

# Investigating dimensions of housing adequacy evaluation by Residents in public housing: factor analysis approach

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## **Abstract**

**Purpose-** The aim of this study was to investigate the dimensions of housing adequacy evaluation by residents in public housing with a view to identifying how government and construction professionals can deliver adequate housing facilities.

**Design/Methodology/Approach-** The research is based on household surveys involving 517 respondents selected from nine public housing estates constructed between 2003 and 2010 in Ogun State Southwest Nigeria. The data were collected using structured questionnaire administered to residents by the researchers through visits to the housing estates. A total of 33 variables derived from the review of literature were used in measuring housing adequacy. Descriptive statistics and factor analyses were used in analysis of the data.

**Findings-** The study reveals that residents perceived their housing situation as inadequate. They evaluated housing adequacy based on four key dimensions: (i) ambient condition of interiors spaces, security, utilities and neighbourhood facilities (ii) social infrastructure (iii) level of privacy and size of sleeping, and (iv) sizes of living and dining areas in the residences. These dimensions of housing adequacy evaluation were found not to be exactly the same way experts conceived housing adequacy in the literature.

**Research Implications:** The concept of housing adequacy can be used to examine occupants' housing preferences and their standard of living; the quality of housing and performance of mass housing projects.

**Practical Implications-** The paper makes practical suggestions to government and construction professionals on how to improve adequacy levels of public housing. Specifically, in the areas of giving more attention to ambient condition of interiors, security, utilities and neighbourhood facilities as well as privacy; and sizes of main activities areas in dwelling units

in the design, construction and management of public housing projects.

**Originality/value-** The study identifies dimensions of housing adequacy evaluation by residents in public housing and compares these with experts' conception of housing adequacy.

**Keywords** Public Housing, Adequate Housing, Factor Analysis; Dimensions of Evaluation; Household Surveys

## **Introduction**

In recent times, there has been increasing need for construction and property professionals to develop a better understanding of the performance of constructed facilities such as residential and office accommodations, healthcare, educational and other infrastructural facilities. Consequently, different kinds of post occupancy evaluations (POEs) have been conducted to provide insight into how end-users perceive and evaluate constructed facilities (Hebert and Chancy, 2012). Djebarni and Al-Abed (1998) specifically noted that POE of housing schemes is essential in determining the effectiveness of such projects and providing feed back to project initiators and managers. In addition, Leung and Yu (2012) made it clear that the evaluation of residential facilities can help to improve the knowledge base of managers in identifying the key components of such facilities that influence user satisfaction.

The evaluation of residential environment cuts across several disciplines, including architecture, environmental psychology, housing and sociology; and has traditionally been based on human-environment interactions. As a result, different theories (see for example Mehrabian and Russell, 1974; Galster, 1987) and concepts such as residential or housing satisfaction (Galster, 1987; Mohit *et al.*, 2010; Ibem and Aduwo, 2013); housing quality (Fiadzo *et al.*, 2001; Ibem 2012), housing adequacy (Ibem and Amole 2011; Eggers and Moumen, 2013) have been used to investigate and understand how residents perceive, evaluate and respond to their housing situations. However, the studies by Morton *et al.*, (2004) and Bonnefoy (2007) indicate that among these concepts, housing adequacy remains one of the least investigated.

Zey-Ferrell *et al.*, (1977) identified the adequacy of housing environment as having direct link with occupants' housing preferences and their socio-economic characteristics. Other studies (e.g. Onibokun, 1985; UN-HABITAT, 2006b; Eggers and Moumen, 2013) help to provide insight into what adequate housing is from experts' perspective, while very few authors (e.g. Ibem and Amole 2011; Ibem, *et al.*, 2012) have examined how residents evaluate the concept of housing adequacy. From the existing studies, we understand that users give their views about buildings and other constructed facilities based on their experience and interactions with such facilities (Vischer, 2008) as against the conceptions of professionals who design and

construct buildings and facilities and may never use them (Chohen *et al.*, 2010). This suggests that housing occupants' views on housing adequacy for instance, may be different from those of the professionals who design, plan, construct and manage housing facilities.

From the literature it would seem right to conclude that housing occupants evaluate adequacy of residential environment based on their perception of the extent to which their current housing situations are adequate in meeting their needs, expectations and aspirations. However, the dimensions of residents' evaluation of housing adequacy; and the extent to which these are similar to or different from experts' conception of housing adequacy have not been adequately investigated and properly articulated in the research literature, especially in the context of public housing. Therefore, this study was designed to investigate the different dimensions of housing adequacy evaluation by residents of public housing in Ogun State Southwest Nigeria.

The study was guided by two key research questions. These are:

- What are the dimensions of housing adequacy evaluation by residents of public housing in Ogun State, Nigeria?
- How are these dimensions similar or different from experts' conception of housing adequacy?

Findings of this study are expected to contribute to housing design and management practices by identifying the key components of residential environment that influence occupants' perception of adequacy of public housing. The study also hopes to contribute to the existing literature on housing evaluation and management research. To achieve this goal, the remaining part of this paper is organized in five sections. The first section is the review of literature on adequate housing, theoretical and conceptual approaches to evaluating housing environment and a summary of empirical studies on adequate housing. Next is a description of research methods, followed by a presentation of study findings. The penultimate section deals with discussion of study findings, while the paper ends with conclusions and recommendations.

