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Analysis of Housing Conditions and Health in Uyo Senatorial District, Akwa Ibom State Nigeria

Utibe Michael Usanga
Kemfon Aniedi Essien
Department of Geography and Natural Resources Management,
University of Uyo, Uyo, Akwa Ibom State, Nigeria.
E-mail: utibeusan@gmail.com

ABSTRACT

Housing conditions are important determinants of health and contribute significantly to disease burden. This study investigated the relationship between housing conditions and health in Uyo Senatorial District, Akwa Ibom State, Nigeria, using a spatial epidemiological approach. We adopted a mixed-methods approach with a cross-sectional survey. A sample of 384 households selected through multistage sampling was used for the study. Data were collected using structured questionnaires, housing condition checklists, Focus Group Discussions and Key Informant Interviews. Descriptive statistics and binary logistic regression were used for analysis. The results showed that malaria, respiratory tract infections, typhoid fever, and diarrhoeal diseases were the predominant housing-related health outcomes. Poor waste disposal, environmental risk exposure, overcrowding, and inadequate sanitation significantly increased the likelihood of adverse health outcomes, whereas access to potable water, basic services, and a clean residential environment reduced disease risk ($p < 0.05$). Spatial analysis further revealed marked geographical inequalities in housing-related health risks across the district. The study concludes that improving housing quality, environmental infrastructure, and access to basic services, supported by GIS-informed planning, is essential for reducing housing-related health risks and improving population health.

Keywords: *Housing conditions; Health; Spatial Analysis; Geographic Information Systems; Uyo Senatorial District; Akwa Ibom State*

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1. Introduction

Housing is widely recognized as a fundamental social determinant of health because it shapes the physical, environmental, and socio-economic conditions in which people live. Housing conditions such as overcrowding, poor ventilation, unsafe water supply, inadequate sanitation, ineffective waste disposal, poor drainage, and substandard building materials have consistently been associated with increased risks of malaria, diarrhoeal diseases, typhoid fever, respiratory tract infections, tuberculosis, and mental health disorders. Consequently, improving housing conditions has become a global public health priority. The global burden of inadequate housing remains substantial. According to the World

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Health Organization (WHO), approximately 1.6 billion people live in inadequate housing, while unhealthy residential environments contribute significantly to preventable diseases and widening health inequalities. Similarly, the United Nations Human Settlements Programme (UN-Habitat) reports that nearly half of the urban population in sub-Saharan Africa resides in informal settlements characterized by overcrowding, poor environmental sanitation, unreliable water supply, inadequate waste management, and limited access to durable housing. These conditions create environments conducive to the transmission of vector-borne, water-borne, and respiratory diseases, particularly among vulnerable populations.

Nigeria faces deplorable conditions of housing as many households lack reliable drainage systems, potable water, adequate sanitation facilities, effective solid waste management, and infrastructure. These deficiencies contribute to persistent outbreaks of environmentally related diseases such as malaria, typhoid fever, diarrhoeal diseases, and respiratory tract infections. Previous studies in Nigeria have reported significant associations between poor housing conditions and adverse health outcomes, emphasising that housing is both a public health and sustainable development concern (Adebowale et al., 2017 and Ezeh et al., 2024).

Housing conditions and health outcomes are rarely distributed evenly across geographical space. Variations in environmental quality, infrastructure provision, socio-economic status, settlement patterns, and institutional support create spatial inequalities in both housing quality and disease occurrence. Recent advances in Geographic Information Systems (GIS) and spatial epidemiology have enhanced understanding of how environmental and housing conditions influence disease distribution by identifying geographical clusters of health risks and vulnerable communities. Although some studies have separately examined housing conditions, disease patterns, or their spatial dimensions, relatively few have integrated housing characteristics, epidemiological data, and spatial analytical techniques within a single analytical framework, particularly in developing countries (Badaru et al., 2014; Adebowale et al., 2017 and Iyanda et al., 2021).

