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Housing Economic Constraints and Household Occupancy Pressure in Ado Ekiti Nigeria

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Abstract

This study assessed associations between housing economic constraints and household occupancy pressure in Ado-Ekiti, Nigeria. Cross-sectional household-survey data were analysed using binary logistic regression to determine an association between households with 1–5 persons per room versus those with six or more. One thousand two hundred forty-four questionnaires were retrieved; 1,230 observations were retained for the main analysis. Housing-expenditure indicators also showed that 69.3% of rent respondents spent over 30% of their income on rent, 57.1% of mortgage respondents spent over 30% on mortgage payments. Perceived building-material costs and reported affordable-housing needs added significantly to a model predicting occupancy pressure from selected demographic, socioeconomic, and spatial controls (likelihood-ratio $\chi^2 = 195.86$, $p < .001$). Building-material cost was associated with increased occupancy pressure (Wald $\chi^2(3) = 130.21$, $p < .001$) as was reported affordable-housing need (Wald $\chi^2(4) = 22.03$, $p < .001$). The association between perceived material costs and occupancy was non-monotonic and cautions against interpreting the responses to a linear measure of economic pressure. An analysis of reported house-construction costs included 679 observations; its smaller sample size and differing respondents limit comparison with the main model. The findings regard occupancy pressure as one aspect of housing inadequacy rather than an estimate of the city's overall housing deficit and suggest considering affordability, household living conditions and spatial planning in housing assessments.

1. Introduction

Adequate housing is central to household well-being, social inclusion, and sustainable urban development, but the availability of residential buildings does not guarantee that households can obtain accommodation that is affordable, sufficiently spacious, and appropriate to their needs. In urban areas where land, construction materials, housing finance, and infrastructure are costly, households may continue to occupy unsuitable accommodation even when new dwellings are being produced. Research on affordable housing in Nigeria has therefore focused on interactions between household resources, construction costs, land, finance, and housing-delivery arrangements [3–5]. Construction costs are particularly relevant because increases in the prices of building materials and other inputs can increase the cost of producing housing and may influence the prices or rents paid by households. Exchange-rate movements and inflation can exacerbate these pressures, particularly where construction depends on imported materials or equipment [6–7]. Nigerian research has examined relationships between exchange-rate movements, building-material prices, and residential construction costs [11]. Nevertheless, higher construction costs do not necessarily affect every household in the same way. Tenure, income, housing type, access to finance, and the amount of residential space available may influence how economic pressures are experienced.

Ado-Ekiti, the capital of Ekiti State in southwestern Nigeria, provides a useful context for exploring these relationships outside the country's largest metropolitan markets. Existing studies have documented concerns about housing quality, affordability, and access to residential estates in the city [8–9].

Additional household-level evidence can help explain how housing-related economic circumstances relate to the conditions under which residents occupy existing accommodation.

A distinction should be drawn between aggregate housing deficit and household occupancy pressure. A citywide housing deficit concerns the gap between housing requirements and the available housing stock under a specified estimation method. The number of people occupying a room, by contrast, describes one aspect of household living conditions. It does not independently establish how many additional dwellings are required in a city. International guidance similarly treats adequate housing as multidimensional, encompassing sufficient space, affordability, habitability, services, and other conditions [18–21].

This study therefore examines elevated occupancy pressure as a household-level indicator of housing inadequacy rather than as a direct measure of Ado-Ekiti's total housing deficit. Analysis focuses on perceived building-material costs and reported affordable-housing needs, while a supplementary model examines the reported cost of building a house.

This study uses a binary outcome based on the questionnaire's existing category boundary: 1–5 persons per room versus six or more. This approach sacrifices some information about differences among the higher categories but provides a more stable and interpretable analysis of elevated occupancy pressure.

The study addresses the following research question:

Are housing-related economic constraints associated with elevated household occupancy pressure in Ado-Ekiti after adjustment for selected demographic, socioeconomic, and spatial characteristics?

The contribution is threefold. Firstly, it adds household-level evidence from a secondary Nigerian city to research on housing affordability and inadequacy. Secondly, it examines building-material costs and different types of affordable-housing need as separate explanatory variables. Thirdly, it distinguishes household occupancy conditions from aggregate housing-deficit estimates and explicitly addresses the statistical limitations arising from sparse outcome categories.

2. Literature review

This section considers the economics of housing deficit, with a focus on construction costs, housing affordability and the availability relative to household needs. It synthesises recent evidence on how the cost of building materials, the overall construction costs and affordability constraints are interrelated within systems, while acknowledging the contextual relevance of these factors to Nigerian cities. The review also establishes the conceptual basis for examining the cost of building materials (COBUM), current affordable housing need (CAHON) and cost of building a house (COBUH) in relation to the housing-deficit indicator used in this study. Particular attention is given to evidence from Nigeria and Ado-Ekiti to establish the empirical gap addressed by the study.

2.1. Housing inadequacy and household occupancy

Housing inadequacy encompasses more than the mere absence of a dwelling; a household can be inadequately housed even within a residence due to overcrowding, poor physical conditions, insufficient services, insecure tenure, or unaffordability of a more adequate dwelling. As such, occupancy pressure is a useful but provisional indicator of household housing conditions that should be used alongside other indicators of housing adequacy and not as a measure of overall need for improved housing.

In related research, residential space has been linked to personal and social wellbeing [2], while international housing policy highlights the importance of providing sufficient space and appropriate living conditions as components of decent housing [18–20]. Nonetheless, the categories do not automatically equate to globally accepted standards of overcrowding, since classification depends on definitions of rooms, the composition of households, and the nature of the housing units.

In Ado-Ekiti, for instance, Ayeni et al. [8] associate low-income levels, the high cost of construction materials, and occupancy ratios with housing-quality issues. Similarly, studies of affordable housing in Nigeria link informal financing, incremental development, and shared ownership with the ability of low-income households to access improved housing [3–5]. Nonetheless, the use of such strategies does not guarantee sufficient living space or overall housing adequacy.

For this study, the number of persons per room is used as a proxy for occupancy pressure. It is noteworthy that the categories should not be interpreted to suggest that all households in the higher category are inadequately housed in all aspects and those in the lower category adequately housed.

2.2. Building-material costs and housing affordability

Building-material costs link the supply side of the housing equation to the demand through the costs associated with construction. For instance, the costs of cement, steel, roofing sheets, fittings, and other construction materials constitute an input cost that influences the price of housing units and, by extension, the affordability of housing. In studies of affordable housing in Lagos State, land, finance, socio-economic factors, and construction costs have been revealed as major factors affecting housing [10].

At a macro level, exchange rates and inflation also affect the relative cost of construction materials and equipment [6–7]. Nigerian studies examining the exchange rate dynamics and their implications on building materials and construction costs have highlighted the indirect impact on housing affordability [11]. Local material and local content issues have also been emphasized as factors affecting the production of housing and promoting affordability [16–17].

It is important to note that the variables should not be interpreted to suggest that respondents who record a higher relative cost of materials record higher occupancy pressure. The perception of cost is a subjective measure that reflects respondents' perceptions of relative cost rather than an objective assessment of actual costs. Additionally, the perception could be influenced by a combination of

income, tenure status, type of dwelling, experience of construction, and the extent to which building materials are purchased by the respondent.

For this study, the response to the question on perceived material costs is treated as a categorical predictor. This acknowledgement of the nature of the data means that the analysis does not assume that the difference between “very expensive” and “expensive” is the same as the difference between “moderately expensive” and “not expensive.” The difference between the two pairs of categories is not readily interpretable.

2.3. Affordable-housing need as a multidimensional construct

Affordable-housing need is a complex issue that emanates from multiple sources, including the inability to afford current housing, high land and construction costs, insufficient consideration in development plans, and lack of services. In Nigeria, the affordability of housing has been examined in relation to the challenges facing lower-income households [5, 12–13, 22]. Studies emphasize incremental housing and shared ownership as mechanisms for promoting access to affordable housing, including addressing the need. Nonetheless, the need for affordable housing emanates from a range of issues, including unavailability of appropriate housing, insufficient provision of social amenities by private landlords, and lack of access to land.

