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Housing Quality Assessment and Health of Residents in Ekong Anaku, Akamkpa Local Government Area of Cross River State

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ABSTRACT

Housing quality assessment and its relationship to human health is the thrust of this study. The study area is the rural community of Ekong Anaku in Akamkpa, east, Akamkpa Local Government Area, Cross River State Nigeria. The background to this study that housing quality consideration has not been considered paramount by housing developers in many developing world. And there is also significant ignorance of the knowledge of housing impact on different ailments associated with it. The problem statement emanated from the established background and its directs attention to the fact that existing literature provides little or no clue on studies carried on the connection between housing quality and human health status. The objectives are also stated to capture need for understanding housing quality criteria, the extent of residents' awareness of the relationship between housing quality and human health and the essence of the prevalence of incidence of diseases related to housing quality in the area of study. Accordingly, the justification of the study was spelt out on the basis of its validity in environmental health planning, its ability in architectural making and the likes. The literature was reviewed in line with key parameters of the study objectives such as Housing quality assessment standards analysis, environmental quality explanations, epidemiological conditions of housing quality and possible etiologist of diseases and so on. Outputs/anticipated results were brought out namely, (i) the essence of a clear understanding of the demographic characteristics of the people, (ii) identification/designation of the etiology of the prevailing ailments associated poor housing quality (iii) vivid understanding, the environmental quality of the area and so on.

Introduction/background

Housing quality considerations and criteria are numerous and complex. The physical architectural characteristics such as structural design, the nature of insulation which may cause dampices or moulding, lack of heating and ventilation are all part of factors of major concern. (WHO 1995). The nature of the built environment can present a significant quality issue in a house. It has been reported that poor physical environment can inhibit or permanently damage a child's physical and mental health (Hardoy et al 1992). Location of houses can also be considered in its quality assessment such sitting of buildings close to areas liable to flooding, gully cites, areas close to markets, excessive noise environments such as heavy industrial sites or factories, churches with extremely loud public address system and so on. (Michael et al 2010).

Neighbourhood assessment is also an important consideration. Many aspects of neighbourhood criteria are determinant in housing quality assessment such as type of energy use by individual, waste disposal method, level of sanitation in individual neighbours etc. (Olukolajo et al 2013). Indoor environment of houses is another vital consideration in housing quality assessment and human health. Predominantly rural housing development consider less issues of ventilation and indoor air quality. Traditional building materials are of several varieties and less sustainable or durable like modern urban housing patterns. Mud brick or murtars that roofs and upaved floor surfaces are typical of the traditional building styles. Often times air vats or ventilation facilities are considered less significant.

Additionally, toilet facilities may not be provided or at best open-pit conveniences which are open to vermin and other disease transmitting agents. Wood stoves or fire hearths are also provided in the indoor home environment leading to incidence of indoor air pollution which affect mostly women and children because of their long exposure to indoor air environment during Cooking and preservation of foods (Mongomery, 1995).

Housing quality assessment also considers safety of occupants. Thatch and mud house are also susceptible to the vagaries natural and artificial hazards. Fire out breaks during dry season or harmatan period are frequent occurrence in the rural settlements. Sometimes flood and erosion impact are rampart in some localities which are established without recurrence to environmental constraints. Personal sanitation is another serious concern in housing quality assessment via-a-viz human health.

Unsanitable room and body conditions are often responsible for the presence body and bed bests such as bedbugs, head louse, rashes, ring worms, body and mouth odor all of which produce appealing unhealthy condition for residents. Safety considerations also focus on presence elements such as rats, (ratus, ratus) reptiles (surafees, rats, cockroaches name them.

Recently however, modernization has eroded most traditional life forms to the extent every society is evolving from cultural attachment to the adulation of new life modes. It is this transforming process that informs the quest for this research endeavour to actually ascertain the degree to which traditional life styles are held currently and the determination of the health implication of this to human sustainability.