Uyo Senatorial District in Akwa Ibom State has experienced rapid urban growth over the past two decades, accompanied by increasing demand for housing and public infrastructure. While some communities have benefited from improved housing and environmental services, others experience overcrowding, inadequate sanitation, poor drainage, unsafe water sources, ineffective waste disposal, and insufficient environmental infrastructure. These disparities are likely to contribute to variations in housing-related health outcomes across the district. Nevertheless, empirical evidence integrating housing characteristics, spatial disease patterns, and epidemiological analysis remains limited. Existing studies have largely relied on descriptive assessments or conventional statistical analyses without GIS-based spatial analysis and multivariate epidemiological modelling to identify localised health risks and their determinants.

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Addressing this knowledge gap is essential for developing evidence-based housing and environmental health planning policies. Essentially, therefore, understanding the spatial distribution of housing conditions, identifying the major housing-related diseases, quantifying the relationship between housing conditions and health outcomes, and evaluating the influence of institutional and infrastructural factors formed the basis for this study, which seeks to:

1. Assess housing conditions among households in Uyo Senatorial District;
2. Identify the major housing-related health outcomes in the study area; and
3. Determine the relationship between housing conditions and health outcomes

2. Description of Study Area

The study was conducted in Uyo Senatorial District, Akwa Ibom State, Nigeria.

a. Location

The study was conducted in Uyo Senatorial District, Akwa Ibom State, Nigeria, located approximately between latitudes 4°45′N and 5°30′N and longitudes 7°45′E and 8°15′E (Figure 1). The district comprises nine Local Government Areas (LGAs): Uyo, Itu, Ibiono Ibom, Ibesikpo Asutan, Nsit Ibom, Nsit Atai, Nsit Ubium, Etinan, and Uruan. Uyo serves as the major administrative and urban centre of the district.

b. Population

The district has experienced population growth and increasing urbanisation, particularly around Uyo and adjoining areas. This growth has increased demand for residential land, housing, and basic infrastructure. Recent spatial analysis of Uyo indicates substantial expansion of built-up areas, with population and economic growth identified among the major drivers of urban expansion (Ituen et al., 2025).

c. Settlement Structure

The settlement structure comprises urban, peri-urban, and rural communities, with greater population concentration and development around Uyo. Urban expansion has extended outward from the city core, with road infrastructure influencing the direction and pattern of growth (Ituen et al., 2025).

d. Housing Development

Housing development has expanded alongside urbanisation and population growth. In Uyo metropolis, housing among lower-income groups is characterised by overcrowding and inadequate access to facilities such as toilets, bathrooms, kitchens, water supply, and other basic amenities (Wizor and Le-ol Anthony, 2020). Earlier research also reported significant variations in housing-health conditions among residential zones in Uyo, particularly in

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relation to sanitation, crowding, ventilation, refuse disposal, building materials, and environmental quality (James *et al*., 2012).

e. Health

Housing conditions and environmental quality have important implications for health in the district. Research in Uyo found that several housing-health indicators fell below recommended standards and that housing-health status varied significantly among residential zones (James *et al.,* 2012). These variations in housing conditions, settlement characteristics, and access to basic services provide an appropriate context for examining the spatial relationship between housing conditions and health outcomes in Uyo Senatorial District.

3. Materials and Method

This study used a mixed-methods cross-sectional approach to examine housing conditions and health outcomes in Uyo Senatorial District, Akwa Ibom State, Nigeria.

This study adopted a mixed-methods cross-sectional survey of housing conditions and health in Uyo Senatorial District, Akwa Ibom State. Quantitative data were obtained through household surveys, while qualitative data were collected through Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs). Secondary data, including health records, GIS datasets, and urban planning information, complemented the primary data.

The study population comprised households across the nine Local Government Areas (LGAs) of Uyo Senatorial District. Household heads or adult representatives aged 18 years and above participated in the survey, while community leaders, environmental health officers, healthcare workers, and other relevant stakeholders participated in the qualitative component. A minimum sample size of 384 households was proportionally allocated across the LGAs based on projected population. A multistage sampling technique was employed. First, the sample was proportionally distributed across the nine LGAs. Second, two communities were selected from each LGA to represent urban and rural settings: Okwo Nsit, Nung Udoe, Idu, Ikot Edibon, Ikot Uyo Nsit, Ntak Inyang, Atan, Ikot Nseyen, Odoro Ididep, Etinan Urban, Afaha Offiong, Use Offot, Mbiabong Anyanya, Ikot Andem Itam, Ikot Udoh Eyoh, Okoita, Odot, and Ekim Enen. Finally, households were selected using systematic sampling.