The current ordinal scale used for the affordable-housing need item focuses on differentiating between the sources of need but not the degree to which they contribute to the overall need. As such, the categories should be treated as nominal measurements. A household that records high construction costs does not necessarily have a greater need than another household that records service inadequacies or insufficient land use policies. A statistically significant interaction effect for affordable-housing need indicates that the association between occupancy pressure and affordable-housing need depends on the source of need. Nonetheless, the analysis does not assume that an increment in the coding of the ordinal variable score has the same impact on the need.

2.4. Housing, urban planning, and sustainable development

Housing affordability is affected by multiple factors, including the availability of suitable land, the distance to jobs, and the ability of residents to meet mortgage payments. Urban development and housing policy recognize the centrality of housing in promoting socioeconomic wellbeing and sustainable development. As such, there is increased emphasis on providing affordable and adequate housing that promotes inclusive growth [14–15, 23, 30]. Housing adequacy and residential inequalities research also emphasizes the importance of considering the spatial distribution of housing and the characteristics of different categories of residents [24–26].

This observation underscores the importance of examining the characteristics of residents alongside housing stock to examine issues affecting their wellbeing. New housing developments do not automatically benefit all residents, particularly those with limited income. As such, urban planners need

to consider the importance of housing affordability and its implications for ensuring sustainable development [29].

Local material options and incremental development are viable options for improving housing supply and promoting affordability. Nonetheless, their implications depend on the broader set of circumstances affecting housing development, including the availability of land, finance, building materials, and general infrastructure, and residents' capacity to purchase or access existing housing or new developments.

2.5. Research gap and contribution

The study has a number research gaps. First, the importance of examining housing issues within secondary cities emerges from the heterogeneity of the built environment, household resources, construction practices, and public policies. The differences in the socio-economic base, availability of land, and investment by both public and private entities in Lagos and Abuja cannot be generalized to other urban centers, such as Ado-Ekiti.

Second, aggregated studies on total housing deficit and housing stock and their use in interpreting the characteristics of residents who stay in a dwelling do not provide insights into the nature of the occupancy conditions. As discussed, the concept of occupancy pressure offers a useful way of acknowledging different household perspectives on the use of the dwelling. It is an informative but supplementary measure that provides residents' perceptions alongside the general characteristics of the housing stock.

Third, the economic factors often operate as bundles of related influences that make it inappropriate to assume a direct and uniform impact on variables of interest. The issues affecting material costs, for instance, are multifaceted and include inflation, exchange rates, distance, and availability. Similarly, income influences the ability to purchase a dwelling or access other investment options. Examining the factors separately helps clarify their associations and underlying mechanisms.

The contribution of the current study emerges from the examination of the link between elevated occupancy pressure and economic factors using a binary logistic model. The study takes advantage of the existing cut-off point in the ordinal scale used for the questionnaire to examine the differences in the associations between occupancy pressure and the three economic variables. Specifically, the study uses the questionnaire's built-in cut-off point between 1–5 persons per room and six or more persons per room to estimate the odds ratios. In other words, the study makes use of the fact that 1–5 persons per room is not the same as six or more persons per room rather than examining the differences within the 1–5 category. As such, the study focuses on the presence of an association, not the degree of association. It is important to note that the current study does not attempt to estimate the overall housing deficit in Ado-Ekiti

2.6. Conceptual framework

The conceptual framework for the analysis assumes that the variables COBUM, CAHON, and COBUH affect occupancy pressure, NUPOR. It acknowledges other variables, notably socio-economic factors, that affect the research model. As such, the framework focuses on examining the associations between the three economic variables and occupancy pressure while controlling for the influence of other factors, notably demographics and the built environment. The framework has been developed with the recognition that the data are cross-sectional and do not allow for a definitive examination of causal mechanisms. As such, the framework focuses on possible associations rather than a hypothesized causal pathway. The conceptual framework emphasizes the multidimensionality of housing adequacy and is informed by the literature on housing indicators and residential space [18–21]. Figure 1 displays the conceptual framework for this study.

3. Methods

This study examines the relationship between housing-related economic constraints and household occupancy pressure in Ado-Ekiti, Nigeria. The methodological approach was designed to assess how construction-related costs and housing affordability pressures relate to differences in household occupancy conditions. A quantitative research design was adopted, with the analysis drawing on household-level data. Binary logistic regression was used to examine the factors associated with higher household occupancy pressure. Descriptive statistics and supplementary analyses were also employed to provide context for interpreting the regression findings.

3.1. Study area and research design

The study was conducted in Ado-Ekiti, the capital of Ekiti State in southwestern Nigeria (See Figs. 2 and 3).

The household survey covered seven residential development corridors, providing spatial coverage across the study area (as shown in Fig. 4). The sampling framework targeted 1,254 households, and 1,244 completed questionnaires were retrieved.

The study employed a cross-sectional quantitative design. The analysis therefore estimates associations among the measured variables at the time of the survey. It cannot establish that the explanatory variables caused the observed occupancy conditions, or determine how these conditions changed over time.

3.2. Sample and data screening

A total of 1,244 completed questionnaires were retrieved. Following data screening, 1,230 observations were retained for Models 1 and 2. Four records with invalid age codes were excluded along with records that did not meet the complete-case requirements for the variables included in the principal models.

Model 3 was estimated on 679 complete observations because the reported cost of building a house (COBUH) was unavailable for a substantial proportion of respondents. As a result, the estimation sample

for Model 3 differs from that used in Models 1 and 2. Changes in the coefficients between Model 2 and Model 3 may therefore be attributable to both the additional predictor and the differing set of cases analysed. Fit statistics from models estimated on different samples should not be interpreted as a straightforward nested-model comparison.

3.3. Data collection and instrument

Primary data were collected using a structured household questionnaire covering household characteristics, occupancy conditions, economic circumstances, and perceived housing constraints. The focal economic variables represent distinct constructs rather than a single reflective scale. As such, they were analysed as separate predictors.

3.4. Measures

The dependent variable, NUPOR, records the number of persons occupying a room. The original questionnaire provided four categories: 1–5, 6–10, 11–20, and above 20 persons. The two highest categories were combined because the above-20 category had very few observations. The final outcome thus comprised three ordered categories: 1–5, 6–10, and 11 or more persons.

The focal predictors were COBUM, respondents' assessment of building-material costs; CAHON, the type of current affordable-housing need reported; and COBUH, the reported cost category for building a house. COBUM was coded from "very expensive" through "not expensive." As such, higher numeric codes represent lower perceived costs, and the direction of its odds ratio should be interpreted in terms of this coding. CAHON was treated as nominal and jointly evaluated. COBUH was recorded in cost bands; its interpretation depends on whether it is modelled as a numeric ordered term or as a categorical factor. The coding used in the reported estimates should therefore be confirmed against the original analysis syntax prior to submission.

Control variables included gender, duration of stay, age, marital status, household size, number of rooms occupied (NURO), educational level, income, occupation, and residential location. Household size and number of rooms occupied are closely associated with occupancy conditions and can account for a large amount of variation in NUPOR. Their inclusion should be interpreted as adjustment for household composition and available space rather than as evidence that these characteristics are independent of the outcome.

3.4.1 Rent-income burden (PINCOR)

PINCOR records the percentage of household income spent on rent. The response categories are below 30%, exactly 30%, and above 30%. This variable is reported descriptively as an indicator of rent burden; it is not included in the principal regression model because the available manuscript does not specify a validated common analytical denominator or the tenure routing required to combine it with mortgage expenditure.

3.4.2 Mortgage-income burden (PINCOM)

PINCOM records the percentage of household income spent on mortgage payments, classified as below 30%, exactly 30%, and above 30%. It is reported separately from PINCOR because rent and mortgage payments apply to different housing-finance circumstances. The source manuscript does not provide item-specific valid-response counts, so no denominators are inferred or added.

