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# Hierarchical multiple regression modelling on predictors of neighbourhood satisfaction in violence-induced segregated urban environments

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**Abstract**
Violence-induced segregated urban environments (VISUE) are quite unique urban centres for their characteristic of neighbourhood sharing among residents before the resultant parting triggered by violence. Yet, not much is known about the neighbourhood satisfaction of inhabitants in this type of urban setting. Such knowledge can provide hints on the factors to be prioritized in planning for improvement of neighbourhood satisfaction of residents in these cities. This paper thus examines the key predictors of neighbourhood satisfaction in a VISUE. Household heads (n = 289), cutting across the three identifiable types of neighbourhoods in Jos, Nigeria, expressed their level of satisfaction on a 71-item self-administered structured survey instrument. The principal component analysis with varimax rotation option explored 10 factors to represent the examined attributes of the neighbourhood environment. The third (final) in the sequence of hierarchical regression models estimated, indicates that none of the socio-economic and demographic attributes and dwelling attributes is significant in predicting neighbourhood satisfaction in VISUE. Three factors: neighbourhood safety and stability, social relationships, and neighbourhood facilities and services, emerge as the key predictors of neighbourhood satisfaction. On the basis of these findings, these three attributes are required to be given precedence in any policy action aiming to improve residents' satisfaction with their neighbourhoods in VISUE.

**Keywords**
Hierarchical regression models, Jos, Neighbourhood satisfaction, Predictors, VISUE (violence-induced segregated urban environment).

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## 1. Introduction

As a place where people's homes are situated and much of the off-work time is expended, satisfaction with the residential neighbourhood has been empirically established to occupy a central place in a person's overall life satisfaction (Batson and Monnat, 2013; Youssoufi and Feltete, 2013). This perhaps is why many researchers have explored the determinants of neighbourhood satisfaction in varying environmental contexts. Boeckermann et al. (2017) notes that despite the fact that several researchers have reported associations between neighbourhood satisfaction and some social and physical attributes, gaps still exist in determining which specific or a category of attributes is stronger in predicting neighbourhood satisfaction than the others. Dassopollous and Monat (2011) in an earlier study had similarly called for further studies to determine which factors of the physical and social environment are more central to neighbourhood satisfaction. They argue that findings of such researches can facilitate focused intervention to address the most fundamental attribute that affects neighbourhood satisfaction which may impact such issues as overall wellbeing, psychological health and residential stability. Predictors of the subject in violence-induced segregated urban environment (VISUE), appear yet to be properly defined in this unique urban setting where, as a result of violence, people who previously shared common neighbourhoods and socio-cultural atmosphere, later regrouped into separate enclaves along ethnic, religious or ethnoreligious divides within the same city,

Jos city in Nigeria was well known for peaceful co-existence among her vast ethnoreligious groups numbered over 50 (Ostien, 2009) especially when compared with other urban centres within the northern zone of the nation. It was however bedevilled with series of urban violence with the maximum intensity recorded between 2001 and 2010 (Krause, 2011) leading to a complete alteration of the neighbourhood arrangement of the city with different ethnoreligious group subsequently occupying different sections of the city (Aliyu et al., 2015; Higazi, 2011). There is therefore the need to understand the attributes of the neighbourhood that determine residents' satisfaction in their new residential environment.

Neighbourhood satisfaction is mainly driven by the attributes of the physical and social environment (Hur and Morrow-Jones, 2008; Ibem et al., 2017; Oshio and Urakawa, 2012), neighbourhood facilities and socio-economic and demographic factors (Basolo and Strong, 2002; Ibem, et al., 2017; Lee et al., 2016; Sirgy and Cornwell, 2002). This is why Francescato et al. (2002) describes the subject as a multi-dimensional construct with multiple attributes, making different researchers and scholars to be interested in different aspect of this phenomenon. Parkes et al. (2002) holds that despite the high level of significance attached to the need to understand the attributes that most predict neighbourhood satisfaction by the policy makers, it is not an easy question to answer because satisfaction researches vary greatly in data sources and analysis' techniques. Baum et al. (2010) however notes that the central theme in the discussion of the topic by the contemporary researchers is subjective assessment of who is satisfied and who is not with the neighbourhood, even though some explain the causal relationship within the demographic variables, dwelling and physical neighbourhood attributes. The objective of this study is to therefore define the key predictors of neighbourhood satisfaction in VISUE as established through subjective perception of the residents of Jos.