## **Review of Literature**

The review of literature is organized in three sections and covers the following areas: the concept of adequate housing; theoretical and conceptual approaches to evaluating housing environment and empirical studies on adequate housing.

## ***The Concept of Adequate Housing***

The concept of adequate housing or housing adequacy has been defined and interpreted in different ways by scholars and authors. From the dictionary definition, the word “adequacy” is generally understood to mean sufficiency in quantity or quality in meeting a need for something. This obviously suggest that adequate housing simply means the residential environment that is both quantitatively and qualitatively sufficient in meeting users’ needs, expectations and aspirations.

From the review of literature, a number of definitions and descriptions of adequate housing were identified and summarised in Table 1.

***Table 1: Definitions of Adequate Housing in the Literature***

<b>Authors</b>	<b>Definition of Adequate Housing</b>	<b>Context</b>
American Public Housing Association (1946) quoted in Onibokun (1985)	Housing that is decent, safe, habitable and affordable in meeting the four fold functions of physiological and psychological needs, protection against contagions and accidents	The American Public Housing Association Committee report on the Hygiene of Housing as basic principle of healthful housing
UN-HABITAT (1996:Paragraph 60)	Adequate shelter means more than a roof over one’s head. It also means adequate privacy; adequate space; physical accessibility; adequate security; security of tenure; structural stability and durability; adequate lighting; heating and ventilation; adequate basic infrastructure, such as water supply, sanitation and waste management facilities; suitable environmental and health related factors; and adequate and accessible location with regard to work and basic facilities: all of which should be at an affordable cost.	The Istanbul Declaration and the Habitat Agenda, Second United Nations Conference on Human Settlements (Habitat II), Istanbul, 1996
Thiele (2002).	Housing that has the following attributes: legal security of tenure, affordability, habitability, accessibility, location and availability of services and cultural identity	A position paper on human right to adequate housing: a tool for promoting and protecting Individual and community health
Zubairu (2002)	Housing that has the following attributes: decency, security, privacy, spacious, healthy, affordable, legally secured tenure, habitable, accessible, and appropriately located with services and infrastructure	A conceptual paper on housing concept and design in a developing economy based on the Nigerian housing problem
UN-HABITAT, (2006b :121)	Housing with adequate privacy and space, physical accessibility, adequate security, secured tenure, structural stability and durability, adequate services and infrastructure, suitable environmental quality and health related factors.	UN-HABITAT global report on national experiences with shelter delivery for the poorest groups

Ibem and Amole (2011)	Housing that has all the characteristics features required to satisfy users' need; expectations and aspirations.	A survey of 517 households on the qualitative adequacy of newly constructed public housing in Ogun State, Nigeria
Eggers and Moumen (2013)	Adequate housing describes absence of any form of physical, spatial, and service abnormalities within the residential environment; and thus it is a measure of quality of houses as physical structure and the associated infrastructure and services.	American Housing Survey between 2005 and 2009 Report for. U.S. Department of Housing and Urban Development

It seems evident from Table 1 that all the definitions and descriptions of adequate housing are closely related in content and meaning. The UN-HABITAT (2006b) however noted what constitutes adequate housing varies from one country to another and depends on specific cultural, social, environmental and economic context. This implies that adequate housing is a multi-dimensional concept defined by contextual factors. Hence, housing conditions considered to be adequate in one context may not necessarily be regarded as adequate housing in another context. In any case, the published literature helps to understand that adequate housing on the one hand can be viewed from the perspectives of housing stock and on the other hand seen from the lens of quality of housing as explained by Oladapo (2006) and Eggers and Moumen (2013). In this study, the focus is on the qualitative aspect of adequate housing, which deals with the habitability, health and safety requirements of housing. Therefore, adequate housing as used in this study describes the residential environment that is habitable and promotes healthy, safe and secured living conditions as well the economic and cultural well-being of individuals, households and communities.

Based on the foregoing definitions of adequate housing, a number of conceptions of housing adequacy have also been put forward by different authors. For examples, McCray and Weber (1991:55) viewed perception of adequate housing to be a composite image of all elements in the housing environment necessary to support minimally accepted standard of living. They further explained that these images are influenced by cultural background, housing norms and values as well as previous experience with various housing features and norms. Similarly, in a research that sought to compare the quality and effectiveness of three public housing projects in Sana'a, Yemeni, Djebarni and Al-Abed (1998) described housing adequacy as a measure of quality under different housing standards. Also in a study on the relationship between perceptions of civic structure and rural housing adequacy in the US, Morton *et al.*,(2004) conceived of housing adequacy as an important aspect of housing quality measurement that deals with the assessment of interior and exterior structural conditions; heating, cooling and

sanitation systems; and residence size relative to space needs. In a recent study that examined housing adequacy of elderly households aged 65 years and above in southern communities in the United States, Le *et al.*, (2014) defined housing adequacy as an objective outcome measuring housing conditions. From these studies reviewed, it can be inferred that housing adequacy is a measure of housing quality; and thus can be used in exploring residents' housing preferences and perhaps their living standard.