Housing condition served as the primary exposure variable and was assessed using indicators including housing type, structural quality, overcrowding, ventilation, lighting, water supply, sanitation facilities, waste disposal, electricity, drainage, road infrastructure, environmental quality, and access to basic services. Health outcomes included malaria, respiratory tract infections, typhoid fever, and diarrhoeal diseases. Additional variables included socio-demographic and household characteristics and spatial location.

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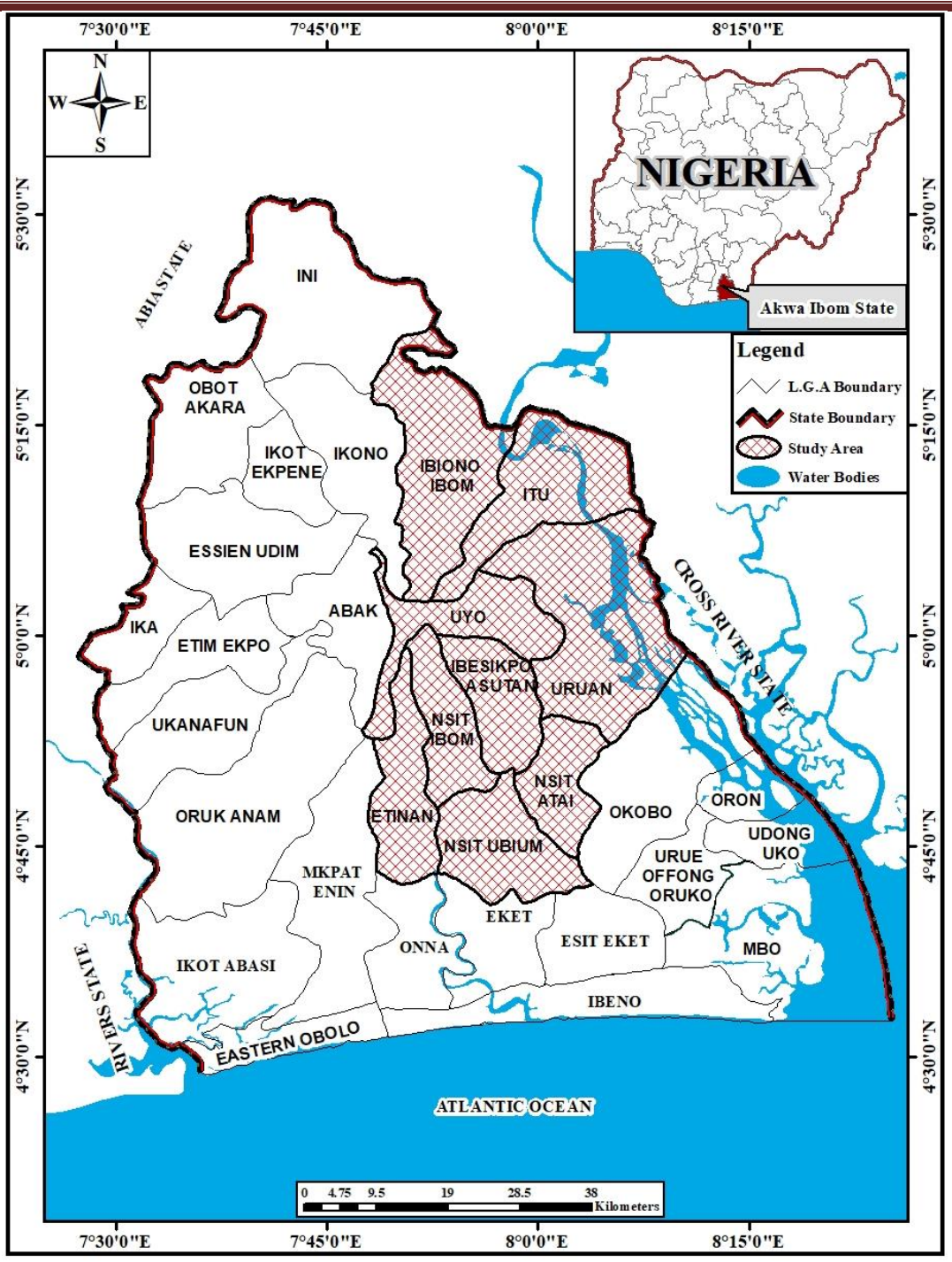