## 2. Theoretical background

Cities are known for attracting people as a result of their potentiality for economic prosperity, education, access to good housing, facilities and services as well as enhancement of social contacts. This often results into the development of multiethnic or pluralistic ethnoreligious cities which are found across the various regions of the world even though there are variations in the background history of such cities. Relationships among residents in most of these cities in the contemporary world are however fragile and as such inhab-

itants often experience different forms of challenges that emanate from the complexities created by the ethnic or ethnoreligious and/or socio-cultural mix of the inhabitants. One of the common challenges that has been identified with these cities by scholars, is urban violence or social conflict (Hur et al., 2015; Kasara, 2015; Rakodi, 2012). According to Bhavnani et al. (2014), recent reports of outbreak of violence across many of these multicultural cities in different parts of the globe is an open testimony to the fragility of the relationships among resident groups in the cities. De Vita et al. (2016) also observes that modern cities are faced with the challenge of social conflict as a result of the presence of different groups divided by cultural, religious or ethnic issues. There is therefore increasing concern with pervasive everyday violence in many cities worldwide (Moser and Horn, 2011; Pieterse, 2010; Rodgers, 2010). Infact, Bosker and De Ree (2014) submit in their research report that ethnically divided countries are potential homes for civil conflicts. This possibly was why Asiyanbola (2010) opines that ethnicity as a mobilizing agent, is among the most important questions of this century as conflicts linked to ethnicity have led to significant loss of life and injuries in many urban centres.

A major resultant consequence of the violence in recent times, is neighbourhood segregation along ethnic, religious or ethno-religious divides (Gambo and Omirin, 2012). Since 1960s according to Corvalan and Vargas (2015), a significant proportion of intra-state urban violence involves different ethnic, religious or ethno-religious groups. In Belfast, the capital city of Northern Ireland for example, urban violence resulted into a clear residential neighbourhood segregation where neighbourhoods in the eastern section of the city are almost exclusively occupied by the Protestants while those of the western part are hugely inhabited by the Catholics. This according to Mac Ginty (2001), prevents the two religious groups from further conflicts and thereby restricting the conflict to the shared districts in the northern part of the city. A situation described as two communities living together but not living with one another. Segregation largely increased to the extent that at a point, up to 50% of the residents lived in areas where members of their religious group constitute at least 90% (Bhavnani et al., 2014). Social contact became highly minimized and segregation reflected in other aspects of the urban life including schooling, shopping and recreation. Infact, segregation became obvious that it was recognized and institutionalized by the town planning authorities as partitions were erected between the contending rivals and neutral zones such as freeway and parks were created (Kasara, 2015). Housing allocations in a particular district was also exclusively reserved to the dominant group of the area in order to minimize social contact. In essence, segregation of residents along residential neighbourhood lines was well accepted as a very effective measure for minimizing urban violence.

There have also been several cases of both intra and inter-ethnoreligious violence in many Nigerian cities and more intensively in the northern part of the country. These violence often result into segregation of the cities or deepening the existing ones that were created during the colonial administration (Muhammad et al., 2015). In a case in 1999 for example, urban violence ensued between the native Hausa in Kano (a northern city) and the Yoruba (a major immigrant ethnic group from the southern part of the country). The violence eventually transmitted into a full scale conflict between the Muslims and the Christians (Human Right Watch, 2005) thereby increasing the initial segregation pattern which mostly restricted the Yoruba to a section of the city.

Jos, a city in the North-central geo-political zone (middle-belt) of Nigeria and the study area for this research, is a highly cosmopolitan city due to its central location and history of tin mining which became a pull factor to citizens from all parts of the country either as labourers or traders in the mining industry (Dung-Gwom and Rikko, 2009). The city experienced a long period of peaceful co-existence among all ethnic and religious groups

but was sadly engulfed in series of violent urban conflicts all through the first decade in the 21st century (Higazi, 2011; HRW, 2001); the first of which occurred from 7th - 12th September, 2001. The violence event was very famous because of its coincidence with the September 11 attack in the US (HRW, 2001). There was re-occurrence of the crisis in other times such as 2002, 2004, 2008 and 2010 apart from the silent killing spree and intermittent uprisings all along between the periods. This eventually resulted in neighbourhood segregation of the city along ethno-religious divides (Higazi, 2011; Krause, 2011; Magaji, 2008). This created neighbourhoods that are homogenously Muslims or Christians with few others retaining their original mixed nature.

