

Inadequate Housing and Physical Health Impairment among Low-Income Households: Evidence from a Pre-Intervention Study in Guyana

Sunil Gopaul^{1,2*}, Michael Olabode Tomori¹

¹Department of Public Health, Texila American University, Georgetown, Guyana

²Projects Department, Central Housing and Planning Authority, Georgetown, Guyana

*Correspondence to be addressed: E-mail - andregsep@gmail.com

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Abstract *Housing conditions are important determinants of physical health, yet evidence from rapidly developing settings with persistent housing deficits remains scarce. We conducted a cross-sectional study to assess the housing adequacy factors associated with physical health impairment (PHI) among low-income households targeted for relocation under Guyana's Adequate Housing and Urban Accessibility Programme (AHUAP). We used pre-relocation data obtained from 127 applicants approved for the programme's Core Home subsidy from July 2025 to April 2026. PHI was defined as a Physical Component Summary (PCS-12) score ≤ 50 . Associations were evaluated through chi-square analyses and multivariable logistic regression using a hierarchical modeling approach. The prevalence of PHI was 66.1% (95% CI: 57.8–74.5), while mean PCS-12 score was 42.0 ± 11.9 . Most socio-demographic factors were not significantly associated with PHI ($p > 0.05$). However, males had lower odds of impairment than females (AOR=0.35, 95% CI: 0.14–0.90; $p = 0.028$), while households with vulnerable members had higher odds (AOR=2.67, 95% CI: 1.10–6.44; $p = 0.029$). Lack of durable material and poor structure quality (AOR=3.67, 95% CI: 1.48–9.14; $p = 0.005$) and insecure tenure (AOR = 2.76, 95% CI: 1.15–6.66; $p = 0.023$) were independently associated with impairment. Lack of electricity showed a strong association but was excluded from the final multivariable model due to complete separation. These findings underscore the importance of structural housing quality, tenure security, and social vulnerability to physical health outcomes. Longitudinal research is warranted to evaluate changes following relocation.*

Keywords *Guyana, Housing Inadequacy, Physical Health, Social Determinants of Health, Structural Housing Quality, Tenure Security.*

Introduction

The relationship between living conditions and physical health remains a central concern in public health, particularly among low-income populations where environmental exposures and material deprivation are most pronounced. Housing conditions influence physical health not only through direct environmental risks, but also by shaping daily functions such as hygiene, nutrition, and exposure to disease [1]. While housing is widely recognized as a social determinant of health, much of the existing research has focused on general or mental health outcomes, with comparatively less emphasis on functional physical health status measured using standardized instruments such as the Physical Component Summary (PCS-12) of the Short Form-12 Health Survey (SF-12) [2, 3].

Globally, housing inadequacies continue to affect a substantial proportion of the population, with the greatest burden occurring in low- and middle-income communities where structural, infrastructural, and tenure-related deficits persist [4]. These inadequacies often manifest as poor structural quality, insufficient living space, insecure tenure arrangements, and limited access to essential services such as electricity, water, and sanitation. Such conditions create environments that facilitate the spread of infectious diseases, increase the risk of injury, and constrain the ability of individuals to maintain health-supporting behaviours [2]. Insecure tenure further limits households' capacity to invest in housing improvements, perpetuating exposure to unsafe living environments [5].

The pathways linking housing conditions to physical health are both direct and cumulative and may be modified by underlying social and household vulnerabilities. Substandard building materials expose occupants to environmental hazards such as dampness, extreme temperatures, and structural instability [6]. Overcrowding increases the likelihood of respiratory and infectious disease transmission,

while inadequate water and sanitation contribute to gastrointestinal illness and other preventable conditions [7-9]. Limited access to electricity and clean fuel further compromises indoor air quality and food security, with implications for physical health outcomes [10-11]. These risks may be amplified in households with vulnerable members or among individuals with limited adaptive capacity, contributing to unequal health outcomes within similar housing environments.

In the Latin America and Caribbean region, rapid urban expansion has outpaced adequate housing provision, resulting in persistent infrastructure deficits in peri-urban communities [12]. A significant proportion of households continue to live in conditions that do not meet minimum adequacy standards, contributing to the burden of preventable diseases, including respiratory infections, vector-borne diseases, injuries, and gastrointestinal illnesses [13]. Despite ongoing investments in housing and urban development, empirical evidence linking housing conditions to measurable physical health outcomes remains limited.