Figure 1: Akwa Ibom State Showing the Study Area

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Primary data were collected using structured questionnaires, housing observation checklists, GPS coordinate recording, FGDs, and KIIs. Additional information was obtained from National Health Management Information System (NHMIS) records, health facility records, administrative maps, GIS datasets, and field observations. GPS coordinates were recorded for sampled households and relevant locations to support spatial analysis. Information on housing conditions and health outcomes was obtained through household surveys and available health records.

Data were analysed using IBM SPSS and GIS software. Descriptive statistics were used to summarise housing characteristics and health outcomes. Binary logistic regression was employed to examine the relationship between housing conditions and health outcomes. The housing-condition variables were coded as 0 for the absence of an adverse condition or good/adequate housing status and 1 for the presence of an adverse condition or poor/inadequate housing status. The health outcome variable was coded as 0 for the absence and 1 for the presence of an adverse health outcome. The regression model was assessed using the Nagelkerke R^2, Hosmer–Lemeshow goodness-of-fit test, and Omnibus Test of Model Coefficients. Spatial analysis integrated survey data, GPS coordinates, and health records to examine the distribution of housing conditions and disease occurrence across the study area. Statistical significance was set at $p < 0.05$.

Ethical approval was obtained from the relevant institutional ethics committee before the commencement of data collection. Administrative permission and written informed consent were obtained before data collection. Participants were informed about the purpose of the study and the nature of their involvement. Participation was voluntary, and respondents were free to decline participation or withdraw at any stage without penalty. Confidentiality and anonymity were maintained throughout the research process, and the information collected was used solely for academic and research purposes.

4. RESULTS

i. Housing Conditions in the Study Area

A total of 384 households were assessed across the study area. The housing-condition variables examined included housing type, overcrowding, water supply, electricity, sanitation facilities, waste disposal, drainage, road infrastructure, and environmental quality. Bungalows constituted the predominant housing type, accounting for 70.3% of the sampled dwellings, followed by flats/apartments (13.0%), self-contained units (8.9%), and duplexes (7.8%). Household overcrowding was reported in 72.9% of households. Access to water supply (93.8%), electricity (91.1%), sanitation facilities (80.7%), and organised waste disposal (89.8%) was relatively high across the study area. However, differences were observed in the quality, reliability, and accessibility of these services among the sampled communities. Drainage and road infrastructure also varied considerably, with some communities characterised by inadequate drainage, poor road

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conditions, and other environmental deficiencies. These conditions were particularly evident in locations with poorer housing environments, as illustrated in Figure 1.1.



Figure 1: Representative photographs of substandard housing conditions showing dilapidated mud structures and abandoned buildings in the study area.

Table 1: Housing and Infrastructure Characteristics in the study area

Characteristic	Category	Frequency (n)	Percentage (%)
Housing type	Bungalow	270	70.3
	Flat/apartment	50	13.0
	Self-contained unit	34	8.9
	Duplex	30	7.8
Living conditions	Overcrowded household	280	72.9
Basic services and amenities	Access to water supply	360	93.8
	Access to electricity	350	91.1
	Organised waste disposal	345	89.8
	Access to sanitation facilities	310	80.7
Housing quality and environmental conditions	Poor ventilation and inadequate lighting	266	69.3
	Poor drainage	269	70.0

Source: Field Survey Data, 2026.

ii. Major Housing-Related Health Outcomes

Malaria emerged as the most frequently reported health condition and constituted the greatest disease burden across the study area. Respiratory tract infections ranked second, followed by typhoid fever and diarrhoeal diseases. Higher disease prevalence was reported in communities characterised by poor drainage, overcrowded housing, inadequate sanitation, unsafe water sources, and ineffective waste management. Seasonal patterns further indicated that malaria incidence peaked during the rainy season, whereas respiratory tract infections were more prevalent during the Harmattan season. These patterns suggest

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possible relationships between environmental and housing conditions and disease occurrence.