Despite the above theoretical and empirical facts that some world cities including Nigeria and Jos to be specific, are segregated along residential neighbourhoods on the basis of urban violence, it appears scholarship research has not been much focused on the aftermath events of such segregation. One of such areas noted to be very important and calls for concern because of its contributions to the wellbeing, quality of life and overall life satisfaction (Campbell et al., 1976; Misun and Hazel, 2008; Oktay and Marans, 2011; Porio, 2015) but is given less attention by the previous researchers, are studies evaluating the neighbourhood satisfaction of residents in these violence-induced segregated cities. In these cities, residents had earlier lived together, shared common neighbourhoods and the same socio-cultural environment but all of a sudden and usually within a short period, fall apart and live in separate neighbourhoods that are homogenously bound by common characteristics usually ethnicity or religion (Aliyu et al., 2012; De Vita et al., 2016; Gambo and Omirin, 2012). There is therefore the need for an investigation of the neighbourhood satisfaction of residents of such cities. The interest of this research is to therefore as a result of these observations and reports, examine this missing gap in neighbourhood studies using violence-induced segregated Jos city in Nigeria as the study area.

## 3. The study area

This study examines Jos, the Nigeria's most cosmopolitan urban centre. It is a well-known city that was ridden off her long period of peaceful co-existence among the various ethnoreligious groups due to series of large scale urban violence beginning from the turn of the century in 2001. As indicated in Figure 1, the violence eventually resulted into social segregation, leading to occupation of separate neighbourhoods by the two main ethnoreligious groups (Krause, 2011; Ostien, 2009).

Situations in the city presents a unique urban scenario similar to the case of Belfast in Northern Ireland, where the two groups live together but not with each other. This makes it to be much suitable for studying neighbourhood satisfaction in VISUE. Unlike previous relevant studies that examined neighbourhood satisfaction of different racial or socio-economic groups, this study involves residents who have once shared the same neighbourhood environment before parting along ethnoreligious divides as a result of violence.

## 4. Data and methods

The approach and procedure employed for collecting and handling the data used for the study are highlighted in this section. The preliminary analysis conducted towards reliability and validity of the findings of the research are equally explained.

### 4.1. Research approach

A deductive approach is employed for the examination of the issue of concern. Hence, the independent variables used in measuring the neighbourhood satisfaction (the dependent variable) were largely derived from the existing literature on satisfaction in varying environmental contexts. The choice was informed by the need to ensure the reliability and generalizability of the findings. On that premise, we employ three key parameters: neighbourhood physical environment attributes (NPEA), neighbourhood social environment attributes (NSEA) and neighbourhood facilities and public utilities (NFPU) as the main variables for the examination. Meanwhile, in or-