In Guyana, these challenges are particularly evident in peri-urban areas, where low-income households often face structural inadequacies, overcrowding, insecure tenure, and exposure to flooding [14]. These conditions contribute to heightened vulnerability to disease and physical health impairment (PHI). National housing initiatives, such as the AHUAP, aim to address these deficits; however, evidence on baseline physical health status and its association with housing conditions remains scarce.

Existing studies frequently assess isolated housing characteristics, limiting understanding of how multiple deficiencies interact to influence physical health. Moreover, few studies have applied standardized health-related quality of life measures, such as the PCS-12, to examine these associations in low-income and rapidly transforming contexts. Accordingly, this study investigated the association between

the conditions of housing adequacy and PHI among low-income households in Guyana before relocation under a national housing programme. This study therefore provides baseline empirical evidence to inform housing policy and intervention strategies that shape physical health outcomes in vulnerable settings.

Materials and Methods

Study Design and Settings

A baseline cross-sectional study was undertaken among low-income households approved for the Core Home subsidy under Guyana's AHUAP. Pre-relocation data were analyzed to investigate the association between housing adequacy and PHI among beneficiaries before relocating to their new Core Home unit.

Data collection was conducted between July 2025 and April 2026 across peri-urban communities within Regions 3 and 4. In Region 4, the study locations comprised Haslington, Good Hope, Vryheid's Lust, Industry, Sparendam, Cummings Lodge along the East Bank Demerara (ECD), and Riverview, Mocha-Arcadia, Herstelling, Peter's Hall, Farm, Covent Garden, Prospect, Diamond, Grove along the East Bank Demerara (EBD). The study locations in Region 3 comprised La Parfaite Harmonie, Onderneeming, Recht door Zee, Westminster, and Lust-en-Rust along the West Bank Demerara (WBD).

The Central Housing and Planning Authority (CH&PA) delivers the programme's Core Home initiative, funded by the Inter-American Development Bank. The AHUAP targets vulnerable, low-income households residing in inadequate or uninhabitable dwellings. At the time of data collection, approximately 156 households, representing an estimated 504 individuals, were approved for a Core Home unit but had not yet relocated. This includes 57 households in WBD, 56 in EBD, and 43 in ECD.

The study communities experience a range of housing and infrastructure deficiencies, including overcrowding, insecure land tenure,

lack of improved sanitation, poor structural housing quality, restricted access to essential services, and elevated environmental risks associated with environments that are vulnerable to flooding. These conditions provide a relevant context for investigating the association between housing adequacy and physical health outcomes before relocation.

The selected communities are characterized by multiple housing and infrastructure challenges, including overcrowding, insecure tenure arrangements, inadequate sanitation, substandard structural housing conditions, limited access to basic services, and heightened environmental risk associated with low-lying, flood-prone areas. These conditions provide a relevant context for examining the association between housing adequacy and physical health outcomes prior to relocation.

Study Population and Procedures

Study participants comprised principal applicants approved for a Core Home subsidy under the AHUAP who remained in their existing residences and had not yet relocated to their allocated housing units when data collection occurred. Information was collected through a one-time structured interview administered either face-to-face or by telephone according to each participant's preference.

Data were collected using a two-part questionnaire consisting of the Adequate Housing and Demographic (AHD) Survey and the SF-12 Health Survey. The AHD Survey gathered information on housing adequacy together with relevant sociodemographic and socioeconomic factors. Development of this instrument was informed by the World Bank's methodological framework for estimating adequate housing deficits within and across emerging economies [3]. Physical health was evaluated using the SF-12 Health Survey, from which PCS-12 scores were calculated [15].

Participants who had died or were unreachable because of inaccurate or obsolete contact details were excluded from the analysis.

Informed consent was obtained from all eligible participants before data collection commenced. To ensure that the findings represented pre-intervention conditions, all interviews were completed before participants relocated to their assigned housing units.

A complete list of eligible participants was obtained from the CH&PA and was periodically reviewed during this study to ensure the accuracy of participant contact details. Interviews were completed during regular working hours (Monday–Friday, 8:00 am – 4:00 pm).