Table 1 shows this study's variables and it's operational definition.

Table 1
Study variables and operational definitions

Variable	Code	Conceptual Definition
Elevated occupancy pressure	NUPOR-B	0 = 1–5 persons per room; 1 = six or more persons per room
Cost of building materials	COBUM	Categorical: very expensive; expensive; moderately expensive; not expensive
Current affordable-housing need	CAHON	Five nominal categories of reported affordable-housing need
Cost of building a house	COBUH	Categorical: below ₦1 million; ₦1–3 million; ₦4–7 million; above ₦7 million
Control Variables	—	Gender, age, duration of residence, marital status, household size, number of rooms occupied, education, income, occupation, and residential location
Percentage of household income spent on rent	PINCOR	Categorical: below 30%; exactly 30%; above 30%
Percentage of household income spent on mortgage payments	PINCOM	Categorical: below 30%; exactly 30%; above 30%
Source: Field Survey (2023)		

3.4. Statistical analysis

Binary logistic regression was used as the principal outcome distinguishes two categories of occupancy pressure. The method estimates the association of each predictor with the odds of being in the six-or-more persons-per-room category, conditional on the other variables in the model.

Three model specifications were used:

i). Model 1: demographic, socioeconomic, and spatial controls.

ii). Model 2: Model 1 plus COBUM and CAHON.

iii) Model 3: a supplementary complete-case model adding COBUH to the core controls and COBUM.

Model 1 and Model 2 were estimated on the same 1,230 observations. Their fits were compared using a likelihood-ratio test and Akaike's information criterion (AIC) [29].

Model 3 was estimated on the 679 observations with valid COBUH data. In this complete-case subset, CAHON category 5 contained no observations in the elevated-occupancy outcome. Including the full CAHON factor in that model produced complete separation for that category. To avoid presenting an unstable estimate, CAHON was omitted from Model 3. The comparison between Model 2 and Model 3 is therefore not presented as a direct nested comparison. Instead, Model 3 is compared with a complete-case model containing the same core controls and COBUM but not COBUH.

The original proportional-odds approach was not retained for final inference. Ordinal logistic regression assumes a common predictor effect across cumulative outcome thresholds, and this assumption requires appropriate assessment [27–28, 31]. Given the sparse highest occupancy category and the unstable threshold-specific estimates, the analysis was recast around the questionnaire's binary boundary rather than claiming that the proportional-odds assumption had been satisfied.

Model performance was assessed using likelihood-based statistics, AIC, the area under the receiver operating characteristic curve (AUC), the Brier score, and a grouped Hosmer–Lemeshow calibration test. These are in-sample diagnostics and should not be interpreted as independent external validation.

4. Results

The findings are presented in relation to the study's central concern: the association between housing-related economic pressures and household occupancy conditions in Ado-Ekiti. The results begin with descriptive evidence on the burden of rent and mortgage payments, highlighting the financial demands experienced by households. The binary logistic regression findings then examine the relationship between selected economic factors and higher occupancy pressure. A supplementary analysis considers construction costs to provide further insight into the economic context of housing provision. Taken together, these findings clarify how housing affordability and construction-related pressures intersect with household living conditions.

4.1. Distribution of occupancy pressure

Of the 1,230 observations retained for the principal analysis, 693 (56.3%) were in the 1–5 persons-per-room category, while 537 (43.7%) were in the six-or-more category. Thus, slightly more than two-fifths of the analytical sample fell into the study-defined elevated-occupancy category. Table 2 illustrates this distribution.

Table 2
Distribution of occupancy pressure in the principal analytical sample

Occupancy category	Frequency	Percentage
1–5 persons per room	693	56.3
Six or more persons per room	537	43.7
Total	**1,230**	**100.0**
Source: Field Survey (2023)		

This finding reflects the distribution of responses in the surveyed households. It should not be extrapolated to estimate the prevalence of overcrowding in the city as a whole, as the operational definition is based on the questionnaire categories and the analysis sample.

4.2. Construction-material costs

Construction-material costs were a significant burden to respondents. In the original survey distribution, 38.3% described building materials as very expensive and 20.9% as expensive, meaning that 59.2% put material costs in the two highest categories. A further 18.3% considered them moderately expensive, while 22.5% considered them not expensive (see Fig. 5).

Source: Field Survey (2023)

4.3. Housing expenditure burden

The survey also recorded the percentage of household income spent on rent (PINCOR) and mortgage payments (PINCOM). These two indicators offer a direct, descriptive perspective on housing-cost burdens that complement the study's occupancy-pressure outcome. The distributions of these variables are presented separately in the analysis for similar reasons: rent and mortgage payments are associated with different tenure and financing situations.

A few portion (23.3%) of respondents spend below 30% of their household income on rent, 7.3% spend exactly 30%, and 69.3% spend more than 30%. Altogether, the numbers sum up to 99.9% due to rounding. For mortgage payments, 7.7% of respondents spend below 30% of their household income on mortgages, 35.2% spend exactly 30%, and 57.1% – spend more than 30% (as shown in Table 3). This means that in both cases, more than half of respondents spend over 30% of their household income as housing costs. It should be noted that 30% is used as an illustrative threshold here: it does not mean that all respondents who spend more than 30% of their household income on housing have comparable levels of unaffordability.

Table 3
Distribution of rent and mortgage expenditure as a share of household income

Housing-expenditure indicator	Share of household income	Percentage
PINCOR: rent	Below 30%	23.3
PINCOR: rent	Exactly 30%	7.3
PINCOR: rent	Above 30%	69.3
PINCOM: mortgage	Below 30%	7.7
PINCOM: mortgage	Exactly 30%	35.2
PINCOM: mortgage	Above 30%	57.1
Source: Field Survey (2023)		
Note: Percentages are reported as presented in the study materials. Item-specific valid-response denominators were not available in the manuscript. Rent and mortgage distributions are kept separate and should not be assumed to represent the same respondents.		

4.4. Binary logistic regression results

The addition of COBUM and CAHON each to the control-only model significantly improved model fit, with Model 1 having a log likelihood of − 651.750 and an AIC of 1,341.500, while Model 2 had a log likelihood of − 553.820 and an AIC of 1,159.641.

The likelihood-ratio comparison was statistically significant, $\chi^2(7) = 195.86$, $p < .001$, suggesting that the added predictors provided information associated with elevated occupancy pressure beyond that captured by the selected demographic, socioeconomic, and spatial controls.

In Model 2, the joint test for COBUM was statistically significant, Wald $\chi^2(3) = 130.21$, $p < .001$, and the same applied to the joint test for CAHON, Wald $\chi^2(4) = 22.03$, $p < .001$.

The relationship between perceived material costs and elevated occupancy was non-monotonic—respondents selecting “expensive” had lower odds of elevated occupancy than those describing materials as very expensive (OR = 0.338, 95% CI 0.218–0.524, $p < .001$), while those selecting “moderately expensive” had higher odds (OR = 2.203, 95% CI 1.439–3.374, $p < .001$), and those selecting “not expensive” had substantially higher odds than those who described materials as very expensive (OR = 8.988, 95% CI 5.337–15.138, $p < .001$).

This finding does not support a straightforward assertion that greater perceived material costs are associated with greater occupancy pressure. The categories may capture different aspects of housing type, tenure, wealth, or construction experience, or reflect differences in respondents’ interpretation of the question. The cross-sectional survey design does not determine which explanation captures the pattern.

CAHON was also significant as a joint categorical term, interpretation of the category-specific estimate for “overall housing deficit” should be cautious due to the small number of observations (26) in the principal sample for that category. Its odds ratio was 0.017 relative to the reference category, with a confidence interval extending from 0.002 to 0.163. The sparse category makes this estimate comparatively unstable, and the joint test is a more appropriate summary of the categorical predictor. This is presented in Table 4.