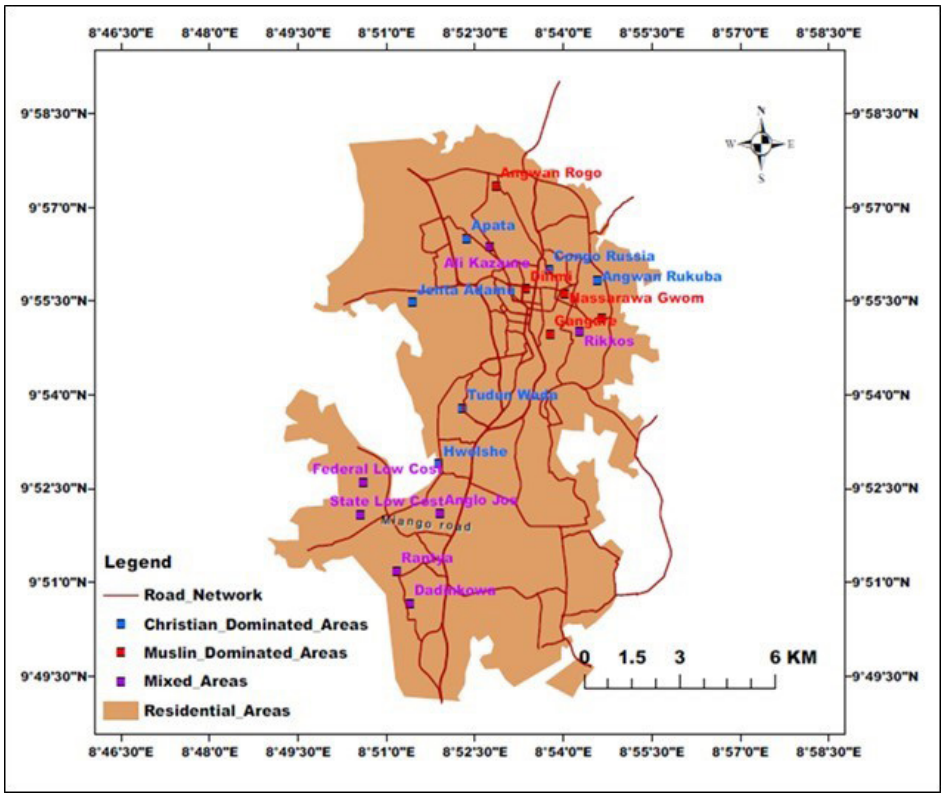


***Figure 1.*** *Location of the three types of neighbourhood in the residential area of Jos.*

der to prevent reporting of superfluous findings, two blocks of variables were controlled for as extraneous variables. First, is the socioeconomic and demographic attributes (SEDA) of the respondents, considering that they have been reported to wholly or partly impact on neighbourhood satisfaction derived by residents in some previous studies (Ibem et al., 2017; Parkes et al., 2002; Sirgy and Cornwell, 2002); and second, some dwelling attributes (DA) which might influence the satisfaction level expressed by the residents for their neighbourhoods.

### 4.2. Data sources

This study relies on the data collected through a survey based on self-administered questionnaire that was conducted in Jos from February to July, 2018. Selection of the samples which aimed to generate ethnoreligious representation, was based on the three distinctive types of residential neighbourhoods (Figure 1) that developed due to the violence as identified by Krause (2011). Based on the table of sample size determination of Krejice and Morgan (1970) cited in Davoudi and Allahyari (2013), a sample size of 384 was required for administration in the study area with a population of 115,142 households, at 95% confidence level (CL) and 5% error margin. We however increased the required sample by 25% considering the experience of inadequate completion reported in previous studies like Ibem and Aduwo, 2013; hence, 480 questionnaires were administered. A total of 454 (94.6%) of the total questionnaires administered were successfully retrieved from the respondents. However, only 289 (63.7%) of this were meaningfully analysable. The remaining were observed not to be adequately completed by the right household heads or completed with less concern for its research essence. This response rate was a bit low compared to the desire of the researcher; nonetheless, it is well above 52.7% average obtained by Baruch and Holtom (2008) in their analysis of 490 researches that employed survey questionnaires in collecting data from individuals. Most importantly however, the potential source of bias which would have been over/underrepresentation of some ethnic groups, were considered immaterial to our results since all the three ethnoreligious segments of the city were adequately represented within the valid samples as contained in Table 1.

***Table 1.*** *Sampling frame for the study.*

| Type of neighbourhood | Number of households | Sampled household | Returned questionnaires | Questionnaires valid for analysis |
|---|---|---|---|---|
| Muslims | 37767 | 187 | 182 | 116 |
| Christians | 45135 | 158 | 144 | 84 |
| Mixed | 32240 | 135 | 128 | 89 |
| Total | 115142 | 480 | 454 | 289 |

The participants responded to 71 questions subdivided into 4 sections. The first section consists of the main independent variables that are used for the examination of the research problem while the next two sections are made up the attributes that are controlled for in the study. In each of the questions, respondents were required to express their level of neighbourhood satisfaction with a given attribute on a Likert scale of 1-5, where '1' = strongly not satisfied, '2' = not satisfied, '3' = fairly satisfied, '4' = satisfied, and '5' = strongly satisfied. As similarly obtained in previous studies (Lee et al., 2016; Mouratidis, 2017; Wu et al., 2018), the last section consists of only one question which is the dependent variable. The respondents were asked to, in consideration of whether the current neighbourhood fulfils their broad neighbourhood desires or not, rate their overall satisfaction level with the neighbourhood, using a similar scale to the above.

**4. 3. Procedure of data analysis**

The version 23 of the SPSS statistics for Windows was employed for the analysis. The data was subjected to normality test using both skewness and kurtosis, as a prerequisite for the parametric tests that were conducted. All the items in both the dependent and independent variables were found to be within ±2 recommended by Field, 2013; Galvatta, and Wallnau, 2014. Aside the description of the respondents, two main analyses, exploratory factor analysis (EFA) and hierarchical regression analysis (HRA) were conducted. Each of these was however initially examined against the background analyses of its basic assumptions. The EFA was used to extract the composite factors, thereby reducing the number of the main independent variables to a manageable number of uncorrelated factors using principal component analysis with varimax rotation method. The HRA was run to explore the predictors of neighbourhood satisfaction as subjectively perceived by the residents in a VISUE.

**5. Results and discussions**

The results of the profile of the respondents, the EFA and HRA are analysed and discussed in this section of the survey report.

**5.1. Respondents of the survey**

70.6% of the respondents of our survey are males while 29.4% are females (Table 2). Most of them, 72.6% are within the active age of 31-60 years. Those below 31 years make up 12.3% while others who are above 60 years make up 15.1% of the total respondents. This reflects on the marital status with 79.2% married and about 87% having children below 18 years. The result equally shows that about 69% have degree or higher certificates. This is below what was obtained in other neighbourhood satisfaction studies in Nigeria such as Ibem et al. (2017b) who had 95.6% of their respondents in this category. The difference is believed to be due to differences in neighbourhood contexts as they conducted their study in formal public housing neighbourhoods while this study surveyed household heads across open neighbourhoods.