### ***Theoretical and Conceptual approaches to evaluating housing environment***

As noted earlier, a number of theories and conceptual frameworks have been used to examine and explain how people perceive and evaluate their environment. One of the theories considered in the current study is the Mehrabian and Russell's (1974) (M-R) model. In a study on perceived quality, emotions and behavioural intentions of customers' restaurant experience, Jang and Namkung (2009: 451) noted that many studies have used the M-R model in exploring the role of environmental stimuli on how people evaluate the quality of their environment and services. Describing the M-R model as a stimulus-organism-response (SOR) model; Jang and Namkung (2009) further explained that on the one hand the environmental stimuli are external to the individual and consist of different elements of the physical environment, the organism on the other hand refers to internal processes and structures intervening between the external stimuli and the final actions and responses by the individual. Specifically, the Mehrabian-Russell (M-R) model posits that human reaction to the physical environment is divided into the following parts: environment stimuli, feeling states (pleasure, arousal and dominance) and behavioural responses (approach or avoidance) (Mehrabian and Russell, 1974:8). According to Mehrabian and Russell (1974), the environmental stimuli influence individuals' feeling states (i.e. transitory conditions of organism that can vary substantially and rapidly over the course of a day) which in turn determine behavioural responses. Whereas feeling states can be described as pleasure (feelings such as happiness, contentment and satisfaction); arousal (a measure of how wide awake an individual is or how ready he/she is to act), and dominance (a reflection of the extent to which the individual is in control of or overpowered by his/her environment), behavioural responses can be classified as approach or avoidance (Mehrabian and Russell, 1974). Approach response includes a desire to stay, to look around, explore the environment and to communicate with others in the environment, while avoidance describes behaviours opposite to approach as explained by Mehrabian and Russell (1974). The implication of this is that individual's evaluation of the quality or adequacy of physical environment or services is influenced by the characteristics features of the different

components of the environment or services and the person's feeling states (Kim and Moon, 2009).

Extant literature from the work by Russell and Pratt (1980) indicates that persons' attribute to environments is divided into affective meaning and perceptual-cognitive meaning. It is believed that the first level of response to the environment is affective. According to Russell and Pratt (1980), this is emotion expressed in language; and thus affective meaning or quality of a physical environment is the emotion-inducing meaning or quality that persons verbally attribute to that place. Also proponents of the perceptual-cognitive model such as Oliver (1993) identified emotions as a mediator among cognitive evaluations, which include perceived performance of products or services by consumers. Consequently, the literature on consumer behaviour tends to see people as cognitive beings, whose views on the quality of products or services are primarily products of comparative analyses of expectations and perceived performance of such products or services (Caro and Garcia, 2007). Expectations in this context represent values individuals hope to derive from consuming a product or service; and are known to be the driving forces behind consumers' desire to buy products or pay for services.

In line with the foregoing, Amerigo and Aragones (1990) identified the three domains involved in individuals' evaluation of the environment as the affective, cognitive and behavioural facets as explained in a study on residential satisfaction in council housing in Spain. Oliver (1997) and Wirtz and Bateson (1998) explained that whereas the affective deals with feelings, the cognitive domain involves thinking and taps into the consciousness of an individual. Also in a study on residents' satisfaction with public housing in Papua New Guinea, Kaitilla (1993) linked the affective and cognitive domains to the subjective and objective approaches, respectively. According to Mohit *et al.* (2010), the subjective evaluation of residential environment is related to the psychological feelings individuals have towards their housing situation. They explained that this kind of evaluation involves perception; and thus it is closely related to the psychological attributes of an individual. On the other hand, the objective approach to evaluating housing environment is based on individual's ability to carry out comparative analyses of what is currently available in relation to what was expected. In the objective approach, individuals are believed to evaluate the physical characteristics of housing facilities and services based on their current needs and aspirations as well as some predetermined criteria and standards established by governments, professionals and experts as Mohit *et al.* (2010) further explained in a study on residential satisfaction in newly designed public low-cost housing in Kuala Lumpur, Malaysia.

In addition, there is also the role of memory and learnt associations in the way individuals

evaluate the environment. The literature on consumer research indicates that evaluation of the performance of products and services is a memory-based judgment (see Krishnan, 1996; Warlop *et al.*, 2005). Krishnan (1996) specifically noted that memory is knowledge used to represent any piece of information. Sen (1999) corroborated Krishnan's view in noting that consumers' memory representations of a product typically include many learnt associations such as product categories, consumption benefits, or semantic. He further explained that during a consumption experience, a product may activate a particular meaning and that meaning becomes associated with that product's consumption experience. Learnt associations in this context help to provide a complete picture of how consumers perceive a product or service. Putting this into context, it can be said that the evaluation of housing adequacy by residents is a function of how well occupants learn from, and remember their prior housing consumption experiences; and the quality attributes they associate with their residential environment.