Statement of the problem

Housing or habitation has been a paramount consideration by all organism including man. The nature and characteristics of housing quality determines the quality of human health and overall wellbeing. Studies have been embarked by scholars in the medical profession and allied field of epidemiology to determine the relationship between Housing/Environmental quality and human health status. Most results have been convergent on the point that there is a close correlation between the two.

Ironically most of these works focused on urban Housing quality and more so on the cities of developed with scant attention to the cities of developing world regions. Investigations on rural housing quality are and best few and far between, this proposed study is primed by the need to properly elucidate the true perspective of the general attributes of the rate rural housing characteristics and how possibly it has impinged on the healthy status of residents in the study area.

Objectives/justification of the study

Objectives: This study is backed up by the following specific objectives

1. To assess the overall housing quality criteria on the basis of the world health organization (WHO 1995), such as durability, good architectural designing, adequate aesthic value etc.

2. To assess the availability of basic amenities such as clean and portable water supply, good waste disposal system, regular supply of electricity and nature of energy use in cooking.

3. To assess the occupants behaviour in terms of their habits of sanitation and other environmental quality modes.

4. To explore or identify the nature of individual disease burden of members of individual households.

5. To examine the room population of individual households

6. To explore the co-connection between housing quality and incidence of disease in the area.

Research Hypothesis

Ho: Housing quality has no Significant effect on the health of the resident

Justification of the study

Issues related to housing and environmental quality must ever rank significantly high in every society's environmental agenda. Predicted on this the relevance of this study is streamlined as follows:

First the provision of a robust basis for housing policy development at the local regional global basis, on this basis planners and regulators public health of facials, building designers, remediations, insurers, researchers and advocacy groups will require housing quality information as basic tools for their operation. Public health officials will employ the essence of standard housing tools in identifying the etiology of certain ailments prevalent in certain localities.

Building designers will be sufficiently guided on the modalities of building plans designs to ensure building quality assurance. According to the report from the study will sufficiently guarantees on the necessity of remediation when the quality standard is deficient or warning in buildings. Insurance agencies will significantly rely on the results of this study to prepare their premium to guide policy planner on the appropriate perspective of quality assurance for buildings.

At the rural with particular reference to area of study, house owners and/or tenants awareness will be raised concerning the tenants of property development.

Literature review

The co-connection between environmental quality and well being has been adequately explored and documented in the literature. Housing quality which forms part of the overall environmental assessment is equally significant in human health and sustainability. Following studies carried out by Ofomata (1975) and Okoye (1982) there is a whole of symbiosis between the nature of man and his dwelling place.

It is unrealistic and impossible to extricate man from his physical environment. This essence of man environment explanation run close to the early thesis of environmental determinism which has been popularised quite early. At this instance attention will be turned to the specific "housing quality" and "human health" explanations and overall implications.

Housing quality criteria

Keall, M. Et al (2010) using criteria from their works in New Zealand and England have provided some standard criteria which can be briefly highlighted in broad outlines as follows:

i. Adequate structural boundaries which embodies consideration of foundations, walls, flours, ceiling, windows, stairs, chimneys, internal walls, water etc.

ii. Adequate sanitary areas and waste such as sanitary areas and waste such as sanitary and functional toilets, personal wasting facilities, adequate soiled was storage and disposal

iii. Adequate food and preparation areas e.g safe and functional device, enough safe area for food preparation and adequate cleaning water and sufficient space for food storage.

iv. Safety from falls and injuries relating to safe bath and shower areas, safe checks and surface, safe stairs and freed risers, safe floor area, safe doors and windows, adequate fencing and soon.

v. Sufficient safety from buses, electrocution and explosion such as safe and functional energy sources, safe and functional gas installation, safe and functional wood humers, fire placo, chimneys' smoke alarms etc.

vi. Adequate warmth and dryness

vii. Adequate lighting and sunlight

note: All stated criteria have their embodying heat implications as provided by several empirical investigations in the field.