On the basis of the nation's minimum wage which is ₦18,000.00, 51.3% of the respondents are low income earners while 38.6% fall in the middle income group with only about 10.1% in the high income cadre. The large proportion of the respondents of our survey, 42.7% who are employed by the private sector suggests a reason for the seeming disparity between the level of education and income groups because the bye-law on minimum wage is weakly implemented on the private employers in the country. A slightly above 50% of the respondents

***Table 2.*** *Socio-demographic attributes of the respondents (n = 289).*

| Attribute | Variable | % | Cumulative % |
|---|---|---|---|
| Gender | Male | 70.6 | 70.6 |
| | Female | 29.4 | **100.0** |
| Age (Years) | 18-30 | 12.3 | 12.3 |
| | 31-45 | 50.4 | 62.7 |
| | 46-60 | 22.2 | 84.9 |
| | 61+ | 15.1 | **100.0** |
| Marital status | Never married | 6.4 | 6.4 |
| | Married | 79.2 | 85.6 |
| | Divorced | 7.4 | 93.0 |
| | Widow | 7.0 | **100.0** |
| Highest education | 1st degree & above | 69.3 | 69.3 |
| | Secondary | 15.4 | 84.7 |
| | Others | 14.2 | 98.9 |
| | None | 1.1 | **100.0** |
| Employment | Public sector employed | 48.4 | 48.4 |
| | Private sector employed | 42.7 | 91.1 |
| | Unemployed | 8.9 | **100.0** |
| Income level (₦) | Low (40,000 & below) | 51.3 | 51.3 |
| | Medium (40,001-120,000 | 38.6 | 89.9 |
| | Upper (120,001 & above) | 10.1 | **100.0** |
| Housing tenure | Owner-occupier | 50.9 | 50.9 |
| | Renters | 42.3 | 93.2 |
| | Others | 6.8 | **100.0** |
| | 7 & above | 21.3 | 21.3 |
| | 5-6 | 28.4 | 49.7 |
| Children < 18 in | 3-4 | 16.0 | 65.7 |
| household | 1-2 | 21.2 | 86.9 |
| | None | 13.1 | **100.0** |
| | Hausa | 39.4 | 39.4 |
| Ethnic group | | | |
| | Natives | 28.7 | 68.1 |
| | Yoruba | 13.5 | 81.6 |
| | Igbo | 10.4 | 92.0 |
| | Others | 8.0 | **100.0** |
| Religion | Muslims | 54.7 | 54.7 |
| | Christians | 40.1 | 94.8 |
| | Others | 3.5 | 98.3 |
| | None | 1.7 | **100.0** |

*$1 = ₦359 as at May, 2018

own their houses while about 42% are renters with 6.8% having other forms of tenureship. The large percentage of renters is believed to reflect the consequence of the recent segregation of the city where many residents relocate to new neighbourhoods.

The Hausa ethnic group is dominant in the survey representing 39.4% while the natives constitutes 27.2%. The other two groups, Yoruba and Igbo are respectively made up of 14.5% and 10.4% of the respondents while other minority groups constitute 8.0%. The respondents are largely Muslims, (54.7%) while the Christians make up 40.1%. Other religions constitute 3.5% while 1.7% practices none.

### 5.2. Composite factors of neighbourhood satisfaction

EFA was conducted to identify fewer factors that can be used to explain the overall neighbourhood satisfaction from the list of neighbourhood attributes responded to by the participants. Suitability of the data for EFA was properly examined before main analysis. A sizable number of the correlations between the dependent and independent, and among the independent variables, were 0.3 and above, implying a good strength of internal relationships among them \as subscribed to by Pallant, 2011. Aside, Kaiser-Meyer Olkin (KMO) and Bartlett test of sphericity (BTS) were examined. The data were suitable with KMO value indicating sampling adequacy of 0.843 and the BTS revealing an approximate chi-square value of 3869.183 which was significant at 0.000 at 95% confidence level. This falls within the acceptable range (Pallant, 2011; Tabachnick and Fidell, 2013).

Having ensured that the data was considerably suitable for the analysis, the main EFA was conducted. Meanwhile, in line with the suggestion of Yong and Pearce (2013), nine of the variables were deleted in the process of the analysis either for reasons of appearing as complex variables or indicating non-significant loadings. The scree plot diagram (Figure 2) was considered in selecting the number of factors. As contained in Table 3, the analysis yielded exploration of ten factors with eigenvalues of 1 and above. The ten factors explained 60.13% of the total variance explained across the 41 variables. Only variables with factor loadings above 0.5 were selected. Similar loadings were adopted by Hadavi and Kaplan (2016).