There are also conceptual approaches that have been used to explain how people perceive and evaluate their environment. One of such conceptions considered here is that proposed by Amos Rapoport in 1977. According to Rapoport (1977), people evaluate their environment based on an ideal picture of what they would like it to be. This implies that people tend to assess their environment firstly, by developing a mental picture of what they would want it to be like; and secondly, by comparing their current environment with what they would like to have (aspirations). On the one hand, Kantrowitz and Nordhaus (1980) noted that this kind of evaluation is usually influenced by cultural values and individuals' life experiences. On the other hand Filfil (1999) was of the view that individuals' socio-economic status and role in the family or society were the key factors that determine how people evaluate their residential environment.

Another conception considered is that presented by Galster (1987) in his seminal work on the correlates of dwelling satisfaction. Galster (1987) introduced the actual-aspirational-gap and purposive approaches to evaluating housing environment. In the actual-aspirational-gap approach, he explained that people evaluate their environment based on self-assessed needs and aspirations. Corroborating Rapoport's (1977) proposition, Galster also contended that people assess their environment by comparing the objective characteristics of that environment with certain standards they believe they may reasonably aspire to have. Hence, the extent to which there is incongruence between what an individual aspires to have and what he/she currently has (actual environment) gives the measure of housing adequacy or satisfaction. In the purposive evaluation approach, Galster (1987) argued that this approach is based on individual's perception of how his/her environment is contributing to achieving his/her goals in

life. This means that individuals tend to evaluate their housing environment based on their expectations of the purpose it can serve, for instance, the extent to which their housing can contribute to the attainment of individual or collective goals in life.

Based on the review of the different theoretical and conceptual approaches to evaluating housing environment, it appears that the way people perceive and evaluate their residential environment is actually influenced by their feeling states and ability to judge the performance of the environment in relation to specific needs, aspirations and expectations. Therefore, occupants' perception of housing adequacy cannot be separated from the direct impact their housing environment has on them. This is generally determined by two key factors. First is the attributes individuals associate with the physical and spatial characteristics of houses and quality of supporting services. Second deals with individual needs, aspirations and expectations. These are usually products of personal traits, knowledge, ability to learn from, and remember previous consumption experiences, roles in the family or society and values (economic, family, personal and social) or meaning people attach to their housing environment.

### ***Literature on Adequate Housing***

From the review of the existing literature, it was observed that the majority of published works on qualitative adequacy of housing dwelt on the description of the various attributes of adequate housing from experts' perspective. The key attributes of adequate housing identified in the literature and found to be relevant in the current study are related to habitability; decency; health and safety of housing conditions (see Table 1).

With regards to habitability attribute of adequate housing, Krieger and Higgins (2002) and Reilly (2008) noted that a dwelling is habitable if it meets a number of requirements that are of beneficial effects to mental health and social pathology of the occupants. These include structural soundness, free from repair, and dampness prejudicial to human health, adequate provision for lighting, heating and ventilation. Others are the provision of satisfactory facilities for the preparation, cooking and storage of food, adequate supply of wholesome water, and efficient system for draining of foul, waste and surface water. Closely related to habitability is the decency attribute. According to Housing Support Unit (2000), a decent housing is a residential environment that meets all the four criteria of (i) fitness (habitability) standard based on health and safety (ii) a reasonable state of repair (iii) has reasonably modern facilities and services (e.g. kitchen, bath room, WC) and (iv) provides reasonable degree of thermal comfort and noise insulation. In addition, Reilly (2008) described decent housing as housing environment that is healthy, safe, secure, energy efficient and free from serious disrepair. The

above suggests that habitability and decency attributes of adequate housing are intertwined and encompass adequacy of the physical structure (building); spaces within the building (spatial attributes) and services (e.g. water and power supply and sanitation).

Another two related attributes of adequate housing considered in this study are health and safety requirements. As it relates to healthy housing, Thiele (2002) made it clear that for housing to be described as adequate, it must meet a number of requirements. First, it must provide inhabitants with adequate space, and protects them from cold, damp, heat, rain, wind, or other threats to health, hazards and disease vectors. Second, occupants must have unimpeded access to safe water supply, sanitary disposal of excreta and solid wastes, drainage of surface water, safe food storage facilities, and protection against disease transmission. Lastly, such housing environment must also promote physical, mental and psychological wellbeing of the occupants. In the same vein, Kawash (2000) explained that the concept of safe housing draws on social formation and architectural design; and that safe housing consists of internal safety and external security of housing environment. Zubairu (2002) identified one of the basic functions of housing as the protection of occupants from inclement weather conditions as well as dangerous animals, insects, reptiles and human intruders. Hence, adequate housing has been described as a residential environment that ensures the security of lives and property of the occupants (UN-HABITAT, 2006a). From the foregoing, it can be inferred that the four attributes of adequate housing considered in this study are closely related and describe the absence of any situation considered to be inadequate housing condition.