Health implications of housing quality

Numerous findings have revealed a relationship between housing quality and human health status. Hardoy et al (1992) have reported on the relationship poor housing quality and a range of psychosocial disorders such as depression, drug abuse, alcohol abur, violence of different kinds such as child abuse, spouse maltreatment and target violence. Further on that households constantly at risk from flood, landslides or other natural disaster can trigger psychosocial disorders such may result in death. Accordingly, also that many physical characteristics of housing and living environments can influence the incidence of psychosocial disorders. Noise, overcrowding, inappropriate design, poor sanitation and garbage collection can contribute significantly to physical and mental health problems. (Anaka 2018).

Another report by (Bake, M. et 2000) has implicated household overcrowding as a major precursor of incidents of diseases which are infections in Nature occupants' behaviour has equally been reported as a major contributor factor is the occurrence of poor housing characteristics such as growth of moulds or dampness in houses which are not well ventilated.

Lowry (1989) in his report asserted that the impact of housing on human health is not in dispute shelter , warmth, sanitation and privacy were identified as basic health requirements houses should provide.

Findings derived from diverse sources of housing and health data indicated that poor housing is associated with increased risk of cardiovascular diseases, respiratory diseases, depression and anxiety, rheumatoid arthritis, muses house of Parliament (2011)

It was also reported that good physical and mental health depends on having homes that free and safe from physical hazards. Along similar lines, Kreeger and Heggins (2004) opined that adequate housing can protect individuals and families from harmful exposures, provide them with adequate safety, security, stability, and making significant contribution to health. On the other hand when the condition of the house is poor and inadequate, it result in infections and chronic diseases, injuries and poor child development (British Medical Association 2003)

WHO (2009) held that people with poor and negative wellbeing are more likely to live in poor housing and that improving housing condition will improve health and save money. In his description or the think between poor housing and health condition of individuals Tomilson (2007) explained that there is a link between overcrowding and the incidence of the risk of opportunistic disease such HIV and other such morbidities.

It is also established that some health disorders such as typhoid and paratyphoid fever, diarrlia, dysentery, cholia, hookworm, asceriasis, viral hepatis, guinea worm disease, shis tomiasis, genital urinary tract infection and other disease are results of poor toilet facilities. From the foregoing it has been establish that there is a clear link between housing consideration and human health. However much of the existing studies focused on urban housing to the neglect of the rural, this study is therefore challenged by the need to adequately investigate the true perspective of rural housing quality and human Health condition in the envisaged area of study.

Methodology of study

Study design

This research design is de facto field survey research design where information is derived from a variety of methods such as observation, interview, and environmental simulation and so on. This will require the employment of a number of instruments such as checklists, questionnaires, measurement devices such as samplers, (air, water and soil) and cameras for place image capturing

Area of study

The study area is Ekong Anaku Community located in Akamkpa, Akamkpa east, Akamkpa Local Government Area. It is flanked in the North by Ekong community in the east by Erat community, North- east by Akpasang community. These three communities are durob speaking communities located in Cameroon. In the south, Ekong Anaku is bordered by Abiati while to the west region it is bordered by Ndinghi-Ane both in Nigeria.

The settlement is predominantly rural and the people are the derop speaking people whose cultural realm extends up to bey on the Cameroun. The people occupation originally was tenerant forest product extraction and a variant of non tillage cultivation but currently they are engaged in stabilized agriculture and some rudiments of Arable farming. Hunting and lumbering also form part of their economic mainstay.

Regarding housing quality modernization has entrenched new modes of western architectural designs to the existing traditional building styles. And so the old and new still exist side by side.

Population of the study

The study population comprises the entire residents and settlement structures (buildings) that are found in the area. This includes adult members males and females as well as children who are of school age. Infants are excluded based on the understanding that they will be incapable of responding verbally in the course of oral interviews.

Sampling techniques

Multi stage or stepwise approach was adopted viz:

i. Purposive sampling: This involves demarcation the wider settlement into units or enumeration areas on the basis of existing administrative demarcations.

ii. Stage II involves systematic sampling based on selected in an ordered alternate, regular interval as will be determined by field exigencies.

iii. Stage III involves stratified sampling based on the criteria of house type modern/old

iv. Random sampling involving "cap and draw" whereby the entire universe selected was subjected to clearance representation based on blind identification.