The ten principal component factors extracted with the factor loadings, eigenvalue, and the percentage of variance explained by each of the principal components are contained in Table 3. The principal component 1 is 'neighbourhood safety and stability' with eigenvalue of 7.963 and it explains

19.422% of the total variance explained. It comprises of seven sub-factors: safety from inter-ethnoreligious violence (0.753), safety of lives and properties (0.684), level of peace within the neighbourhood (0.678), overall stability of the neighbourhood (0.662), ethnic composition of the residents in the neighbourhood (0.627), contact with members of other ethnoreligious groups (0.615) and liveliness of the neighbourhood (0.611). The second principal component which is tagged 'social relationships', also loaded with seven sub-factors having eigenvalue of 3.398, and explains 8.589% of the total variance with level of co-operation among members of the neighbourhood having the highest loading (0.638). Others are participation in social organization activities (0.629), proximity to family and relatives (0.608), contact with members of ethnoreligious group (0.597), interaction among members of neighbourhood (0.588), trust among members of neighbourhood (0.572) and contact with friends (0.568).

The third factor named 'public facilities and services' has an eigenvalue of 2.631 and explains 6.916% of the variance explained. It consists of five sub-factors which include access to public schools (0.705), access to police station (0.644), access to public library (0.610), power supply (0.554) and water supply in the neighbourhood (0.507). Noise and recreation which is the fourth factor is made up of three sub-factors: level of noise in the neighbourhood (0.689), access to recreational facilities (0.651) and access to public toilet (0.584). It has an eigenvalue of 1.878 and explains 5.481 of the total variance. The fifth called housing and aesthetics factor also loaded with three sub-factors, with an eigenvalue of 1.688 and explains 4.418% of the variance. The three factors are density of housing in the neighbourhood (0.592), physical condition of houses in the surrounding (0.513) and aesthetic appearance of the environment (0.485).

Transport and financial institutions is the sixth principal with two sub-factors: access to bus/car station (0.767) and access to bank and other financial institutions (0.753). The factor explains 3.638% of the total variance and has an eigenvalue of 1.491. The next, which is the seventh relates to the environment and is named environmental sanitation with eigenvalue of 1.336 and 3.558% variance explanation. It is made up of solid waste collection (0.664), illumination of the neighbourhood at night (0.585) and availability of open spaces (0.507). The eighth component named distance to places has two sub-factors