Table 4. Full coefficient estimates for Model 2

Outcome: Elevated occupancy pressure (six or more persons per room = 1; 1–5 persons per room = 0).

N = 1,230.

Predictor or contrast	Coefficient (β)	SE	Odds ratio	95% CI for OR	p-value
Gender: category 2 vs 1	0.474	0.166	1.607	1.161–2.222	.004
Duration of residence: one-category increase	0.140	0.085	1.150	0.974–1.357	.099
Age: one-category increase	−0.512	0.123	0.599	0.471–0.762	< .001
Marital status: category 2 vs 1	−0.991	0.208	0.371	0.247–0.559	< .001
Marital status: category 3 vs 1	0.040	0.433	1.041	0.445–2.432	.927
Marital status: category 4 vs 1	0.677	0.341	1.968	1.009–3.840	.047
Marital status: category 5 vs 1	0.637	0.345	1.891	0.961–3.722	.065
Education: category 2 vs 1	0.060	0.287	1.062	0.605–1.862	.834
Education: category 3 vs 1	0.590	0.297	1.804	1.007–3.232	.047
Education: category 4 vs 1	−0.642	0.466	0.526	0.211–1.311	.168
Education: category 5 vs 1	1.123	0.454	3.075	1.262–7.492	.013
Income: one-category increase	−0.483	0.072	0.617	0.536–0.710	< .001
Location: category 2 vs 1	0.005	0.483	1.005	0.390–2.589	.992
Location: category 3 vs 1	1.321	0.326	3.748	1.979–7.101	< .001
Location: category 4 vs 1	0.608	0.292	1.837	1.036–3.257	.038

Source: Field Survey (2023)

Notes: OR = odds ratio; CI = confidence interval; SE = standard error. Reference categories are code 1 for each categorical variable. Duration of residence, age, and income were entered using their ordered category codes; their ORs thus represent a 1-category increase. For COBUM, code 1 is “very expensive.” For CAHON, code 1 is current occupants of existing rental housing in need. The estimate for category 5 of CAHON was based on a small number of cases and should be interpreted with caution. The coefficient table presents the model estimates; joint tests were reported in the text.

Predictor or contrast	Coefficient (β)	SE	Odds ratio	95% CI for OR	p-value
Location: category 5 vs 1	−0.987	0.546	0.373	0.128–1.086	.071
Location: category 6 vs 1	0.187	0.301	1.206	0.669–2.173	.534
Location: category 7 vs 1	1.684	0.275	5.389	3.145–9.236	< .001
COBUM: expensive vs very expensive	−1.086	0.224	0.338	0.218–0.524	< .001
COBUM: moderately expensive vs very expensive	0.790	0.217	2.203	1.439–3.374	< .001
COBUM: not expensive vs very expensive	2.196	0.266	8.988	5.337–15.138	< .001
CAHON: category 2 vs category 1	−0.378	0.262	0.685	0.410–1.145	.149
CAHON: category 3 vs category 1	0.353	0.305	1.424	0.783–2.591	.247
CAHON: category 4 vs category 1	−0.231	0.283	0.793	0.455–1.383	.414
CAHON: category 5 vs category 1	−4.085	1.158	0.017	0.002–0.163	< .001
Source: Field Survey (2023)					
Notes: OR = odds ratio; CI = confidence interval; SE = standard error. Reference categories are code 1 for each categorical variable. Duration of residence, age, and income were entered using their ordered category codes; their ORs thus represent a 1-category increase. For COBUM, code 1 is “very expensive.” For CAHON, code 1 is current occupants of existing rental housing in need. The estimate for category 5 of CAHON was based on a small number of cases and should be interpreted with caution. The coefficient table presents the model estimates; joint tests were reported in the text.					

McFadden’s pseudo-R 2 for Model 2 was .343; the apparent AUC was .866, and the Brier score was .146. The grouped Hosmer–Lemeshow test was not statistically significant, χ 2 (8) = 5.70, p = .681. These are in-sample model assessments; the data should not be considered as an independent sample for testing the predictive performance of the model.

4.5. Supplementary analysis of house-construction costs

The reported cost of building a house (COBUH) was missing for a substantial proportion of the original records. A complete-case subset of 679 observations was therefore used for the supplementary analysis.

In this subset, the proportion of respondents in the elevated-occupancy category differed from that in the principal sample. The supplementary model was thus treated as a separate-sample analysis rather than as a direct comparison with the 1,230-observation Model 2.

To evaluate the additional information provided by COBUH, a complete-case baseline model containing the core controls and COBUM was compared with a model adding COBUH. The baseline model had a log likelihood of − 288.167 and an AIC of 620.335. After COBUH was added, the log likelihood improved to − 220.701 and the AIC fell to 491.402. The likelihood-ratio comparison was statistically significant, $\chi^2(3) = 134.93$, $p < .001$.

With the below-₦1-million category as the reference, the reported odds ratios for the ₦1–3-million, ₦4–7-million, and above-₦7-million categories were 0.012, 0.102, and 0.029, respectively. All three estimates were statistically significant in this supplementary specification.

These are substantial associations, but they should not be interpreted as evidence that higher construction costs reduce housing inadequacy. Respondents reporting higher construction-cost categories may differ in dwelling type, tenure, household resources, and housing arrangements. The supplementary sample also represents only those records with valid COBUH values. The analysis does not establish the mechanism behind the observed relationship. The category-specific construction-cost estimates should therefore be treated as exploratory. The model shows that COBUH contains information associated with occupancy pressure in the complete-case sample; it does not establish a causal effect. Table 5 presents this analysis.

Table 5
Complete-case comparison for the house-construction-cost analysis

Statistic	Complete-case baseline: controls + COBUM	Supplementary model: controls + COBUM + COBUH
N	679	679
Log likelihood	−288.167	−220.701
AIC	620.335	491.402
Additional parameters	—	3
Likelihood-ratio test for adding COBUH	—	$\chi^2(3) = 134.93$, $p < .001$
Source: Field Survey (2023)		
Note: CAHON was omitted from these complete-case models because its fifth category had no elevated-occupancy observations in the subset, producing complete separation. The table compares models estimated on the same 679 observations.		

4.6. Sensitivity analysis for household size and number of rooms

A sensitivity model added household size and number of rooms occupied to the principal Model 2. These variables were excluded from the main model because they are closely related to the persons-per-room outcome.

The added variables improved model fit, a likelihood-ratio difference of $\chi^2(7) = 310.35$, $p < .001$. The material-cost association remained statistically significant as a joint term, but the category-specific odds ratios changed. The odds ratio for "not expensive" versus "very expensive" decreased from 8.988 in the principal model to 3.760 in the sensitivity model. The "expensive" category remained associated with lower odds of elevated occupancy, while the "moderately expensive" category was not statistically significant.

The joint CAHON term was also statistically significant in the sensitivity model, although its estimated effects also changed. The sensitivity to household composition and available space illustrates the dependence of the relationship between perceived material costs and occupancy pressure on the covariates in the model. Since household size and number of rooms are closely related to the definition of occupancy pressure, the sensitivity results should not be regarded as a superior causal specification. This illustrate the importance of distinguishing household composition from the focal economic associations.

5. Discussion

The analysis indicates that perceived building-material costs and reported affordable-housing needs are associated with elevated household occupancy pressure in Ado-Ekiti. A likelihood-ratio comparison shows that the two focal variables add information beyond the selected demographic, socioeconomic, and spatial controls. This finding is consistent with research that treats housing affordability as an interaction between construction, finance, land, and household resources rather than as a simple count of dwellings [3–5, 10].

The descriptive PINCOR and PINCOM findings add an expenditure dimension to this interpretation. A reported 69.3% of rent respondents spent above 30% of household income on rent, while 57.1% of mortgage respondents spent above 30% of on mortgage payments. These results indicate that housing-cost pressure extends beyond construction inputs: recurring payments can also consume a substantial share of household resources.

