studies. Spatial disparity was visible, with fast informal expansion in peri-urban areas like Ikorodu, Ajegunle, and Surulere. Correlation analysis revealed that informal expansion had a modest impact on structural dwelling quality but did influence access to water and sanitation, implying incremental service adaption.

Table 2 shows the relationship between informal housing characteristics and selected health outcomes, as viewed through an environment-behaviour perspective. The findings show that informal settlements, poorly constructed dwellings, low sanitation, and overcrowding have no significant association with respiratory ailments, skin infections, or mental stress ($p > 0.05$). This shows that the relationship between housing design and certain health consequences may be indirect, mediated by behavioural adaptability, coping mechanisms, and social environment rather than structural circumstances alone. However, issues related to governance had a greater impact on health.

Table 2: Correlation between health outcomes and informal housing

			Informal settlements increasing	Poorly constructed informal housing	Limited clean water/sanitation due to informal urban expansion	Government failed to control expansion	Overcrowding in homes due to informal urban expansion
Kendall's tau_b	Respiratory diseases	Correlation Coefficient	-.061	-.063	-.038	.070	-.003
		Sig. (2-tailed)	.309	.304	.525	.244	.967
	Malaria/vector-borne diseases	Correlation Coefficient	.037	.082	-.007	**.120***	.064
		Sig. (2-tailed)	.537	.179	.902	**.045**	.287
	Diarrhea diseases (e.g., typhoid, cholera)	Correlation Coefficient	-.022	.061	-.028	**.118***	.111
		Sig. (2-tailed)	.712	.315	.636	**.049**	.064
	Skin diseases	Correlation Coefficient	-.006	.013	.064	-.031	.002
		Sig. (2-tailed)	.920	.827	.280	.600	.972
	Mental stress	Correlation Coefficient	.068	.088	.044	.107	.033
		Sig. (2-tailed)	.255	.148	.463	.073	.585
		N	184	184	184	184	184

Perceived government inability to restrict informal expansion was significantly associated with malaria/vector-borne diseases (τ =

0.120; p = 0.045) and diarrhoeal disorders (τ = 0.118; p = 0.049). This means that inadequate institutional control over settlement expansion, infrastructure provision, and environmental management increases vulnerability to environmental health risks. Poor regulation frequently results in poor drainage, hazardous sanitation, and unplanned spatial expansion, all of which promote disease transmission. From an environment-behaviour viewpoint, these data imply that health outcomes in informal settlements are influenced not only by housing conditions, but also by governance efficacy and inhabitants' behavioural reactions to environmental restrictions.

Additionally, institutional failure and environmental mismanagement elevated communicable disease risk dramatically. Furthermore, the lack of strong correlations between informal housing indicators and mental stress or respiratory illnesses could indicate behavioural normalisation and adaptation among residents, in which prolonged exposure to poor environmental conditions reduces perceived risk or influences coping strategies. The findings data show that environmental-behavioral dynamics particularly governance quality, sanitation practices, and environmental management which have a significant impact on health outcomes in Lagos informal settlements. These findings emphasise the importance of integrated interventions that address infrastructure provision, behavioural change, and institutional capacity simultaneously, rather than focusing exclusively on housing structures.

Table 3 depicts the link between housing quality and public health outcomes in informal settlements, emphasising how built environment conditions influence health via environment-behavior pathways. The findings reveal strong negative relationships between major housing quality measures and a variety of health outcomes, implying that better environmental conditions reduce disease incidence and psychosocial stress. The quality of home construction had a strong inverse connection with diarrhoeal diseases (τ = -0.129; p = 0.030), skin infections (τ = -0.120; p = 0.043), and mental stress (τ = -0.189; p = 0.001). This means that better-built housing decreases environmental exposure, increases safety and comfort, and boosts well-being.

Table 3: Relationship between Housing Standards and Public Health Outcomes

		Quality of housing construction	Access to potable water	Toilet facilities	Waste disposal & drainage	Air quality &ventilation	Electricity & cooking facilities	Proximity to healthcare
Respiratory diseases	Correlation Coefficient	.072	**-.150***	**-.211****	**-.124***	-.111	-.021	-.064
	Sig. (2-tailed)	.227	**.012**	**.000**	**.037**	.061	.723	.288
Malaria/vector-borne diseases	Correlation Coefficient	-.076	-.098	**-.215****	**-.144***	**-.199****	-.031	-.021
	Sig. (2-tailed)	.200	.099	**.000**	**.015**	**.001**	.598	.731
Diarrhea diseases (e.g., typhoid, cholera)	Correlation Coefficient	**-.129***	**-.185****	**-.134***	**-.130***	**-.149***	**-.162****	-.094
	Sig. (2-tailed)	**.030**	**.002**	**.024**	**.028**	**.012**	**.006**	.114
Skin diseases	Correlation Coefficient	**-.120***	**-.187****	**-.248****	**-.174****	**-.155****	.016	-.093
	Sig. (2-tailed)	**.043**	**.002**	**.000**	**.004**	**.009**	.789	.119
Mental stress	Correlation Coefficient	**-.189****	**-.130***	-.081	**-.166****	-.108	-.061	-.042
	Sig. (2-tailed)	**.001**	**.029**	.173	**.005**	.069	.305	.480
	N	**184**	**184**	184	**184**	184	184	184

Access to potable water has a strong negative correlation with respiratory disorders (τ = -0.150; p = 0.012), diarrhoeal diseases (τ = -0.185; p = 0.002), skin infections (τ = -0.187; p = 0.002), and mental stress (τ = -0.130; p = 0.029). These findings emphasise the importance of water access in changing hygiene practices and mitigating environmental health concerns. Similarly, enhanced toilet facilities were substantially associated with lower respiratory illnesses, malaria/vector-borne diseases, diarrhoeal diseases, and skin infections, highlighting the relevance of sanitation infrastructure in communicable disease management. Waste disposal and drainage also had substantial inverse correlations with respiratory ailments, malaria, skin infections, and mental stress, demonstrating that environmental management lowers exposure to contaminated environments and disease vectors.