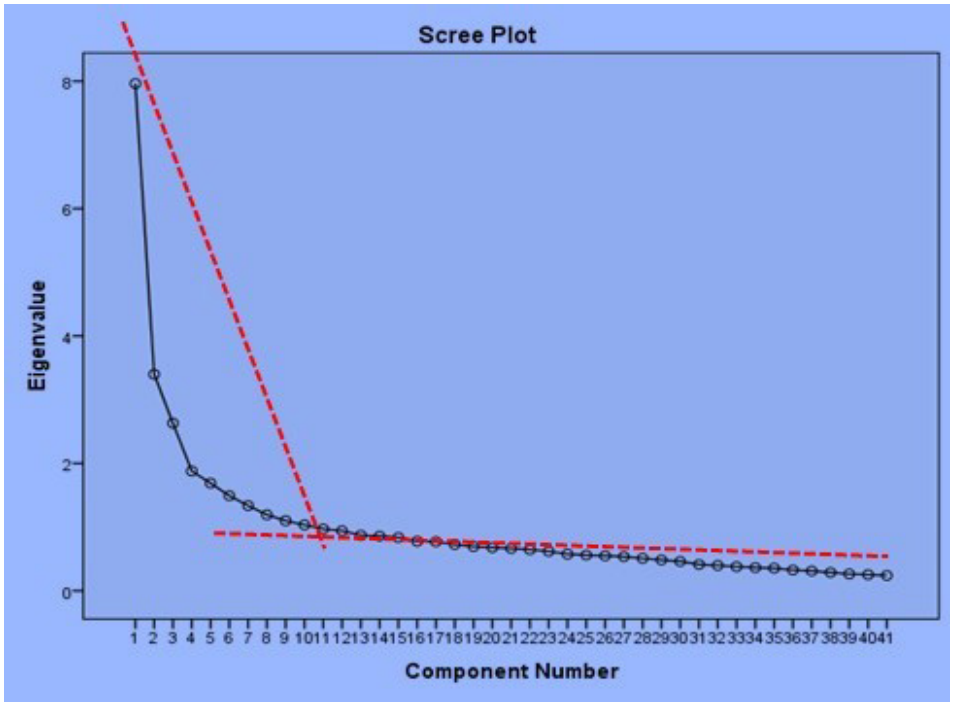


***Figure 2.*** *Scree plot diagram indicating ten component factors.*

***Table 3.*** *Factor analysis of responses to satisfaction with neighbourhood environment.*

| Attribute | Variable | % | Cumulative % |
|---|---|---|---|
| Gender | Male | 70.6 | 70.6 |
| | Female | 29.4 | **100.0** |
| Age (Years) | 18-30 | 12.3 | 12.3 |
| | 31-45 | 50.4 | 62.7 |
| | 46-60 | 22.2 | 84.9 |
| | 61+ | 15.1 | **100.0** |
| Marital status | Never married | 6.4 | 6.4 |
| | Married | 79.2 | 85.6 |
| | Divorced | 7.4 | 93.0 |
| | Widow | 7.0 | **100.0** |
| Highest education | 1st degree & above | 69.3 | 69.3 |
| | Secondary | 15.4 | 84.7 |
| | Others | 14.2 | 98.9 |
| | None | 1.1 | **100.0** |
| Employment | Public sector employed | 48.4 | 48.4 |
| | Private sector employed | 42.7 | 91.1 |
| | Unemployed | 8.9 | **100.0** |
| Income level (₦) | Low (40,000 & below) | 51.3 | 51.3 |
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| Housing tenure | Owner-occupier | 50.9 | 50.9 |
| | Renters | 42.3 | 93.2 |
| | Others | 6.8 | **100.0** |
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| | 5-6 | 28.4 | 49.7 |
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| household | 1-2 | 21.2 | 86.9 |
| | None | 13.1 | **100.0** |
| | Hausa | 39.4 | 39.4 |
| Ethnic group | | | |
| | Natives | 28.7 | 68.1 |
| | Yoruba | 13.5 | 81.6 |
| | Igbo | 10.4 | 92.0 |
| | Others | 8.0 | **100.0** |
| Religion | Muslims | 54.7 | 54.7 |
| | Christians | 40.1 | 94.8 |
| | Others | 3.5 | 98.3 |
| | None | 1.7 | **100.0** |

*$1 = ₦359 as at May, 2018

and explains 2.908% of the variance with an eigenvalue of 1.192. It has factor loadings of 0.766 and 0.729 respectively for distance to work place and distance to city centre. In the ninth factor, parking and circulation, two sub-factors are loaded, has an eigenvalue of 1.100 and explains 2.682% of the total variance. The two factors are access to parking facilities (0.586) and road network (0.553). The last factor has an eigenvalue of 1.034 and explains 2.521% of the total variance explained by the 41 items. It has two sub-factors, condition of access roads (0.781) and traffic congestion in the neighbourhood (0.587) and is referred to as traffic, as contained in Table 3.

### 5.3. Hierarchical models: Predictors of neighbourhood satisfaction in VISUE

The data was at first examined for non-violation of basic assumptions of multiple regressions. A minimum sample size of five observations to one independent variable (Hair et al., 2013) was adopted. Hence, a minimum of 150 samples was required for the analysis; 5 observations by 30 variables (12 SEDA, 8 DA, and 10 factors explored through EFA). This is far lower than 289 (sample size for this research). The EFA that was earlier conducted removed the effect of multicollinearity. The collinearity statistics, Tolerance and VIF values that were generated alongside the regressions, were respectively within the acceptable ranges of > 0.1 and < 10. In addition, the normal probability plot (P-P) of the regression standardized residual (Figure 3) which was requested as part of the analysis suggested there was no major deviation from normality as it can be noted that all points reasonably lie on the diagonal line from the bottom left to the top right.

For the main analyses, in consistence with previous studies (Cao and Wang, 2016; Du et al., 2017; Fleming et al., 2016), the first set of control variables (12 SEDA) were entered into the equation. These attributes are age, gender, marital status, ethnic group, religion, education level, employment status, income, presence of children in the household, household size, length of stay in neighbourhood and housing tenure. With these variables entered into the equation, the R2 generated was 0.065 (Table 5), implying that the first model explains 6.5% of the variance. In the model, only age with beta value of 0.141 was a significant predictor of neighbourhood satisfaction at 0.020.