Independent Variables

Independent variables were selected based on previous research examining the association between socioeconomic factors, housing conditions, and health outcomes. For analytical purposes, these variables were grouped into two categories: (1) sociodemographic factors and (2) housing adequacy conditions.

The sociodemographic factors evaluated in this study comprised age (24–35, 36–44, 45–54, 55–64, and ≥ 65 years), total size of household (1–3, 4–5, and ≥ 6 persons), gender (female or male), presence of vulnerable household members (yes/no), monthly household income (USD) (<300, 300–412, 413–600, and >600), employment status (employed or unemployed), household composition (extended, nuclear, or single-adult), and residence type (owner, renter, squatter, or residing with relatives or friends) [16–23].

The housing adequacy domain included seven indicators: improved water access (yes/no), improved sanitation access (yes/no), adequate living space (yes/no), durable material and good structural quality (yes/no), security of tenure (yes/no), electricity access (yes/no), and clean cooking access (yes/no) [10, 24–29].

Outcomes

Physical health status served as the primary study outcome and was assessed using the Physical Component Summary (PCS-12) score derived from the SF-12 instrument [30]. Scores were calculated and standardized according to established scoring procedures [15], yielding values that range from 0 to 100 units. Higher scores reflect better physical health.

For analyses, PCS-12 scores were dichotomized using a recommended cut-off [31]. Participants with scores ≤ 50 were classified as having PHI (coded as 1), while those with scores > 50 were categorized as having better-than-average physical health (coded as 0).

Statistical Analysis

Descriptive statistics were generated for all variables included in the analysis. Continuous variables are presented as means, while categorical variables are summarized as proportions. The prevalence of PHI (PCS-12 ≤ 50) across independent variables was examined using chi-square analyses, which were also used to assess associations between the outcome and explanatory variables.

To assess the association between independent variables and PHI, binomial logistic regression analysis was conducted. The analysis followed a hierarchical modeling approach based on a conceptual framework, with stepwise variable selection used to guide model development [14]. The framework was structured into two levels to reflect the association between sociodemographic factors (Level 1) and housing adequacy conditions (Level 2) in influencing physical health outcomes (Figure 1).