Instruments for data collection

i. Visual observation and description of building and household characteristic

ii. Oral interviews based questionnaire administration

iii. Use of environmental sampling mechanisms to collect soil, air and water.

v. Cameras for image capturing

Method/procedure for data collection

The essential procedure for data collection was:

i. Areal delineation of delimitation

ii. Observation and codification of housing quality and household characteristics

iii. Administration of questionnaire on respondents and elicitation of responses

iv. Sampling/collection of environmental parameters e.g. air, water and soil samples.

Method of data analysis

Data will be analyse in a variety such as

i. Description of demographic/housing characteristics using tables

ii. Statistical testing using Multivariable logistic regression

RESULTS/DISCUSSION

To evaluate connections between housing quality and each health outcome variable, nested logistic regression models were used. We present odds ratios and 95% Wald confidence intervals. For the potential outcomes of the number of medical visits, different logistic regression models were applied. Model 1 calculated the bivariate connection between the outcome of interest and low housing quality. Demographic, socioeconomic, and other contextual housing factors that are known to have an impact on the link between housing and health were additively adjusted for in models 2-4.

To determine how other factors, affect health outcomes in the context of various levels of housing quality, additional analyses (results not shown) looked at each of our fully-saturated models, stratified by the number of poor housing features. The models were created in advance and were inspired by the clinical applications and theoretical underpinnings of socioeconomic determinants of health frameworks (Solar and Irwin, 2010).

Good, very good, or exceptional health was the comparison group's health status, whereas "no hospitalizations" was the comparison group's hospitalization frequency. Findings for no medical visits against moderate use (1-2 visits) and for high use (3 or more visits) versus moderate use are reported separately (1–2 visits). Since the majority of persons in the sample who reported "good health status" had a mean of 1-2 medical visits per year, this group served as our reference group for moderate use.

Descriptive statistics

Descriptive statistics for the sample are shown in Table 1. Adults under the age of 40 made up 51.0% of the analytic sample, while adults between the ages of 41 and 60 made up 30.2% and adults above the age of 61 made up 20.8%. A little over 18.2% of the sample claimed to have at least one impairment, and 12.5% said they had not completed high school. 33.6% of the sample, or around one third, did not own their home. According to the referent adult, 32.2% of adults live in an area that is not considered to be safe.

Table 1: Weighted percentages and means of adults in Ekong Anaku for those aged 18 years and older.

	Age group ≥ 18 years of age N = 200
	% or mean (std error)
Outcome variable of interest	
Poor or fair health status	16.3% (0.002)
Any hospitalization, 2022	10.7% (0.002)
No medical utilization, 2022	23.4% (0.003)
Moderate utilization (1–2 medical visits,) 2022	30.9% (0.003)
High utilization (> 2 medical visits), 2022	45.6% (0.003)
Housing quality current characteristics	
No poor housing characteristics	83.3% (0.003)
1 poor housing characteristic	11.3% (0.002)
2 poor housing characteristics	3.8% (0.001)
3 poor housing characteristics	1.2% (0.001)
4 poor housing characteristics	0.4% (0.0004)
Demographic characteristics	
Male	48.2% (0.002)
Age	
Young adulthood (18–40)	46.7% (0.003)
Middle adulthood (41–60)	34.5% (0.002)
Older adulthood (> 61)	20.8% (0.002)

	Age group ≥ 18 years of age N = 200
	% or mean (std error)
Disability status	18.2% (0.002)
Education	
Less than high school	12.5% (0.002)
High school graduate or equivalent	29.1% (0.002)
Associate's degree or some college	29.1% (0.002)
Bachelor's degree or higher	12.5% (0.003)
Socioeconomic characteristics	
Income to poverty ratio (past year)	4.4 (0.03)
In labor force in December 2022	65.4% (0.002)
Food insecurity (range l:Low - 3:High)	1.2 (0.004)
Health insurance coverage (past year)	84.9%% (0.002)
Non-housing gov't assistance (past year)	11.2% (0.002)
Other housing contextual characteristics	
Rental status (current)	33.6% (0.003)
Household size during month of interview	2.9 (0.02)
Unsafe neighborhood (past year)	32.2% (0.003)