The material-cost results require particular attention. The estimated odds ratios do not follow a simple increasing or decreasing sequence across the response categories. Respondents describing materials as expensive had lower odds of elevated occupancy than those selecting "very expensive," while those selecting "moderately expensive" or "not expensive" had higher odds. The non-monotonic pattern is a caution against interpreting the variable as a direct measure of market-price pressure.

Several explanations might account for the pattern. Respondents might vary in whether they own or rent their accommodation, whether they have previously built a house, how they interpret the cost question,

or the type of dwelling they occupy. The data do not establish which explanation is correct. The result should therefore be seen as an empirical association that requires further investigation, and not evidence that lower material costs increase occupancy pressure.

The joint significance of CAHON indicates that the reported type of affordable-housing need contains information associated with the outcome. However, the categories represent different conditions rather than a single scale. The results do not support a statement that a uniform increase in housing need causes elevated occupancy. Moreover, the smallest category—overall housing deficit—contains relatively few observations, its individual estimate being less stable than those for larger categories.

The supplementary construction-cost analysis identifies a strong association between reported construction-cost categories and occupancy pressure in the 679-observation complete-case sample. This finding should not be interpreted as a protective effect of expensive housing. Higher construction cost categories might identify households with different financial resources, tenure circumstances, or dwelling characteristics. The sample differs from the principal analytical sample, and the supplementary model was deliberately separated from the main model because the CAHON category structure caused complete separation in the complete-case set.

The study also demonstrates the reasons why household occupancy should not be used as a direct substitute for a citywide housing-deficit estimate. A room-occupancy measure can identify one aspect of living conditions, but cannot establish the number of dwellings required, the quality of the existing stock, the security of tenure, or the affordability of available accommodation. International housing frameworks similarly emphasise the multiple dimensions of adequacy [18–21].

For urban planning purposes, the results support integrating household living conditions with housing provision and affordability assessments. Programmes that expand the housing stock should also consider whether the units produced are financially accessible and suitable for the households they are intended to serve. Research on local materials, incremental housing, and alternative ownership arrangements provides relevant policy directions, but these approaches should be assessed alongside finance, infrastructure, construction quality, and household capacity [5, 13, 16–17, 22].

The study contributes evidence from Ado-Ekiti, but its findings should not be generalised automatically to other Nigerian cities. Differences in housing markets, construction practices, income distributions, and urban structure might produce different patterns. Further research using longitudinal or multilevel designs could establish how economic conditions and household occupancy interact over time and across neighbourhoods.

6. Conclusion and planning implications

This study examined the association between housing-related economic constraints and elevated household occupancy pressure in Ado-Ekiti, Nigeria. In the principal sample of 1,230 observations, 43.7% fell into the study-defined category of six or more persons per room. Adding perceived building-material

costs and reported affordable-housing needs improved model fit beyond the selected demographic, socioeconomic, and spatial controls.

The association between perceived material costs and elevated occupancy was non-monotonic. It would be misleading to conclude that higher building-material costs necessarily increase occupancy pressure on the basis of these results. Affordable-housing need was also jointly associated with the outcome, but category-specific estimates—particularly for the smallest category—require caution. A supplementary analysis found a strong association between construction-cost categories and occupancy in a smaller complete-case sample, but this relationship cannot be interpreted causally.

Three planning implications follow.

First, housing strategies should consider affordability and household living conditions alongside the number of dwellings produced. Construction-material costs, finance, land, and the financial resources of households are interconnected aspects of housing access. Measures to improve the affordability and quality of housing should be evaluated using evidence on both supply and household access.

Housing-affordability monitoring should also track the share of income devoted to rent and mortgage payments, reported separately by tenure and financing arrangement. The PINCOR and PINCOM distributions indicate that a substantial proportion of the relevant respondents reported expenditure above the 30% reference point. Local authorities and housing agencies can use such indicators alongside income, dwelling quality, occupancy, and service-access data when targeting support, but avoiding the assumption that a single expenditure threshold captures every household's circumstances.

Second, housing-needs assessments should incorporate occupancy indicators as a complement to housing-stock estimates. Such indicators can help identify households experiencing pressure on residential space, but should be interpreted alongside dwelling quality, tenure, services, and affordability. They should not be substitutes for estimating the aggregate housing deficit.

Third, housing programmes should be responsive to differences in income, tenure circumstances, household characteristics, and location. Uniform approaches might overlook the different conditions through which households experience housing inadequacy. These directions are consistent with international housing and urban-development frameworks [14–15, 18, 22–23, 30].

Future research should combine occupancy measures with dwelling quality, housing expenditure, tenure security, service access, and spatial accessibility. It should also examine the non-monotonic relationship between perceived material costs and occupancy pressure, validate the measures to represent economic pressure, and test the findings in other Nigerian cities.

7. Limitations

Several limitations qualify the findings.

First, elevated occupancy pressure was operationalised using the questionnaire's existing boundary between 1–5 and six or more persons per room. This is a study-defined indicator and is not an internationally validated overcrowding threshold. The binary outcome sacrifices distinctions between the 6–10, 11–20, and above-20 categories.

Second, the cross-sectional design supports analysis of associations but not causal inference. The observed relationships might reflect differences in tenure, household resources, housing type, or other characteristics not fully captured in the survey.

Third, COBUM and CAHON were self-reported variables. Perceptions of building-material costs do not directly measure market prices or construction expenditure. The non-monotonic COBUM results suggest that respondents' assessments should be interpreted with care.

The reported PINCOR and PINCOM percentages provide additional descriptive evidence on housing expenditure, but the manuscript's source material does not state item-specific valid-response denominators or fully document the routing of rent and mortgage questions. The two distributions are therefore presented separately, without denominator reconstruction or direct comparison between tenure groups. They were not incorporated into the principal regression estimates.

Fourth, the supplementary construction-cost model was estimated on 679 observations because COBUH was missing for a substantial proportion of the original sample. The complete-case sample might differ systematically from the principal analytical sample. In addition, CAHON was omitted from the supplementary model because its smallest category had no elevated-occupancy observations in that subset, causing complete separation.

Fifth, household size and number of rooms occupied were excluded from the principal model because they are closely related to the outcome. The sensitivity analysis showed that including them changes the estimates of the focal economic variables. This means that the magnitude of the associations depends on how household composition and available space are handled.

Finally, the original proportional-odds specification could not be reliably validated because of sparse upper occupancy categories. The final analysis therefore uses binary logistic regression and does not claim to have established a proportional-odds relationship.

Declarations

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Ethics approval and consent to participate

This study formed part of the Lead Author's doctoral research conducted through the Department of Urban and Regional Planning, Federal University of Technology, Akure, Nigeria. The research was approved by the Urban and Regional Planning Postgraduate Committee, Federal University of Technology, Akure (Approval Reference No. URP/PGC/2024/0018).

Permission to conduct fieldwork was obtained from the Ekiti State Ministry of Housing and Urban Development (Approval Reference No. EKSHMHUD/2025/00210) and the Ekiti State Housing Corporation (Approval Reference No. EKSHC/2025/00143).

Verbal informed consent was obtained from all 1,244 respondents before questionnaire administration. Participation was voluntary, respondents were informed of the purpose of the study, and their responses were treated confidentially.

Competing interests

The authors declare no competing interests.

Author contributions

F.S. Abe: Conceptualisation, methodology, investigation, data curation, formal analysis, visualisation, and original draft preparation. O.E. Dairo: Conceptualisation, validation and review and editing of the manuscript. Both authors contributed to the development of the manuscript, read and approved the final version, and accept responsibility for the integrity of the work.

Data availability

The study is based on primary household survey data collected in Ado-Ekiti. A de-identified version of the dataset may be requested from the corresponding author, subject to applicable institutional and ethical requirements.

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Generative AI disclosure

Generative AI was used to assist with manuscript organisation, language refinement, and revision of the conceptual presentation. The authors remain responsible for verifying the data, statistical analyses, interpretations, references, and final manuscript content.