Looking at empirical studies on adequate housing, Zey-Ferrell *et al.*, (1977) examined the relationships between housing adequacy and the socio-economic and demographic characteristics of 361 females in two Louisiana communities in the US. That study found that housing was significantly less adequate for (i) blacks (ii) those living in the north Louisiana community (iii) renters (iv) families of females who possessed lower levels of education (v) males who worked at jobs with lower occupational prestige; and (vi) females who did not prefer to spend their resources on long-range alternatives to housing. Both socio-economic variables and consumer preferences were found to be directly associated with housing adequacy. Kutty (1999) investigated the determinants of structural adequacy of dwellings using data from the American Housing Survey of Metropolitan Areas of Atlanta, Baltimore, New York, St. Louis, San Diego, Seattle and Washington, DC. The study revealed significant differences in the prevalence of structural inadequacy across metropolitan areas. It found that structural adequacy was associated with engineering and economic factors, such as age of the buildings, unit type, tenure, income of occupants, and vehicle ownership. Also Eggers and

Moumen (2013) used data from the American Housing Survey (AHS) to investigate physical adequacy of housing units based on variables grouped under 14 key components. That study showed that between 2005 and 2009 less than two percent of housing units in the United States were found to be inadequate. The two main sources of inadequacy were related to sharing of bathrooms and heating failure. Also in the US, Lee *et al.* (2014) examined housing adequacy as a well-being indicator for 7,675 elderly households in Southern U.S. Communities. The results revealed that elderly households in that region were more likely to live in inadequate housing if they had (i) lower incomes (ii) more household members (iii) low housing satisfaction (iv) were Blacks or Hispanics or not married or (v) lived in housing built before the 1970s or in rural areas, or the West South Central areas, or in a smaller structure size. The authors concluded that elderly households living in inadequate housing may be deprived of independence, autonomy, and meaningful activities that are essential for well-being.

Elsewhere in Brazil, Ornstein *et al.*, (2011) investigated the adequacy of residential high-rise buildings in Saõ Paulo in relation to occupants' needs. Analyses of the designs of apartments built in that city after 2003 revealed that emphasis was more on the cosmetic and fashionable aspects than the real needs of end-users. The authors concluded that there was a need for the housing market in that city to establish a closer and link between needs and human behaviour in the domestic space; and that the architectural quality of homes should serve as a means of increasing satisfaction levels and improving design performance.

In Nigeria, Ibem and Amole (2011) examined residents' perception of the levels of adequacy of public housing in Ogun State. That study revealed that the 517 respondents perceived their housing conditions to be generally inadequate in meeting their needs. Housing unit attributes and neighbourhood facilities were perceived to be the most adequate and least adequate housing components, respectively. That study did not examine the dimensions of housing adequacy evaluation by the residents. A similar survey of 156 residents in incrementally constructed low-income public housing in Ogun State, Nigeria, by Ibem *et al.* (2012) revealed that 50 percent of the respondents felt that their housing environment in that estate was adequate in meeting their needs. That study identified the three main housing components residents responded to in their evaluation of housing adequacy to be (i) design of the housing units (ii) availability of social infrastructure; and (iii) adequacy of management practice in the housing estate.

It is evident from the studies reviewed here that the existing studies in the US, Brazil and Nigeria focused on the physical, spatial and structural adequacy of dwellings and quality of housing services with little or no consideration given to the dimensions of residents' evaluation

of adequate housing. The second study in Nigeria reviewed focused mainly on one low-income housing estate where housing units were constructed as starter homes; and thus did not consider the dimensions of housing adequacy evaluation amongst residents in walk-in homes and shell houses, and how the dimensions are similar to, or different from experts' conception of housing adequacy. Therefore, the current study was an attempt to fill this research gaps.

## **Research Methods**

The study reported in this paper was part of the overall research project conducted to evaluate public housing in Ogun State Southwest Nigeria. Ogun State is one of the most urbanized of the 36 States in Nigeria (Ibem and Amole, 2011). In response to the growing urban housing challenge, the government embarked on the construction of several new public housing estates for different categories of people in the State between 2003 and 2010. Hence the state was purposively chosen for the study.

In order to achieve the goal of the study as previously highlighted in the introduction, the research strategy adopted was household survey. This choice was based on the nature of the research questions of the study. The surveys were conducted in nine of twelve public housing estates constructed between 2003 and 2010 in major urban centers in the study area. At the time of the survey 1,411 housing units were completed in the different housing estates, but only 709 housing units were found to be occupied by residents in Abeokuta (the State capital), Ijebu-Ode, Ota, Agbara and Ibafo area of the State. The nine housing estates were selected based on the type of houses: starter/core housing (in OGD-Workers Housing Estate, Laderin) ; shell houses (in the Ogun State Housing Corporation Housing Estate, Ota) and walk-in homes (in the Media Village, OGD Housing Estate, Asero; Presidential Mandate Housing Estate, Olokota and Obasanjo Hill-Top GRA Housing Estate all in Abeokuta. Others were OGD Housing Estate Itanrin, Ijebu-Ode, Ogun State, OGD-Sparklight Housing Estate, Ibafo and OPIC Housing Estate, Agbara). These housing estates were also selected based on the socio-economic status: low, medium and high income earners. To ensure a sample size that is representative of the three different housing types, stratified sampling technique was employed in selecting the housing units based on the number of occupied units of the different typologies identified at the time of the survey. Specifically, 250 units were selected from the core houses, 405 units from 424 walk-in-homes and 15 units from the shell houses. These translated to 670 households representing about 95 percent of households in the occupied housing units in the aforementioned housing estates.