16.3% of the people said their overall health was poor or fair. One to two medical visits per year were recorded by over one-third (30.9%) of people, while hospitalizations accounted for 10.7% of all reported medical visits. One poor housing characteristic was reported by more than ten percent of adults (11.3%), with pests being the most prevalent (46.7% of adults with one housing problem), followed by two poor housing characteristics (3.8%), which were most frequently reported by adults with two housing problems (40.2%), three poor housing characteristics (1.2%), and all four poor housing characteristics (0.4%). (cracks in ceiling, holes in floor, pest problems, or plumbing problems).

Multivariable logistic regression results

Health status

Table 2 lists the findings from the models that looked at the link between poor housing conditions and bad health. The results of the baseline model showed that the likelihood of having fair or poor health increased with each additional characteristic of inadequate housing (odds ratio [OR] = 1.50, 95% confidence interval [CI] = 1.44,1.56). When considering demographic information, such as whether the respondent reported having a disability, the effect of poor home quality remained significant. Inclusion of socioeconomic and housing factors reduced the severity of the impact of poor housing quality on health status, but the association remained statistically significant across all models (Model 4 (completely adjusted model): OR = 1.17, CI = 1.11, 1.23). The association between poor housing quality and bad health status could be somewhat explained by current hardships, but the primary effect remained strong. Results from the stratified model show that receiving assistance increased the odds for people with zero to two housing quality issues, living in a non-metro area increased the odds for people with one, two, or four housing quality issues, and food insecurity increased the odds of fair or poor health for people with zero to three housing quality issues.

Table 2: Logistic regression odds ratio estimates and 95% Confidence limits of models predicting self-reported poor or fair health status of adults ages 18 and older in the United States (N = 200).

	Model 1	Model 2	Model 3	Model 4
Current housing characteristics				
Poor housing quality, 0–4	1.50 [1.44, 1.56]	1.34 [1.27, 1.40]	1.19 [1.13, 1.26]	1.17 [1.11, 1.23]
Demographic characteristics				
Race				
Black		1.59 [1.45, 1.74]	1.34 [1.22, 1.48]	1.28 [1.16, 1.42]
Male		0.89 [0.84, 0.95]	1.02 [0.96, 1.08]	1.02 [0.96, 1.08]

	Model 1	Model 2	Model 3	Model 4
Age				
Young adulthood (18–40)				
Middle adulthood (41–60)		2.58 [2.39, 2.78]	3.00 [2.77, 3.25]	3.05 [2.80, 3.32]
Older adulthood (> 61)		2.52 [2.31, 2.76]	2.49 [2.26, 2.74]	2.56 [2.31, 2.84]
Disability status		8.66 [8.13, 9.23]	6.54 [6.13, 6.98]	6.49 [6.08, 6.92]
Education				
Less than high school		3.12 [2.79, 3.50]	1.97 [1.74, 2.23]	1.90 [1.68, 2.15]
High school graduate or equivalent		2.21 [2.02, 2.41]	1.66 [1.51, 1.82]	1.62 [1.48, 1.78]
Associate's degree or some college		1.64 [1.50, 1.78]	1.35 [1.23, 1.48]	1.32 [1.21, 1.45]
Bachelor's degree or higher				
Socioeconomic characteristics				
Income to poverty ratio (past year)			0.96 [0.95, 0.97]	0.96 [0.95, 0.97]
In labor force in December 2013			0.51 [0.48, 0.54]	0.51 [0.48, 0.54]
Food insecurity (past year)			1.40 [1.33, 1.47]	1.36 [1.29, 1.44]
Health insurance coverage (past year)			0.88 [0.81, 0.97	0.89 [0.81, 0.97]
Receipt of non-housing gov't assistance (past year)			1.73 [1.57, 1.90]	1.66 [1.51, 1.83]
Housing characteristics				
Rental property (current)				1.05 [0.98, 1.14]
Household size during month of interview				1.01 [0.98, 1.03]
Gov't housing assistance (past year)				1.19 [1.06, 1.34]
Unsafe neighborhood (past year)				1.29 [1.20, 1.38]
Non-metropolitan status (current)				1.13 [1.05, 1.23]

Poor home quality was quantified as a count variable ranging from 0 to 4, with 0 denoting no problems with the house to 4 faults with the house (cracks in ceiling, holes in floor, pest and plumbing problems).