Consent to Participate: Verbal informed consent was obtained from all 1,244 respondents before the administration of the questionnaires. Respondents were informed about the purpose of the study and

how their responses would be handled. Participation was voluntary and respondents' information was treated confidentially.

Consent to publish: Not applicable. This manuscript presents aggregated findings from household survey data and does not contain identifiable personal information, individual images, or other material requiring individual consent for publication.

References

1. Hipp JR, Poon BS, Kim JH. The role of renter burden and affordable units at risk in city-level housing inadequacy. Cities. 2025;165., Article 106086. https://doi.org/10.1016/j.cities.2025.106086.
2. Hadziabdic S, Kohl S. A room of one's own? The consequences of living density on individual well-being and social anomie. Soc Forces. 2025;103(4):1442–64. https://doi.org/10.1093/sf/soae163.
3. Akinwande T, Hui ECM, Dekker K. Effective affordable housing strategies for the urban poor in Nigeria. World Dev. 2024;173. https://doi.org/10.1016/j.worlddev.2023.106438. Article 106438.
4. Akinwande T, Hui ECM. Effective affordable housing provision in developing economies: A deductive analysis of informal housing strategies in Lagos, Nigeria. Cities. 2024;149. https://doi.org/10.1016/j.cities.2024.104964. Article 104964.
5. Nwachukwu L, Obi L, Akotia J. Addressing housing affordability in Nigeria through incremental housing: An evaluation of the Millard Fuller Foundation (MFF) model. Cogent Social Sci. 2025;11(1). Article 2588049. https://doi.org/10.1080/23311886.2025.2588049.
6. International Monetary Fund. (2026). *Nigeria: Selected issues.* IMF Staff Country Reports, 2026(126). https://doi.org/10.5089/9798229048514.002
7. Ozili PK. (2024). Exchange rate unification in Nigeria: Benefits and implications. In A. M. Sghaier Derbali, editor, *Recent developments in financial management and economics.* IGI Global. https://doi.org/10.4018/979-8-3693-2683-1.ch007
8. Ayeni FO, Taiwo OD, Agboola JT. Assessment of factors responsible for the inadequacy of quality housing in Ado Ekiti. Afr J Educational Manage. 2024;25(1):129–42. https://journals.ui.edu.ng/index.php/ajem/article/view/1485.
9. Olaseni AO, Owolabi BO, Gabriel E. Analysis of residents' accessibility to residential housing estates in Ado-Ekiti, Nigeria. Environ Anal Ecol Stud. 2023;10(3). Article 000737. https://doi.org/10.31031/EAES.2023.10.000737.
10. Ogundipe KE, Owolabi JD, Ogunbayo BF, Aigbavboa CO. Exploring inhibiting factors to affordable housing provision in Lagos metropolitan city, Nigeria. Front Built Environ. 2024;10:1408776. https://doi.org/10.3389/fbuil.2024.1408776.
11. Kasim O, Ajayi S, Omirin O, Alabi A. The impact of foreign exchange rate on building materials and residential building construction cost in Nigeria (1999–2021). Acta Structilia. 2023;30(2):61–93. https://doi.org/10.38140/as.v30i2.7523.

12. Akinyemi AT, Ibrahim RA, Ajenifujah-Abubakar AO, Kamarudeen OT, Oke AB. Challenges of accessing affordable housing among low income civil servants in Kubwa, Abuja. Commonw J Acad Res. 2023;4(9). https://doi.org/10.5281/zenodo.8322983.
13. Ale TA. Shared homeownership and the pursuit of affordable housing: Insights from low-to-medium income earners in Akure, Nigeria. Discover Civil Eng. 2025;2:60. https://doi.org/10.1007/s44290-025-00218-8.
14. United Nations Department of Economic and Social Affairs. (n.d.). Goal 11: *Sustainable cities and communities*. https://sdgs.un.org/goals/goal11
15. United Nations Human Settlements Programme. (2026). *World cities report 2026: The global housing crisis: Pathways to action.* https://unhabitat.org/world-cities-report-2026
16. Agwu K, Okechukwu K, Ogburie IG, Ezirim OP. Evaluating the economic implications of local content in Nigeria's sustainable housing development mantra: A cost-benefit approach. Int J Real Estate. 2025. https://doi.org/10.5281/zenodo.14644360.
17. Nwaji OI, Ugonabo CU. Assessment of the impact of locally sourced building materials on residential property development in Owerri, Imo State, Nigeria. Int J Real Estate. 2025;1(4):117–44. https://journals.unizik.edu.ng/Ijre/article/view/7567.
18. United Nations Human Settlements Programme. (2024). *Development of a framework for measuring and reporting on the adequacy of housing across diverse national and local contexts* (Report HSP/OEWG-H.2024/4). UN-Habitat. https://unhabitat.org/sites/default/files/2024/10/2416765e.pdf
19. Organisation for Economic Co-operation and Development. (n.d.). *Housing overcrowding*. OECD Data. https://doi.org/10.1787/96953cb4-en
20. World Health Organization. WHO housing and health guidelines: Recommendations to promote healthy housing for a sustainable and equitable future. World Health Organization; 2018. https://www.who.int/publications/i/item/9789241550376.
21. Organisation for Economic Co-operation and Development. (2024). *HC2.1 living space.* OECD Affordable Housing Database. https://www.oecd.org/content/dam/oecd/en/data/datasets/affordable-housing-database/hc2-1-living-space.pdf
22. Adedeji I, Deveci G, Salman H. The challenges in providing affordable housing in Nigeria and the adequate sustainable approaches for addressing them. Open J Appl Sci. 2023;13:431–48. https://doi.org/10.4236/ojapps.2023.133035.
23. United Nations. New Urban Agenda. United Nations; 2017. https://habitat3.org/the-new-urban-agenda/.
24. Marnane K, Greenop K. Housing adequacy in an informal built environment: Case studies from Ahmedabad. J Housing Built Environ. 2023;38:2059–82. https://doi.org/10.1007/s10901-023-10029-x.
25. Grewal A, Hepburn KJ, Lear SA, Adshade M, Card KG. The impact of housing prices on residents' health: A systematic review. BMC Public Health. 2024;24. https://doi.org/10.1186/s12889-024-

18360-w. Article 931.

26. Anierobi CM, Nwalusi DM, Efobi KO, Nwosu KI, Nwokolo NC, Ibem EO. Urban housing inequality and the nature of relationship between formal and informal settlements in Enugu metropolis, Nigeria. SAGE Open. 2023;13(3). https://doi.org/10.1177/21582440231192390.
27. McCullagh P. Regression models for ordinal data. J Roy Stat Soc: Ser B (Methodol). 1980;42(2):109–27. https://doi.org/10.1111/j.2517-6161.1980.tb01109.x.
28. Agresti A. Analysis of ordinal categorical data. 2nd ed. Wiley; 2010.
29. Akaike H. A new look at the statistical model identification. IEEE Trans Autom Control. 1974;19(6):716–23. https://doi.org/10.1109/TAC.1974.1100705.
30. United Nations Human Settlements Programme. (2024). *World cities report 2024: Cities and climate action*. UN-Habitat. https://unhabitat.org/world-cities-report-2024-cities-and-climate-action
31. Brant R. Assessing proportionality in the proportional odds model for ordinal logistic regression. Biometrics. 1990;46(4):1171–8. https://doi.org/10.2307/2532457.