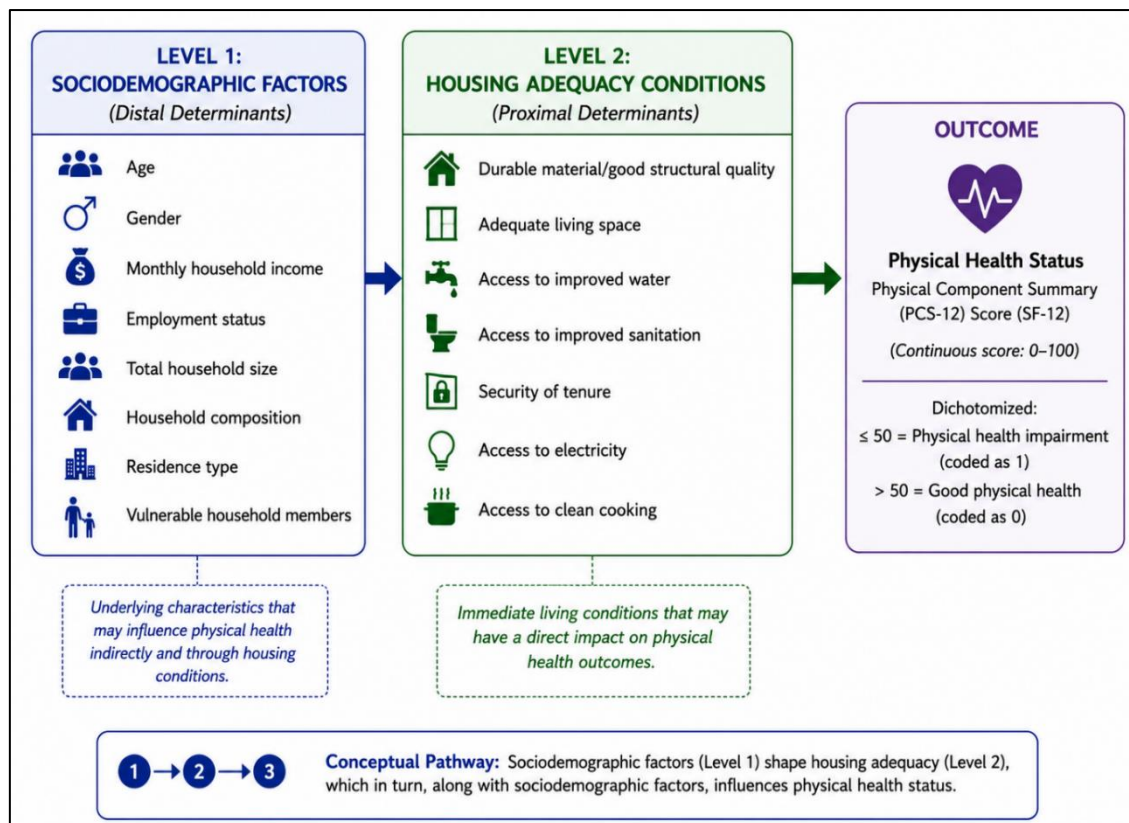


Figure 1. Conceptual Pathway Exploring the Association between Household Sociodemographic Factors, Housing Adequacy Conditions, and Physical Health

At Level 1, all sociodemographic variables were entered into the regression model. Variables with p-values <0.20 were retained, whereas those with p-values > 0.20 were removed sequentially, starting with the variable that had the largest p-value [14]. The resulting reduced Level 1 model, with retained variables, were carried forward to the next stage.

At Level 2, the sociodemographic variables retained from Level 1 were entered into the regression model together with the housing adequacy variables. The same stepwise selection procedure was then applied to derive the final model, with Level 1 variables retained irrespective of subsequent changes in statistical significance.

All statistical tests were two-tailed, with statistical significance set at $p < 0.05$. Multicollinearity among independent variables included in the final multivariate model was assessed using the Variance Inflation Factor (VIF). All VIF values ranged from 1.01 to 1.06,

indicating no evidence of multicollinearity. All analyses were conducted using jamovi statistical software [32].

All statistical analyses were two-tailed, with statistical significance defined as $p < 0.05$. Multicollinearity among the independent variables retained in the final multivariate model was evaluated using the Variance Inflation Factor (VIF). VIF values ranged from 1.01 to 1.06, indicating that multicollinearity was not present. Statistical analyses were performed using jamovi statistical software [32].

Results

Between July 2025 and April 2026, 156 applicants were approved to receive a Core Home Subsidy but had not yet relocated under the AHUAP. One applicant (0.6%) was deceased, while 23 (14.7%) could not be contacted because of invalid contact information and were excluded from the study. The remaining 132 eligible applicants were

invited to participate, of whom 5 (3.8%) declined. Consequently, the final analytical sample comprised 127 participants, representing a response rate of 96.2%.

Table 1 summarizes the characteristics of the participants included in the study as well as the prevalence of PHI (PCS-12) according to each independent variable. The median age of participants was 55 years (IQR: 45–62), with a median monthly household income of USD 368 (IQR: 253–478) and a median household size of 3 persons (IQR: 2–5). The majority of participants were female (77.2%) and employed (66.9%), while 68.5% reported having at least one vulnerable member in the household. Most participants resided in nuclear households (44.1%) or lived with relatives or friends (40.9%).

In terms of housing conditions, most participants had access to improved water (86.6%) and improved sanitation (86.6%). However, substantial housing inadequacies remained: 74.8% lacked adequate living space, 74.8% lived in dwellings of poor structural quality, and 58.3% lacked security of tenure. Access to electricity (89.0%) and clean cooking (72.4%) were relatively high (Table 1).

Table 1 also shows that access to basic housing services was generally high, with 86.6% of participants reporting access to improved water and improved sanitation, and 89.0% and 72.4% having access to electricity and clean cooking, respectively. Despite these favorable indicators, housing inadequacies remained common. More than half of participants lacked adequate living space (53.5%), 74.8% lived in dwellings constructed of non-durable materials or with poor structural quality, and 58.3% lacked security of tenure.