Table 2: Major Housing-Related Health Outcomes and Associated Environmental Risk Factors in the study area

Rank	Health outcome	Major environmental/housing risk factor	Peak season
1	Malaria	Poor drainage, stagnant water, overcrowding	Rainy season
2	Respiratory tract infections	Overcrowding, poor ventilation	Harmattan
3	Typhoid fever	Unsafe water supply, inadequate sanitation	Year-round
4	Diarrhoeal diseases	Ineffective waste disposal, unsafe water	Rainy season

Note: The ranking and seasonal patterns should be retained only if supported by the household survey or health records.

iii. Relationship Between Housing Conditions and Health Outcomes

The housing-condition variables were measured as binary variables and coded as 0 and 1, where 0 represented the absence of the adverse condition or a good/adequate housing status, while 1 represented the presence of the adverse condition or a poor/inadequate housing status. The health outcome variable was similarly coded as 0 for absence and 1 for presence of the specified adverse health outcome. These binary variables were used in the logistic regression analysis to estimate the associations between housing conditions and health outcomes. Binary logistic regression analysis revealed statistically significant associations between housing conditions and health outcomes. The model explained approximately 52.1% of the variation in the modelled health outcome (Nagelkerke R^2 = 0.521). The Hosmer–Lemeshow goodness-of-fit test indicated an adequate model fit (χ^2 = 6.214, p = 0.624), while the Omnibus Test confirmed that the overall model was statistically significant (χ^2 = 128.560, $p < 0.001$).

Among the significant predictors, improper waste disposal (OR = 3.32), environmental risk exposure (OR = 3.00), household overcrowding (OR = 2.58), and inadequate sanitation (OR = 2.34) were associated with increased odds of adverse health outcomes ($p < 0.05$). Conversely, access to potable water (OR = 0.50), access to basic services (OR = 0.52), and a clean residential environment (OR = 0.55) were associated with reduced odds of disease occurrence.

Table 3: Binary Logistic Regression Showing Housing Indicators as Predictors of Health Outcomes

Predictor	Odds ratio (OR)	Effect	Significance
Improper waste disposal	3.32	Increased odds	$p < 0.05$
Environmental risk exposure	3.00	Increased odds	$p < 0.05$

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Household overcrowding	2.58	Increased odds	$p < 0.05$
Inadequate sanitation	2.34	Increased odds	$p < 0.05$
Access to potable water	0.50	Reduced odds	$p < 0.05$
Access to basic services	0.52	Reduced odds	$p < 0.05$
Clean residential environment	0.55	Reduced odds	$p < 0.05$

Source: Field Data, 2026.
Model diagnostics: Nagelkerke $R^2 = 0.521$; Hosmer–Lemeshow test: $\chi^2 = 6.214$, $p = 0.624$; Omnibus test: $\chi^2 = 128.560$, $p < 0.001$.

5. Discussion of Findings

The findings revealed that housing conditions in Uyo Senatorial District were characterised by relatively high access to basic services alongside persistent deficiencies in housing adequacy and environmental quality. Bungalows were the predominant housing type (70.3%), while overcrowding affected 72.9% of households. Although access to water supply (93.8%), electricity (91.1%), organised waste disposal (89.8%) and sanitation facilities (80.7%) was relatively high, poor ventilation and inadequate lighting affected 69.3% of households, while poor drainage remained a notable concern. These findings indicate that access to basic services does not necessarily guarantee satisfactory housing conditions. Howden-Chapman *et al.* (2023) similarly emphasised the importance of housing quality to health and well-being. The high prevalence of overcrowding is particularly important because limited living space may compromise privacy, restrict ventilation and increase close contact among household members. Poor drainage and inadequate environmental management may also expose residents to environmental hazards. These findings suggest that housing improvement should extend beyond the provision of basic infrastructure to include adequate living space, improved ventilation, functional drainage and effective environmental sanitation. Such measures are particularly relevant to settlements experiencing population growth and increasing demand for housing.