Figures

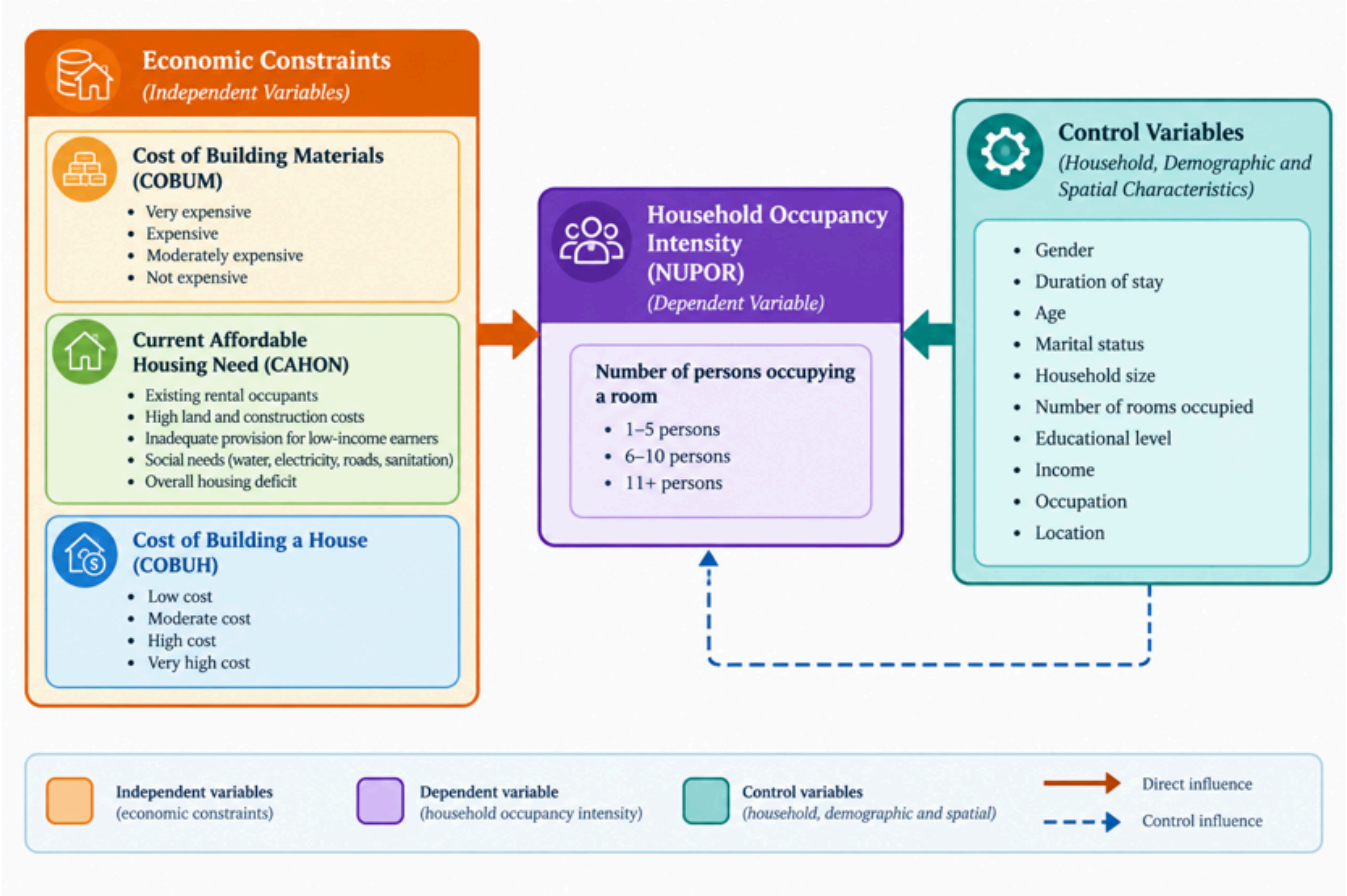


Figure 1

Conceptual framework linking housing-related economic constraints, household occupancy pressure, and control variables

Source: Author's conceptualisation, informed by research on housing affordability, living density, and multidimensional housing adequacy [1–2, 18–21].

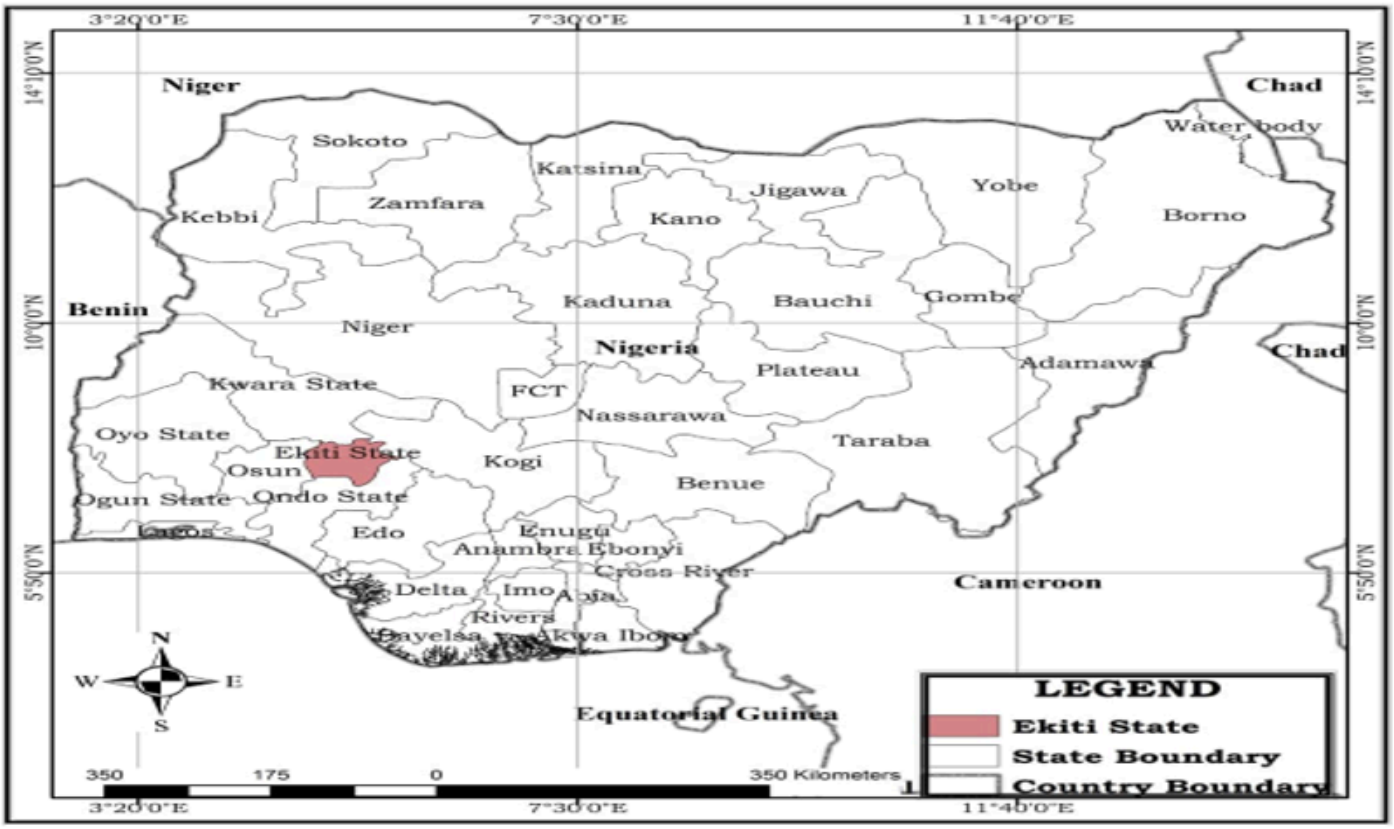


Figure 2

Map of Nigeria, showing Ekiti State

Source: Department of Urban and Regional Planning, Federal Polytechnic Ado-Ekiti (2019)



Figure 3

Ekiti State showing Ado-Ekiti LGA.