The mean PCS-12 score was 42.0 ± 11.9 . Overall, the prevalence of PHI (PCS-12 ≤ 50) was 66.1% (95% CI: 57.8–74.5).

Bivariate chi-square analyses showed no statistically significant association between PHI and the sociodemographic variables examined, specifically age, gender, income level, employment status, household size, and residence type ($p > 0.05$). However, there was demonstrated higher prevalence of PHI among females (70.4%) compared to males (51.7%) ($p = 0.075$), and among households with vulnerable members (71.3%) compared to those without (55.0%) ($p = 0.106$). Although these associations were not statistically significant ($p > 0.05$) they were retained for further analyses ($p < .20$). Differences were observed across household composition; however, these were not statistically significant ($p = 0.177$).

In contrast, several housing adequacy conditions demonstrated statistically significant associations with physical health outcomes. Participants living in dwellings made of non-durable materials and of poor structural quality had a significantly higher prevalence of PHI (71.6%) than those in durable housing of good structural quality (50.0%) ($p = 0.032$). Lack of access to electricity was also strongly associated with PHI, with all participants without electricity classified as impaired (100.0%) compared to 61.9% among those with access ($p = 0.002$). Security of tenure showed a borderline association with PHI ($p = 0.060$), with a higher prevalence among participants without secure tenure (73.0%) compared to those with secure tenure (56.6%).

Other housing adequacy variables, including access to improved water (65.5% vs. 70.6%; $p = 0.788$), improved sanitation (65.5% vs. 70.6%; $p = 0.788$), adequate living space (64.4% vs. 67.6%; $p = 0.711$), and clean cooking access (64.1% vs. 71.4%; $p = 0.531$), were not significantly associated with PHI.

Table 1. Sample Characteristics According to the Prevalence of PHI (July 2025 – April 2026).

Independent Variables	Description N (%)	Prevalence of Physical Health Impairment N (%)	p-value
Age			p = .910
24–35	8 (6.3)	5 (62.5)	
36–44	24 (18.9)	14 (58.3)	
45–54	26 (20.5)	18 (69.2)	
55–64	39 (30.7)	27 (69.2)	
>65	30 (23.6)	20 (66.7)	
Total Household Size			p = .826
1–3	65 (51.2)	39 (60.0)	
4–5	35 (27.6)	19 (54.3)	
>6	27 (21.3)	18 (66.7)	
Gender			p = .075
Female (0)	98 (77.2)	69 (70.4)	
Male (1)	29 (22.8)	15 (51.7)	
Vulnerable Household Members			p = .106
Yes (1)	87 (68.5)	62 (71.3)	
No (0)	40 (31.5)	22 (55.0)	
Monthly Household Income (USD)			p = .380
<300	47 (37)	35 (74.5)	
300–412	38 (29)	25 (65.8)	
413–600	32 (25.2)	18 (56.3)	
>600	10 (7.9)	6 (60.0)	
Employment Status			p = .693
Employed (1)	85 (66.9)	55 (64.7)	
Unemployed (0)	42 (33.1)	29 (69.0)	
Household Composition			p = .177
Extended Family	51 (40.2)	33 (64.7)	
Nuclear Family	56 (44.1)	41 (73.2)	
Single Adult Household	20 (15.7)	10 (50.0)	
Residence Type			p = .622
Reside with Friends or Relatives	52 (40.9)	36 (69.2)	
Owner	43 (33.9)	29 (67.4)	
Renter	27 (21.3)	15 (55.6)	
Squatter	5 (3.9)	4 (80.0)	
Improved Water Access			p = .788
Yes (1)	110 (86.6)	72 (65.5)	

No (0)	17 (13.4)	12 (70.6)	
Improved Sanitation Access			p = .788
Yes (1)	110 (86.6)	72 (65.5)	
No (0)	17 (13.4)	12 (70.6)	
Adequate Living Space			p = .711
Yes (1)	59 (46.5)	38 (64.4)	
No (0)	68 (53.5)	46 (67.6)	
Durable Material & Good Structural Quality			p = .032
Yes (1)	32 (25.2)	16 (50.0)	
No (0)	95 (74.8)	68 (71.6)	
Security of Tenure			p = .060
Yes (1)	53 (41.7)	30 (56.6)	
No (0)	74 (58.3)	54 (73.0)	
Electricity Access			p = .002
Yes (1)	113 (89.0)	70 (61.9)	
No (0)	14 (11.0)	14 (100.0)	
Clean Cooking Access			p = .531
Yes (1)	92 (72.4)	59 (64.1)	
No (0)	35 (27.6)	25 (71.4)	

Fisher Exact test was used to calculate the p-value.