Air quality and ventilation were found to be strongly associated with reduced malaria, diarrhoeal illnesses, and skin infections, demonstrating the importance of indoor environmental conditions in determining health outcomes. Electricity and cooking facilities influenced diarrhoeal illnesses, implying a relationship between energy access, home habits, and environmental health. From an environmental-behavioral standpoint, the data show that housing standards influence daily behavioural patterns such as cleanliness routines, ventilation techniques, and waste management that mediate health consequences. Improvements in housing and environmental services lower residents' risk exposure while increasing adaptive ability. The findings demonstrate that the quality of the built environment and the behaviours it promotes have a significant impact on health outcomes in informal settlements. increasing housing standards, WASH infrastructure, ventilation, and environmental management is thus critical for increasing health and wellbeing in Lagos' informal settlements.

5.0 Discussion

The findings demonstrate that informal settlements are socio-environmental systems in which built environment conditions and behaviours interact to influence health outcomes. Environmental deficiencies influence coping mechanisms, risk perception, and exposure patterns (UN-Habitat, 2024; WHO, 2023). Improved WASH infrastructure dramatically lowered disease incidence,

corroborating global data that cleanliness practices mitigate environmental health hazards. Behavioural adaptation, such as shared sanitation and informal water sourcing, influences exposure and susceptibility.

Long-term residents' risk normalisation explains why informal expansion did not consistently predict home deterioration, which is consistent with research on adaptive behaviour in informal communities (Olufadewa et al., 2025). Mental stress appeared as a significant result, emphasising the psychosocial effects of overpopulation, tenure insecurity, and environmental instability (Jowell et al., 2025). Governance failures also influenced illness prevalence, highlighting the importance of institutional quality in modulating health outcomes (Hughes, 2025). The findings encourage participatory upgrading and integrated planning that connects housing, health, and behaviour.

The apparent disparity between governance-related indicators and housing service factors reflects disparities in the extent to which environmental influences influence health outcomes. While settlement-level indicators such as poor housing and overcrowding had no statistically significant associations with several diseases, infrastructure-specific variables such as potable water access, sanitation facilities, drainage conditions, and ventilation had strong negative relationships with communicable and psychosocial health risks. This shows that governance failings have an indirect impact on health via environmental service provision rather than settlement morphology alone. These findings lend support to an environment-behaviour theory in which structural governance circumstances indirectly impact environmental risk.

From an environmental-behavioral standpoint, the study confirms that: (i) The built environment influences behavioural reactions. (ii) Behavioural adaptation mitigates environmental health risks. (iii) Governance structures influence environmental quality and behavioural results. These findings build on prior Lagos-based studies that focused exclusively on housing inadequacies, incorporating behavioural and psychosocial factors into the housing-health nexus.

The findings have far-reaching consequences for rapidly urbanising African cities in the following ways: (i) Integrated planning: Housing, health, and behavioural issues must be addressed concurrently. (ii) Climate resilience: Environmental vulnerabilities like flooding and heat stress necessitate adaptive infrastructure and behavioural changes. (iii) Community-led upgrading: Participatory governance promotes behavioural change and infrastructure sustainability. (iv) Public health integration: Strategies for illness prevention, mental health support, and environmental health must all be included in urban design. Thus, by placing health outcomes within environmental-behavioral dynamics, the study provides a comprehensive framework for understanding informal urban life and designing long-term treatments in Lagos and other cities.

6.0 Conclusion and Recommendations

The study found that environmental-behavioral dynamics have a major impact on health outcomes in Lagos' informal settlements. Inadequate WASH, ventilation, waste management, and utilities were highly linked to communicable diseases and mental stress, whereas enhanced infrastructure reduced these risks. These correlations were mediated by behavioural adaptation and the quality of governance. Improving health outcomes necessitates integrated interventions that target infrastructure, behavioural patterns, and governance systems simultaneously.

Recommendations include (i) Implement participatory slum improvement, including WASH, drainage, ventilation, and secure tenure. (ii) Encourage better governance coordination and community involvement in planning. (iii) Encourage behavior-change programs for hygiene, sanitation, and environmental practices. (iv) Integrate mental health services into community health systems. (v) Invest in climate-resilient infrastructure to prevent eviction-driven redevelopment.

The study used cross-sectional, self-reported data, restricting causal inference and clinical validation. Sample size and purposeful site selection limit generalisability across Lagos. Measurement reliability issues in behavioural constructs highlight the need for improved techniques. Rapid urbanisation may also have an impact on contextual relevance. Future studies should use longitudinal designs, combine self-reports with objective environmental and health data, integrate GIS and remote sensing, improve behavioural instruments, and include seasonal sampling.

Paper Contribution to Related Field of Study

This study contributes to informal settlement research by incorporating environmental-behavioral theory into housing-health analysis. It reveals how environmental factors affect health both directly and indirectly through behavioural adaptation and risk perception. Methodologically, it blends quantitative housing-health correlations, behavioural indicators and governance variables. It presents new evidence from Lagos that connects infrastructural shortfalls, governance shortages, behavioural adaptation, and health consequences. Policy-wise, it encourages participatory upgrading, behavior-change programs, and health-sensitive urban planning. The study provides a transportable framework for rapidly urbanising African cities and adds to multidisciplinary discussions on sustainable urban development, environmental justice, and health equity.

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