Hospitalization

Table 3 lists the findings from the models that looked at the links between subpar housing and hospitalization. The results of the initial logistic regression model showed that each new aspect of substandard housing increased the likelihood of hospitalization, similar to the findings for health status (OR = 1.22, 95% CI = 1.16,1.27). With the inclusion of demographic, socioeconomic, and housing factors, this effect remained significant (Model 4 (completely adjusted model): OR = 1.07, CI = 1.02, 1.12). A higher risk of hospitalization was also linked to having more people living in the home, not being in a city, renting, and receiving government aid for something other than housing. The association between poor home quality and hospitalizations was only partially explained by current hardships, but the primary effect of housing quality remained statistically significant. Findings from the stratified models showed that receiving housing help, non-housing government aid, and food insecurity all raised the likelihood of high medical usage, but the effects differed depending on how many bad housing features were reported.

Table 3

Logistic regression odds ratio estimates and 95% Confidence limits of models predicting hospitalizations of adults in the United States (N = 200).

	Model 1	Model 2	Model 3	Model 4
Current housing characteristics				
Poor housing quality, 0–4	1.22 [1.16, 1.27]	1.13 [1.08, 1.19]	1.07 [1.02, 1.13]	1.07 [1.02, 1.12]
Demographic characteristics				
Race				
Black/AA		1.14 [1.05, 1.24]	1.03 [0.95, 1.13]	1.01 [0.92, 1.11]
Male		0.68 [0.64, 0.72]	0.76 [0.71, 0.80]	0.76 [0.71, 0.80]

	Model 1	Model 2	Model 3	Model 4
Age				
Young adulthood (18–40)				
Middle adulthood (41–60)		1.10 [1.02, 1.19]	1.13 [1.04, 1.22]	1.17 [1.08, 1.27]
Older adulthood (> 61)		2.01 [1.84, 2.18]	1.76 [1.60, 1.94]	1.89 [1.71, 2.08]
Disability status		3.13 [2.94, 3.34]	2.50 [2.33, 2.67]	2.50 [2.33, 2.67]
Education				
Less than high school		1.32 [1.18, 1.49]	1.09 [0.96, 1.23]	1.05 [0.92, 1.18]
High school graduate or equivalent		1.16 [1.06, 1.27]	1.05 [0.95, 1.16]	1.03 [0.93, 1.14]
Associate's degree or some college		1.10 [1.00, 1.20]	1.03 [0.93, 1.13]	1.02 [0.92, 1.12]
Bachelor's degree or higher				
Socioeconomic characteristics				
Income to poverty ratio (past year)			1.00 [0.99, 1.01]	1.01 [1.00, 1.01]
In labor force in December 2022			0.62 [0.58, 0.67]	0.63 [0.58, 0.67]
Food insecurity (past year)			1.20 [1.14, 1.26]	1.18 [1.12, 1.24]
Health insurance coverage (past year)			1.63 [1.47, 1.81]	1.46 [1.31, 1.62]
Receipt of non-housing gov't assistance (past year)			1.78 [1.62, 1.97]	1.70 [1.54, 1.88]
Housing characteristics				
Rental property (current)				1.13 [1.04, 1.22]
Household size during month of interview				1.03 [1.01, 1.05]
Gov't housing assistance (past year)				1.16 [1.03, 1.29]
Unsafe neighborhood (past year)				1.00 [0.93, 1.08]
Non-metropolitan status (current)				1.10 [1.02, 1.19]

Number of medical visits

The correlations between low housing quality and 1) no medical visits compared to moderate use (1-2 medical visits/services) and 2) high medical use (three or more medical visits/services) compared to moderate use are examined in Supplementary Tables 2 and 4, respectively. The discussion of the findings will concentrate on high medical use because the association between low housing quality and no medical visits was not significant in the entire model.