The data were collected between December 2009 and February 2010 through personal visits to each of the housing units. A total of 517 valid questionnaires representing about 77 percent of the distributed questionnaires were retrieved. The data collection instrument used was structured questionnaire administered only to household heads or an adult member in each of the housing units found at the time of the visits. The questionnaire was designed by the researchers based on findings from the review of literature. The existing studies (including Ibem and Amole, 2011; Ibem *et al.*, 2012) suggest that residents evaluated adequacy of residential environment in public housing based on their interactions with the housing unit attributes, housing services and infrastructure, neighbourhood facilities and management of the estates. Therefore, a total of 33 housing attributes comprising six-teen housing units attributes; six housing services and infrastructure; nine neighbourhood facilities and two attributes related to management of the estates were used to capture the respondents' perception of adequacy of their residential environment in the nine housing estates (see Table 2 ). The respondents were asked to rate the level of adequacy of each of the 33 housing attributes based on a 5-point Likert type scale ranging from 1 for "Very Inadequate" to 5 for 'Very Adequate'. The question asked was "How would you rate the adequacy levels of your house and the estate where you live in terms of the following". The data on the personal profiles of the respondents were also collected using the questionnaire.

**Table 2: Dimensions of Housing Adequacy Evaluation**

S/N	Housing Units' Attributes
1	Level of Privacy
2	Sizes of Bed rooms
3	Natural Lighting in Kitchen
4	Natural Lighting in Bed Rooms
5	Ventilation in Bedrooms
6	Sizes of Living and Dining spaces
7	Ventilation in Living and Dining spaces
8	Lighting in Living and Dining spaces
9	Sizes Kitchen and Storage
10	Protection against dampness in the building
11	Protection against noise pollution
12	Level of Thermal Comfort in the residence
13	Protection against harmful Insect
14	Security Measures in residence
15	Number of Bedrooms
16	Fire Protection measures
	<b>Housing Services and Infrastructure</b>
1	Sanitary and drainage facilities
2	Road Network
3	Power Supply
4	External Lighting
5	Potable water supply
6	Refuse Disposal facilities in the Estate
	<b>Neighbourhood Facilities</b>
1	Public Transport Service

2	Place of Worship
3	Parking Spaces
4	Open Spaces and Green areas
5	Play Ground for Children
6	Healthcare facilities
7	Educational Facilities
8	Shopping Facilities
9	Recreational Facilities
	<b>Management of Facilities</b>
1	Communal Activities
2	Management and Maintenance of facilities in the estates

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The data were analyzed using SPSS Version 20 software package. Two types of analyses were conducted. The first was descriptive statistics which produced proportions and percentages of the personal demographics of the respondents as well as mean adequacy scores (MAS) for the 33 housing attributes investigated. The MAS represents the average adequacy score given by all the 517 respondents on each of the 33 attributes used in the assessment of housing adequacy. The second type of analysis was factor analysis with principal component analysis. The responses on the 33 housing attributes used in measuring housing adequacy were subjected to factor analysis. Apart from revealing the key dimensions of housing adequacy evaluation by the respondents, the factor analysis was also used as a means of handling the multi-collinearity problem that may arise due to intracorrelations among the 33 housing attributes. Efforts were also made to ensure the validity and reliability of findings of the study by pre-testing the questionnaire instrument and conducting Cronbach alpha coefficient test, respectively. Feedback from the pre-testing exercise was incorporated into the final version of the questionnaire. Cronbach alpha test conducted on all the 33 variables used in assessing housing adequacy produced Cronbach alpha value of 0.891, which is more than 0.7 recommended by Pallant (2011). This suggests that the questionnaire instrument was reasonably reliable in measuring housing adequacy in the survey.

## **Study Findings**

### ***Personal Demographics of the Respondents***

The personal demographic profiles of respondents encountered in the surveys are shown in Table 3. It is evident from Table 3 that the majority of the respondents were males and aged between 31 years and 59 years. They were also educated and low-income earners living in owner-occupied houses. The result also shows that around 79 percent of them had lived in their current residences for between 1 year and 3 years. This result goes to suggest that the respondents had lived in their current residences for a reasonable period of time; and thus can

provide reliable data on the levels of adequacy of their current housing environment.

**Table 3: Demographics of Respondents**

	n=517	Percentage
<b>Respondent's Sex</b>		
Male	333	64.4
Female	184	35.6
<b>Age Group in Years</b>		
No Response	3	0.6
18-30	65	12.8
31-45	293	56.8
46-59	140	27.1
60 and above	16	3.1
<b>Highest Educational Attainment</b>		
No Response	8	1.6
Primary Education	4	0.8
Secondary Education	11	2.1
Tertiary Education	494	95.6
<b>Average Monthly Income (Naira)*</b>		
No Response	36	7.0
Below ₦38,000 (Low-Income)	137	26.5
₦38,000-₦71,000 (Middle Low Income)	186	36.0
₦72,000-₦145,000 (Middle High Income)	77	15.0
₦145,000 and above (High Income)	81	15.7
<b>Tenure Type</b>		
No Response	3	0.6
Privately Rented	168	32.5
Owner Occupied	323	62.4
Official Quarters	23	4.5
<b>Length of Residency</b>		
No Response	5	0.97
Less than 1 year	82	15.9
1year-3years	406	78.5
4years -5 years	20	3.9
More than 5years	4	0.8

\* \$US 1= ₦ 162 as at June 2014

### ***Perception of Housing Adequacy by the Respondents***

Result of the respondents' perception of adequacy levels of their housing environment shows overall mean adequacy score (MAS) of 2.8. This indicates that the respondents rated their residential environment in all the nine housing estates investigated as inadequate in meeting their needs. The implication of this is that the housing environment in the estates falls short of residents' needs, expectations and aspirations.