The study identified malaria, respiratory tract infections, typhoid fever and diarrhoeal diseases as the major health outcomes considered among households and in available health records. Malaria was particularly prominent. Its occurrence is relevant to environmental conditions such as poor drainage and stagnant water, which may create suitable mosquito-breeding habitats. Kua and Lee (2021), in a systematic review and meta-analysis, examined the potential contribution of housing interventions to the prevention of malaria and other mosquito-borne diseases. Their findings support the relevance of housing improvements as a complement to established malaria-control measures. Respiratory tract infections may be associated with overcrowding and inadequate ventilation, which can increase close contact and affect indoor air quality. Similarly, typhoid fever and diarrhoeal diseases highlight the importance of safe water, adequate sanitation and effective waste

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management. Wolf *et al*. (2023) demonstrated the substantial disease burden associated with unsafe drinking water, inadequate sanitation and insufficient hygiene. In the study area, therefore, improving drainage, water quality, sanitation and waste disposal may help reduce exposure to environmental health risks. Nevertheless, the reported disease patterns should not be interpreted as proof that the observed housing deficiencies directly caused these illnesses, since health outcomes are influenced by several environmental, behavioural and individual factors.

The binary logistic regression model was statistically significant ($\chi^2 = 128.560$, $p < 0.001$), with a Nagelkerke R^2 of 0.521. The Hosmer–Lemeshow test was not statistically significant ($\chi^2 = 6.214$, $p = 0.624$), indicating no evidence of poor fit according to this test. Improper waste disposal had the highest reported odds ratio (OR = 3.32), followed by environmental risk exposure (OR = 3.00), household overcrowding (OR = 2.58) and inadequate sanitation (OR = 2.34). These factors were associated with increased odds of the modelled adverse health outcome ($p < 0.05$). Conversely, access to potable water (OR = 0.50), basic services (OR = 0.52) and a clean residential environment (OR = 0.55) were associated with lower odds. Assuming the outcome was coded as 1 for an adverse health outcome, these results suggest that access to essential services and a healthier residential environment may reduce exposure to housing-related health risks. The findings are consistent with evidence highlighting the importance of housing quality and safe water, sanitation and hygiene in population health (Howden-Chapman *et al*., 2023; Wolf *et al.*, 2023). Overall, the regression findings demonstrate that the relationship between housing conditions and health extends beyond dwelling type to include overcrowding, waste disposal, sanitation, environmental exposure and access to essential services. Improving these conditions requires coordinated housing, infrastructure and environmental health interventions. However, because the study employed a cross-sectional design, the results establish statistical associations rather than causal effects.

6. Conclusion

This study examined housing conditions and their relationship with health outcomes in Uyo Senatorial District, Akwa Ibom State, Nigeria. The findings revealed that relatively high reported access to basic services coexisted with significant housing and environmental deficiencies, particularly overcrowding, poor ventilation, inadequate lighting and poor drainage. Malaria, respiratory tract infections, typhoid fever and diarrhoeal diseases were identified as the major health outcomes considered in the study. The regression analysis demonstrated significant associations between the modelled adverse health outcome and several housing and environmental factors. Improper waste disposal, environmental risk exposure, overcrowding and inadequate sanitation were associated with higher odds, whereas access to potable water, basic services and a clean residential environment was associated with lower odds. These findings highlight the need for an integrated approach to

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housing and environmental health that prioritises adequate living space, safe water, functional sanitation, effective waste disposal and proper drainage. Addressing these deficiencies through coordinated housing policies, settlement planning and public health interventions could help reduce environmental health risks and promote healthier living conditions across Uyo Senatorial District.

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