The mean PCS-12 score in the study was 42.0 ± 11.9 units (Figure 2). The prevalence of PHI (PCS-12 ≤ 50) was 66.1% (95% CI: 57.8–74.5).

Multivariable logistic regression analysis (Table 2) identified several independent predictors of PHI. Among sociodemographic variables, the presence of vulnerable members in the household was significantly associated with increased odds of impairment (AOR = 2.67, 95% CI: 1.10–6.44; $p = 0.029$). Gender was also significantly associated with physical health outcomes, with males demonstrating lower odds of impairment compared to females (AOR = 0.35, 95% CI: 0.14–0.90; $p = 0.028$). Other sociodemographic variables were not significantly associated with PHI in the adjusted analysis.

Among housing adequacy conditions, lack of durable material and poor structural quality was

a significant predictor of PHI, with participants residing in such dwellings exhibiting higher odds of impairment compared to those in in housing that is made of durable materials and has good structural quality (AOR = 3.67, 95% CI: 1.48–9.14; $p = 0.005$). Similarly, absence of secure tenure was independently associated with increased odds of impairment (AOR = 2.76, 95% CI: 1.15–6.66; $p = 0.023$).

Although lack of access to electricity demonstrated a strong association in chi-square analysis, it was not retained in the multivariable model due to complete separation, which prevented reliable estimation of adjusted effects.

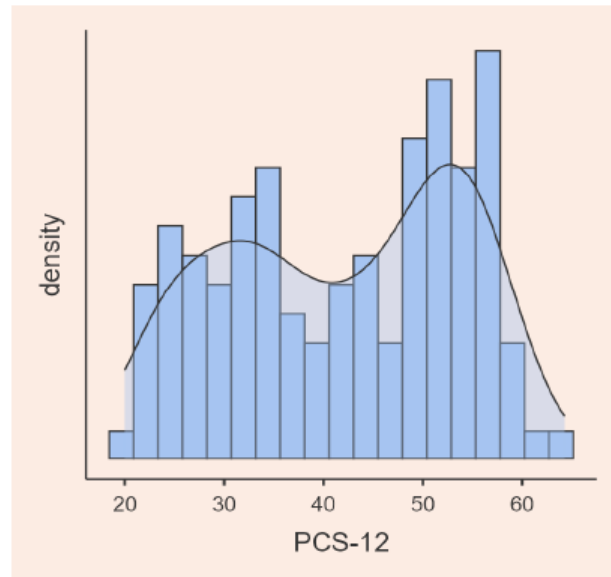


Figure 2. Distribution of PCS-12 Scores Among Participants between July 2025 and April 2026. Although the Shapiro–Wilk Test Indicated a Statistically Significant Departure from Normality ($W = 0.939$, $p < 0.001$), the Distribution Exhibited only Slight Negative Skewness (skewness = -0.174), Suggesting an Approximately Normal Distribution

Table 2. Logistic Regression Odds Ratios for Variables Associated with PHI

Independent Variables	COR (95 percent CI)	p-value	AOR (95 percent CI)	p-value
Age				
24–35	ref	.915		
36–44	0.84 (0.16–4.35)			
45–54	1.35 (0.26–7.07)			
55–64	1.35 (0.28–6.58)			
>65	1.20 (0.24–6.06)			
Total Household Size				
1–3	ref	.824		
4–5	0.87 (0.37–2.04)			
>6	1.22 (0.46–3.21)			
Gender				
Female (0)	ref	.065	ref	.028
Male (1)	0.45 (0.193–1.05)		0.35 (0.14–0.90)	
Vulnerable Household Members				
Yes (1)	2.03 (0.93–4.41)	.074	2.67 (1.10–6.44)	.029
No (0)	ref		ref	
Monthly Household Income (USD)				
<300	ref	.386		
300–412	0.66 (0.26–1.68)			
413–600	0.44 (0.17–1.15)			
Employment Status				
Employed (1)	ref	.627		
Unemployed (0)	1.22 (0.55–2.68)			