The second column of Table 4 presents the adequacy levels of the 33 housing attributes investigated. It seems evident from Table 4 that the respondents rated 14 of the 16 housing unit attributes as being adequate, while none of the housing services and infrastructure, neighbourhood facilities and management related attributes was found to be adequate. This is seen in the result, which shows that none of the housing services and infrastructure;

neighbourhood facilities; and management related attributes emerged with MAS of up to 3.01. Table 4 also reveals that the most adequate housing attribute was privacy in the residence with MAS of 3.89, while the least was recreational/ sporting facilities in the housing estates with MAS of 1.47. This result suggests that the respondents perceived housing unit attributes to be more adequate than neighbourhood facilities, housing services and infrastructure in their current residences.

### ***Dimensions of Housing Adequacy evaluation by the Respondents***

The study also investigated the dimension of housing adequacy evaluation by the respondents in the survey. This was achieved by conducting exploratory factor analysis using principal component. Also displayed in Table 4 are the four factors with eigenvalues greater than one which accounted for 51.1 percent of total variance across the 33 variables investigated. These represent the key dimensions of housing the residents responded to in their evaluation of housing adequacy in all the nine housing estates investigated.

**Table 4: Dimensions of Housing Adequacy Description in the Housing Estates**

<b>Dimensions of Evaluation</b>	<b>MAS</b>	<b>Factor Loading</b>	<b>Eigenvalue</b>	<b>Percentage of Variance</b>	<b>Percentage Cumulative</b>
<b>1: <i>Ambient condition of interiors and adequacy of security, utilities and neighbourhood facilities</i></b>					<b>27.70</b>
			9.130	27.70	
Natural Lighting in Living and Dining Spaces	3.47	.671			
Natural Lighting in Bedrooms	3.60	.635			
Natural Lighting in Kitchen	3.64	.504			
Fresh air in Living and Dining spaces	3.50	.653			
Circulation of fresh air in bedrooms	3.58	.619			
Level of thermal Comfort in the Residence	3.21	.569			
Protection against Noise Pollution	3.30	.454			
Protection against Dampness in the Building	3.13	.479			
Protection against insects and dangerous animals	3.10	.566			
Security Measures in the Residence	3.01	.657			
Fire Safety measures in the Residence	2.68	.595			
Power Supply	2.42	.625			
Potable Water Supply	2.24	.615			
Sanitary/ Drainage Facilities in the Residence	2.85	.454			
Refuse Disposal facilities in the Estate	2.04	.633			
Parking Spaces provided in the Estate	2.67	.612			
Open Spaces and Green Areas in the Estate	2.15	.593			
Shopping Facilities in the Housing Estate	1.61	.607			
Accessibility to Public Transport Service	2.80	.487			
External Lighting in the Housing Estate	2.60	.630			
Road Network within the Estate	2.69	.671			
Communal Activities within the Estate	2.65	.470			

Management and Maintenance of Facilities in the Estate	2.41	.718			
<b>2: Social Infrastructure</b>			3.906	11.84	<b>39.54</b>
Educational Facilities in the Estate	1.61	.618			
Recreational/ Sporting facilities in the Estate	1.47	.598			
Play Ground for Children in the Estate	1.85	.568			
Medical and Health Care facilities in the Estate		.515			
<b>3: Privacy and Sizes of sleeping area in the residence</b>			2.246	6.81	<b>46.35</b>
Privacy of Residence	3.89	.421			
Sizes of Bedrooms in the dwelling units	3.80	.463			
<b>4: Size of Living and Dining Spaces</b>			1.566	4.75	<b>51.10</b>
Sizes of Living and Dining Spaces	3.57	.472			
<b>Attributes not loaded on any factor</b>					
Places of Worship in the Estate	2.77	-			
Number of Bedrooms	2.99	-			
Sizes of Cooking and Storage Spaces	3.36	-			
<i>Total variance explained = 51.1%</i>					

Although three housing adequacy attributes: size of places of worship with MAS of 2.77, number of bedrooms in the housing units (2.99) and sizes of cooking and storage spaces (3.36) were not loaded on any of the four dimension (factors) extracted from the factor analysis, Table 4 shows that the first dimension residents responded to in their evaluation of housing adequacy was ambient condition of interiors and adequacy of security, utilities and neighbourhood facilities. With 23 housing attributes loaded on it, this factor explains around 27.7 percent of the total variance across all 33 variables investigated. Next was adequacy of social infrastructure with four attributes loaded on it and explaining around 11.8 percent of the total variance. This is followed by adequacy of privacy and size of sleeping area in the residence with two attributes loaded on it and also explaining around 6.8 percent of the total variance across the 33 attributes. The last dimension was sizes of living and dining spaces explaining around 4.8 percent of the variance.