Source: Ekiti State Ministry of Land, Housing and Urban Development (2016); Digitized by Okosun (2020)

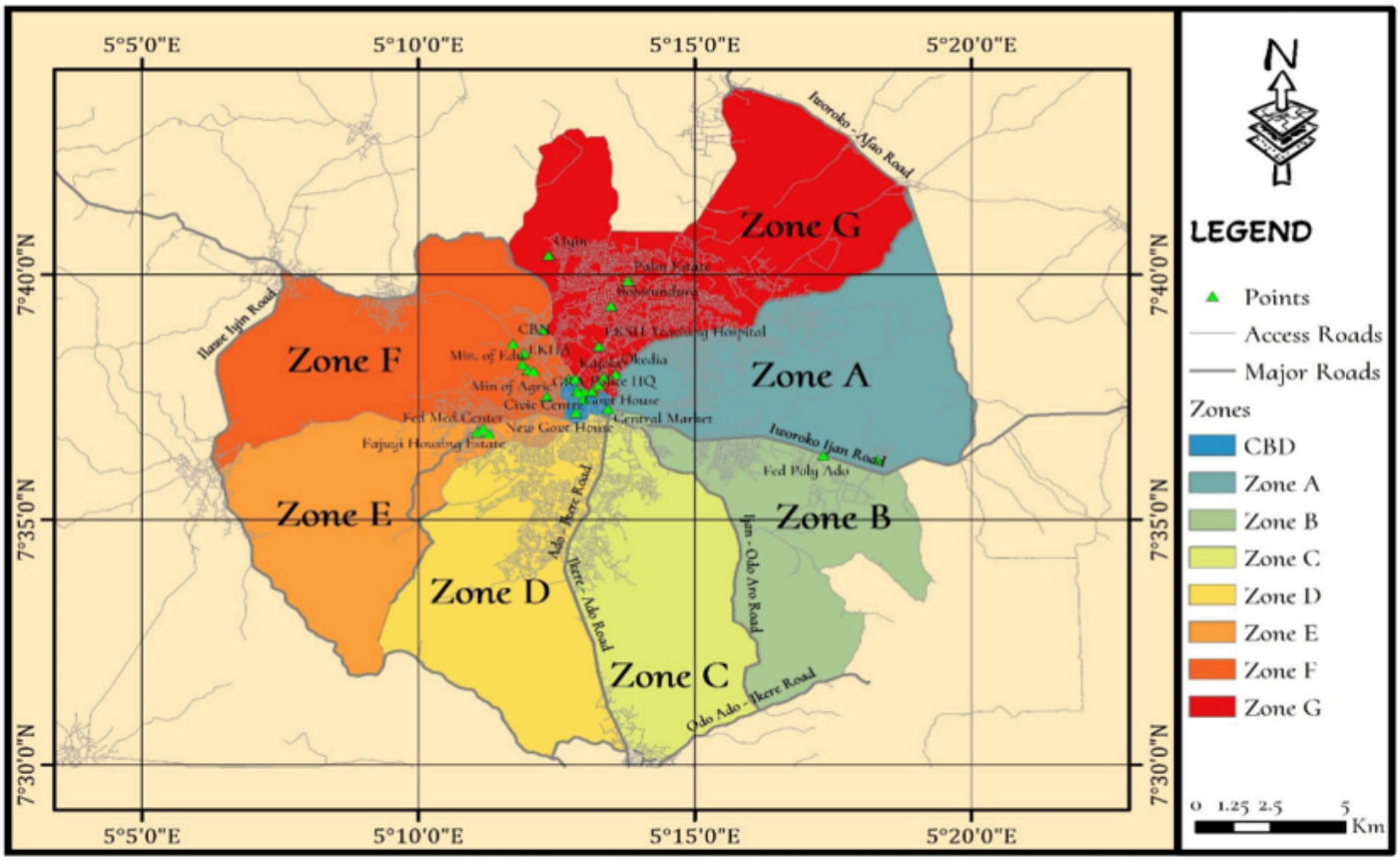


Figure 4

Map of Ado-Ekiti Indicating the Sectoral Zone Accessible via Residential Development Corridors (RDCs)

Source: Ministry of Land, Housing and Urban Development (2016), Digitized by Researcher, (2022)

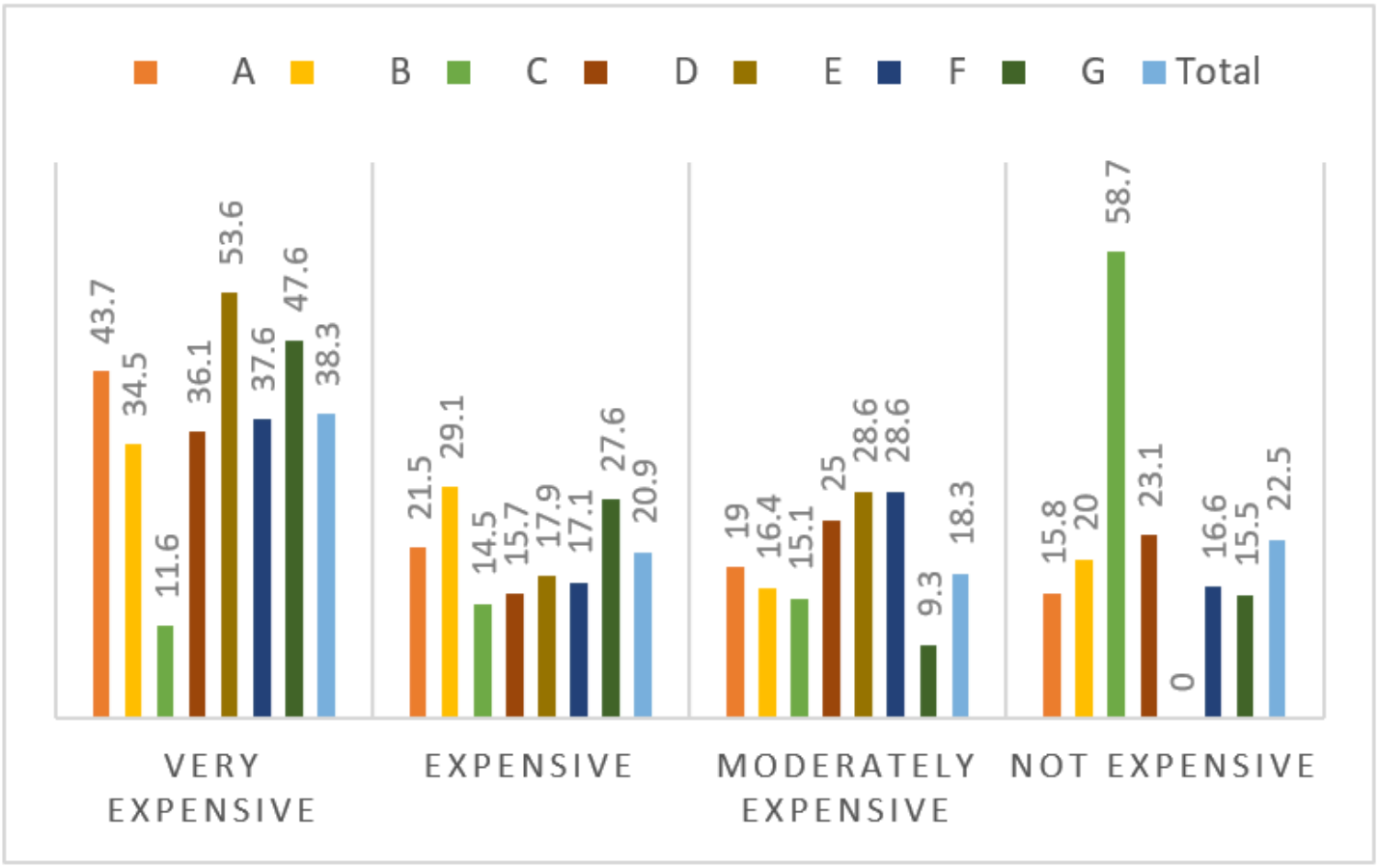


Figure 5

Cost of building materials used in house construction (COST BUM)

Source: Field Survey (2023)