Household Composition				
Extended Family	0.67 (0.29–1.53)	.170		
Nuclear Family	ref			
Single Adult Household	0.37 (0.13–1.05)			
Residence Type				
Reside with Friends or Relatives	1.09 (0.46–2.59)	.568		
Owner	ref			
Renter	0.60 (0.22–1.63)			
Squatter	1.93 8 (0.20–18.92)			
Improved Water Access				
Yes (1)	ref	.678		
No (0)	1.27 (0.42–3.86)			
Improved Sanitation Access				
Yes (1)	ref	.678		
No (0)	1.27 (0.42–3.86)			
Adequate Living Space				
Yes (1)	ref	.700		
No (0)	1.16 (0.55–2.41)			
Durable Material & Good Structural Quality				
Yes (1)	ref	.028	ref	.005
No (0)	2.52 (1.11–5.74)		3.67 (1.48–9.14)	
Security of Tenure				
Yes (1)	ref	.056	ref	.023
No (0)	2.07 (0.98–4.37)		2.76 (1.15–6.66)	
Adequate Electricity Access				
Yes (1)	ref	.987		
No (0)	2.61e+7 (0.00–∞)			
Clean Cooking Access				
Yes (1)	ref	.438		
No (0)	1.40 (0.60–3.27)			

Only variables with a *p*-value < 0.20 in the bivariate analysis were considered eligible for inclusion in the multivariable model.

Discussion

Our study provides baseline evidence on the association between housing adequacy and physical health among low-income households in Guyana prior to relocation under a national housing intervention programme. The findings indicate a substantial burden of PHI, with over two-thirds of participants classified as having PCS-12 scores ≤ 50 units.

Housing-related factors, particularly structural quality of the dwelling and security of tenure, emerged as significant predictors of

physical health outcomes, while most sociodemographic factors showed limited influence. These findings reinforce the role of housing conditions as key determinants of physical health in resource-constrained settings [2-3].

The association between poor structural housing quality and PHI is consistent with existing evidence linking substandard construction materials and unsafe housing environments to adverse health outcomes. Dwellings constructed, which are of poor structural quality and constructed with non-

durable materials expose occupants to environmental hazards such as dampness, heat stress, and injury risks, all of which can impair physical functioning. Intervention studies, including programmes that upgrade flooring and structural components, have demonstrated reductions in parasitic infections, respiratory illness, and overall morbidity [33-34]. These findings support structural quality as a critical pathway through which housing conditions influence physical health.

Security of tenure also emerged as a significant determinant of physical health, highlighting the importance of residential stability and control over living conditions. Households lacking tenure security may face constraints in improving their dwellings or accessing basic services, thereby sustaining exposure to substandard environments. Empirical studies have shown that tenure security is associated with increased household investment in housing improvements, enhanced access to infrastructure, and improved health outcomes [35-36]. These findings reinforce the need to consider tenure security as a core dimension of housing adequacy.

The strong association observed between households that lack electricity access and PHI further underscores the importance of basic service provision. Although complete separation prevented reliable estimation of the adjusted effect, the finding that all participants without electricity were classified as physically impaired suggests a critical association. Access to electricity supports essential household functions, including lighting, food storage, and safe cooking practices, and has been linked to improved health outcomes [11, 37].

In contrast, other housing adequacy variables, including improved water and sanitation access and adequate living space, were not significantly associated with physical health outcomes. This may reflect the relatively high coverage of Government-led water and sanitation improvement programmes benefiting participants in Guyana [38], as well as reduced

variability in household conditions, including declining household size [39], which may have limited the statistical power to detect differences. Still, extensive evidence demonstrates that water and sanitation improvements are strongly associated with reductions in infectious disease burden [8-9, 24], suggesting that their importance should not be discounted despite the lack of statistical significance observed in this study.