Table 4: Models 1–4 Multinomial logistic regression odds ratio estimates and 95% Confidence limits of models predicting high medical utilization compared to moderate medical utilization in adults in the United States (N = 200).

	Model 1	Model 2	Model 3	Model 4
Current housing characteristics				
Poor housing quality, 0–4	1.18 [1.14, 1.23]	1.14[1.09, 1.18]	1.11 [1.06, 1.16]	1.11 [1.06, 1.16]
Demographic characteristics				
Race				
Black/AA		0.98 [0.91, 1.06]	0.95 [0.87, 1.03]	0.95 [0.87, 1.03]
Male		0.66 [0.63, 0.69]	0.69 [0.66, 0.72]	0.69 [0.66, 0.72]
Age				
Young adulthood (18–40)				
Middle adulthood (41–60)		1.42 [1.34, 1.50]	1.44 [1.36, 1.52]	1.44 [1.37, 1.53]
Older adulthood (> 61)		2.14 [1.99, 2.31]	1.97 [1.82, 2.13]	1.97 [1.82, 2.13]

	Model 1	Model 2	Model 3	Model 4
Disability status		2.96 [2.77, 3.15]	2.69 [2.51, 2.88]	2.69 [2.51, 2.88]
Education				
Less than high school		1.01 [0.92, 1.11]	0.97 [0.88, 1.06]	0.96 [0.88, 1.06]
High school graduate or equivalent		0.94 [0.88, 1.00]	0.93 [0.87, 1.00]	0.93 [0.87, 0.99]
Associate's degree or some college		0.99 [0.93, 1.05]	0.98 [0.92, 1.05]	0.98 [0.92, 1.05]
Bachelor's degree or higher				
Socioeconomic characteristics				
Income to poverty ratio (past year)			1.01 [1.00, 1.01]	1.01 [1.00, 1.01]
In labor force in December 2013			0.83 [0.79, 0.88]	0.83 [0.79, 0.87]
Food insecurity			1.16 [1.11, 1.22]	1.16 [1.11, 1.21]
Health insurance coverage (past year)			1.68 [1.54, 1.82]	1.68 [1.55, 1.83]
Receipt of non-housing gov't assistance (past year)			1.36 [1.26, 1.46]	1.36 [1.26, 1.47]
Housing characteristics				
Rental property (current)				0.97 [0.92, 1.03]
Household size during month of interview				0.99 [0.97, 1.00]
Gov't housing assistance (past year)				1.00 [0.89, 1.12]
Unsafe neighborhood (past year)				1.11 [1.05, 1.18]
Non-metropolitan status (current)				1.01 [0.94, 1.09]

According to Table 4's baseline model, there was a higher likelihood of having high medical usage compared to moderate use for each extra bad housing attribute (Model 1: OR: 1.18, 95% CI = 1.14, 1.23). Poor housing quality's association with high medical use was partially explained by socioeconomic factors and other contextual housing characteristics (Model 4 (fully adjusted model): OR = 1.10, 95% CI = 1.05, 1.15). Despite this, the association between poor housing quality and high medical use persisted across all nested models. Findings from the stratified model show that receiving non-housing government aid, living in a dangerous neighborhood, and food insecurity all raised the likelihood of high medical usage, but the effects differed depending on how many poor housing characteristics were reported.

Discussion

Even after adjusting for other variables that are known to have an impact on health and medical usage, such as neighborhood safety and disability status, each additional poor housing characteristic (cracks in the ceiling, holes in the floor, pests, or plumbing problems) was associated with worse health status, high medical use, and a higher likelihood of hospitalization. Our study offers proof that socioeconomic assistance, neighborhood safety, and rental status do not entirely account for the adverse connections between low housing quality and health.