## Discussion

From the result, two key issues were identified and brought forward for discussion. The first issue deals with the dimensions of housing adequacy evaluation by the respondents in the survey. The second is concerned with the analysis of how these dimensions of housing adequacy evaluation are similar to or different from that established by experts in the literature. First, our survey data show that the respondents in the survey evaluated housing adequacy based on four dimensions: (i) ambient condition of interiors and adequacy of security, utilities and neighbourhood facilities (ii) social infrastructure (iii) level of privacy and size of sleeping areas in the residence; and (iv) size of living and dining spaces (see first column in Table 4).

The implication of this is that residents of public housing encountered in the survey assessed the level of adequacy of their current housing environment based on these four key components. In the first instance, this result indicates that these are the most important aspects of housing environment the residents actually considered in their evaluation of housing adequacy. Secondly, it also suggests that these are the four housing-related factors that influence residents' perception of housing adequacy in the context of public housing in the study area. Comparing this result with finding of the study by Ibem *et al.*, (2012) previously highlighted, it is obvious that access to social infrastructure is one key dimensions of housing adequacy evaluation by residents of public housing in Ogun State, Nigeria.

Second, it also seems evident from the result that going by experts' point of view, housing adequacy can be evaluated based on four key components: housing units' attributes; housing services and infrastructure; neighbourhood facilities; and management of the housing estates (see Tables 2 and 5).

**Table 5: Comparison of Dimensions of Housing Adequacy Evaluation by Experts and Residents**

	<i>Experts' Dimensions of Evaluation</i>	<i>Residents' Dimension of Evaluation</i>
1	Housing Units' Attributes	Ambient condition of interiors and adequacy of security, utilities and neighbourhood facilities
2	Housing Services and Infrastructure	Social Infrastructure
3	Neighbourhood Facilities	Privacy and Sizes of sleeping area in the residences
4	Management and Maintenance of Facilities	Size of Living and Dining Spaces in the residences

However, a close examination of Table 5 will reveal that residents do not necessarily evaluate housing adequacy based on these four components as conceived by experts. Notably, one point of disparity between experts' and users' understanding of housing adequacy evaluation can be seen in the result, which shows that as opposed to experts' conception, the respondents identified privacy and sizes of main activities areas (e.g. bedrooms, living and dining spaces) in the residence as two different dimensions of housing adequacy evaluation. Also contrary to experts' thinking, our survey data suggest that residents do not consider management of facilities in the housing estates as key dimensions of housing adequacy evaluation. In any case, it seems interesting that both experts and residents share common view as it relates to the identification of four dimensions of housing adequacy evaluation; and housing units' attributes and social infrastructure as key dimensions of housing adequacy evaluation as the study indicates. Therefore, based on the evidence from this study, it can be inferred that there are disparities and similarities in the way both housing occupants and construction professionals/researchers understand and evaluate housing adequacy.

## **Conclusions and Recommendations**

This study investigated and analysed the dimensions of housing adequacy evaluation by 517 respondents in nine public housing estates in urban areas of Ogun State, Southwest Nigeria. Findings show that the respondents rated their current housing situation in the housing estates sampled as inadequate in meeting their needs, expectations and aspirations. They also evaluated housing adequacy based on four key dimensions: (i) ambient condition of interiors spaces, security, utilities and neighbourhood facilities (ii) social infrastructure (iii) level of privacy and size of sleeping; and (iv) sizes of living and dining areas in the residences. These dimensions were found to be similar and different in some respects from the way experts conceived housing adequacy in the literature. Based on this result, the following conclusions were arrived at. First is that the most important housing-related factors with significant influence on residents' perception of housing adequacy in public housing are ambient condition of interior spaces, security of residence, availability of utilities, neighbourhood facilities and social infrastructure; privacy and sizes of main activity areas sleeping areas in the dwelling units. The second conclusion is that there are indeed differences and similarities on how housing occupants and experts understand and evaluate housing adequacy.

In order to ensure improved performance of public housing in meeting occupants' needs, expectations and aspirations and by extension their satisfaction levels; the following recommendations are made. First, in terms of research, the concept of housing adequacy can be used to examine users' housing preferences and standard of living, quality of housing and the performance of housing projects. Findings of such studies should form part of the essential database used in the process of providing and managing residential facilities. Second, there is a need for government officials, construction and property professionals (e.g. architects, planners, engineers, project and facilities managers) to give adequate attention to ambient conditions of interior spaces, security of residence, availability of services and social infrastructure; privacy and sizes of main activity areas in dwelling units in the design, planning, construction and management of public housing projects. Lastly, the development and management of residential facilities should follow user-focused and participatory approach, which enables end-users to make input into the design, planning, development and management of housing facilities. This is to ensure that the conception, development and management of such facilities are not based only on the ideas and understandings of experts, rather the views of target population are sought and taken into consideration.

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