Sociodemographic factors showed limited influence on physical health outcomes in the adjusted analysis, apart from the presence of vulnerable members in the household, which was associated with increased odds of impairment. This may reflect the additional physical and resource demands placed on households with dependents, potentially affecting the health status of household members who assume caregiving responsibilities [40]. Gender was also significantly associated with PHI, with males exhibiting lower odds of impairment compared to females. This finding suggests that females may experience a greater burden of PHI, consistent with evidence that the health impacts of housing conditions may differ across genders due to underlying housing-related social and structural inequalities [18].

Taken together, these findings highlight the multidimensional nature of housing as a determinant of physical health. Structural quality, tenure security, and access to essential services operate through distinct but interconnected pathways to influence physical functioning. The results underscore the need for integrated housing policies that address both the physical attributes of dwellings and the institutional conditions governing access to housing and services [3-4].

From a policy perspective, these baseline findings provide critical insight into the pre-relocation conditions of beneficiaries targeted under national housing programmes implemented by the CH&PA. Rather than reflecting programme outcomes, the results

identify the structural and service-related deficits from which households are transitioning, thereby highlighting priority areas for intervention.

The association between inadequate structural quality and PHI underscores the importance of ensuring that newly delivered housing units meet minimum standards for durability and construction integrity. This reinforces the need for rigorous quality assurance during implementation, supported by systematic post-construction verification.

Similarly, the link between insecure tenure and poorer health outcomes highlights the importance of incorporating legally recognized, secure occupancy arrangements into housing delivery frameworks to promote long-term residential stability.

Access to essential services, particularly electricity, further underscores the need to provide integrated infrastructure alongside housing development. In peri-urban expansion areas, delays in utility access may limit potential health gains. Integrating health-sensitive housing indicators into programme design and monitoring systems would support evidence-based planning and strengthen the evaluation of post-relocation outcomes.

Limitations

This study is subject to several limitations. First, the cross-sectional design precludes causal inference between housing conditions and physical health outcomes. Second, the small number of participants in certain exposure categories, particularly those without access to electricity, may have reduced the precision of the estimated associations, resulting in wider confidence intervals in the regression models.

Third, although lack of access to electricity demonstrated a strong association with PHI in chi-square analysis, it was not retained in the multivariable model, primarily due to complete separation, which prevented reliable estimation of adjusted effects. Fourth, reliance on self-

reported data introduces the potential for reporting bias, including inaccuracies in assessing physical health status. Finally, because the study was limited to applicants enrolled in a specific national housing programme, the findings may not be directly applicable to low-income populations outside comparable housing intervention settings.

Despite these limitations, this study contributes important baseline evidence from a rapidly developing setting where housing deficits remain substantial and empirical research examining the association between housing conditions and physical health remains scarce. These findings establish a benchmark for future longitudinal studies evaluating the health effects of housing interventions after relocation.

Conclusion

A substantial burden of physical health impairment was observed among low-income households awaiting relocation through Guyana's AHUAP, national housing intervention programme. Housing adequacy conditions, particularly durable materials and good structural quality, and security of tenure, emerged as key predictors of physical health outcomes, while most sociodemographic factors showed limited influence. However, the increased risk observed among female participants and households with vulnerable members indicates that physical health outcomes are not uniformly experienced, even within similar housing conditions, and should therefore be explicitly considered in the housing–health relationship.

These findings provide important baseline evidence from a rapidly developing context where housing-related disparities persist. They underscore the need to integrate structural housing quality and durability, and tenure security into national housing and development strategies, with particular attention to vulnerable groups. The study also lays the groundwork for future longitudinal analyses to

assess changes in physical health after relocation to improved housing conditions.

Conflict of Interest

The authors declare no conflict of interest.

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Ethical Approval

The Ministry of Health Institutional Review Board (MOH-IRB), Guyana (Protocol #101/2025), the Research Committee of Texila

American University (Guyana Campus), and the Central Housing and Planning Authority granted ethical approval. The study adhered to all applicable ethical standards governing research involving human participants. We obtained informed consent from all participants before participation.

Author Contributions

SG conceptualized and designed the study, conducted the analysis, interpreted the findings, and drafted the manuscript. MOT contributed to the critical review of the manuscript and approved the final version.

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Data Availability

The dataset generated and analyzed during the current study has been de-identified and is available from the corresponding author upon reasonable request, in accordance with institutional data governance policies and ethical approval conditions.

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