Socioeconomic factors and additional potential protective factors, such as non-housing-related government aid, could only partially account for the link between substandard housing and health. They also stand for other elements that frequently make the connection worse. Household size, rental status, neighborhood safety, and housing-related government aid, among other contextual housing factors, had very little impact on the associations between substandard housing and any of our health outcomes.

Our findings could be used to guide interventions to improve housing and housing quality standards that may result in corresponding improvements in health and decreases in healthcare costs because they are consistent with other literature linking poor housing to poor health (Jacobs et al., 2009; Krieger and Higgins, 2002). The amount of poor housing characteristics a house has is linked to a higher risk of being in poor health, even if this article does not investigate which poor housing characteristics have the highest relationships with health outcomes or the direction of the association. In an effort to address the connection between housing and health, the National Center for Healthy Housing and the American Public Health Association (2014) developed healthy housing standards. However, these guidelines only serve as a reference for property owners, elected officials, and code agency staff.

There have also been international initiatives to raise housing quality standards and guidelines. The World Health Organization (WHO) published housing and health guidelines in 2018 and suggested increasing the enforcement of existing housing quality requirements (World Health Organization, 2018). According to Klepeis et al. (2001), the average individual spends around 60–70% of their day at home, with newborns and the elderly spending more time there. Hence, the benefit of upgrading the house may be significant to public health policymakers, clinicians, and healthcare systems. Despite the fact that there are already a number of housing quality requirements, only a small portion of our population is protected by enforceable federal housing

quality legislation. Only individuals who live in government housing are legally protected in the United States, which means that only 3% of the total population is protected (U.S. Department of Housing and Urban Development, 2001).

After adjusting for socioeconomic and other contextual housing characteristics, our findings revealed that each incremental bad housing characteristic was linked to a higher risk of hospitalization and a high number of medical visits. Research to ascertain if home improvement activities could result in decreased utilization and associated cost savings in our healthcare system could be supported by identification of these linkages. While housing-related government support has previously been linked to decreased neighborhood poverty and crowded living conditions (Lindberg et al., 2010).

Given the correlation between poor housing quality and adverse health outcomes, health providers and community health needs assessments (Billioux et al., 2017) carried out by local hospitals may think about extending current social determinants of health questions to include screening for housing quality. Relatedly, options for enhancing the caliber of both new and current affordable housing should be added to housing resources associated with screening, such as rent support, eviction prevention, and additional affordable housing. According to research, improvements in housing (DiGuiseppi et al., 2010; Jacobs et al., 2010; Krieger et al., 2010; Sandel et al., 2010; Thomson et al., 2009) and neighborhoods (Branas et al., 2018), as well as the general environment, have a favorable impact on people's health and safety.

Our findings highlight the connection between housing and health, thus health care systems might also focus on improving the sharing of social and health service information to boost connections and referrals among community organizations, health care delivery organizations, and families (McKethan et al., 2019). As more studies have shown, home improvement partnerships have a positive impact and are effective in improving patient health outcomes, health care systems may begin to take them into account (Martinez et al., 2017).

Innovative tactics that could be used by community or health care systems include web-based referral programs like the Breathe Easy at Home initiative, which allows healthcare professionals to refer patients with asthma to housing officials for inspections (City of Boston, 2018; State of Rhode Island Department of Health, 2019).

Our results lend some credence to the holistic idea that a patient's therapy should be viewed in the context of their social milieu and environment. Within a social context-centered care paradigm, the connection between health and the physical environment of the house might be taken into account as a potential area for intervention to further enhance patient health.

Conclusion

Holistic methods to care can be supported by early identification of housing quality issues, housing instability, and related treatments in vulnerable families. Our findings imply that, even after adjusting for current adversity and socioeconomic determinants, poor home quality is linked to unfavorable health outcomes. Using Ekong Anaku as a case study, evaluating current local, state, and federal legislation on housing quality standards can help establish whether these criteria lead to better health and lower healthcare costs or whether they reduce the number of Nigerians who live in subpar housing. Simply expressed, [we say] that health is [found] at home.

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