In the second model, the list of 8 DA was entered into the equation as proxy for residential satisfaction. These attributes include type of house, physical condition of the house, location of the house within the neighbourhood, privacy in the house, number

of rooms, size of the living space, size of bedrooms and provision for toilets and bathrooms. In this model, the R2 value is 0.244 and the R2 change is 0.178 (Table 5). This indicates that the dwelling attributes explain additional 17.8% above the variance explained by the SEDA. In the model, neither age that was significant in the first model nor any of the SEDA is significant in predicting neighbourhood satisfaction in VISUE. This implies that having controlled for the effect of residential satisfaction, none of the SEDA of residents was a predictor of neighbourhood satisfaction. However, three DA which include type of house, number of bedrooms, and provision for baths and toilets were respectively significant at 0.002, 0.007 and 0.000.

In the final model, the ten factors explored through EFA were added into the regression equation with a view to detecting the overall key predictors of neighbourhood satisfaction for the entire segregated city. Having entered these factors, none of the SEDA and DA was statistically significant for predicting neighbourhood satisfaction in VISUE at $p < 0.05$. Ultimately, only three of the ten factors entered, were statistically significant after controlling for the effect of SEDA and DA at $p < 0.05$. Therefore, these three factors which include neighbourhood safety and stability, social relationships and public facilities and services remained the significant factors capable of enhancing neighbourhood satisfaction in the VISUE.

The final model (model 3) explains 55.6% of the total variance ($R^2 = 0.556$) and uniquely explains additional 31.2% ($R^2$ change = 0.312) of the total variance after statistically controlling for SEDA and DA (Table 5). This is a statistically significant contribution as indicated by the significance F-change value for the third model (0.000) and compared with reports in previous studies such as Turkson and Otchey (2015). The ANOVA table is significant $F(30, 251) = 10.476$, $p < 0.000$.

The non-significance of SEDA in our model is in part, supported by previous research findings. Permentier et al. (2011) for instance found some of their variables (length of stay in neighbourhood, presence of children in household and tenureship) in Utrecht, Netherlands as significant predictors of neighbourhood satisfaction and others (income, level of education, employment and ethnicity) insignificant in the same study. Similarly, Ibem et al. (2017) discovered that marital status, employment status and tenureship significantly contributed to neighbourhood satisfaction in Nigeria but respondents' gender, age, education qualification, income size, duration of stay in neighbourhood and household size were not significant. It therefore suggests that in segregated cities rooted in violence, socio-demographic and dwelling characteristics appear to be less important in determining residents' satisfaction with their neighbourhoods. Rather, inhabitants hinge on safety and factors that support the attainment of such safety.

The sub-factors in the three significant factors that are contained in Table 6 show that a total of 19 units of attributes (14 social environment and 5 public facilities and services) predict neighbourhood satisfaction in the VISUE. It should be noted that there is no single physical environment attribute that is statistically significant in predicting neighbourhood satisfaction in

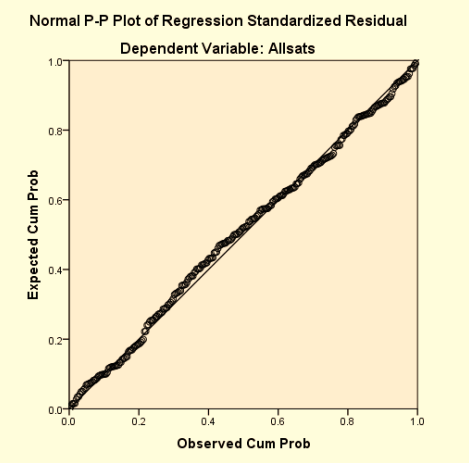


***Figure 3.*** *Normal P-P plot of regression standardized residual of neighbourhood satisfaction.*

***Table 4.*** *Model summary of the hierarchical regression models.*

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df | Sig. F Change |
| 1 | .256[a] | .065 | .024 | 1.282 | .065 | 1.568 | 12 | .010 |
| 2 | .494[b] | .244 | .186 | 1.171 | .178 | 7.689 | 8 | .000 |
| 3 | .746[c] | .556 | .503 | .915 | .312 | 17.656 | 10 | .000 |

the study area at $p < 0.05$. It suggests residents are generally not disposed to the physical environment as being important to their neighbourhood satisfaction possibly due to the root of their segregation experience which was violence, thereby making them to give preference to the aspect of social environment. This is supported by the previous research reports (Aliyu et al., 2015) who found that safety became the sole consideration of neighbourhood choice at the wake of the violence in the city. This finding seems to be peculiar to violence-induced segregated urban environment as it disagrees with findings of some previous studies such as Lee et al. (2016) and Hur and Morrow-Jones (2008) who found most of the physical environment attributes in their studies to be significantly associated with neighbourhood satisfaction in their sampled neighbourhoods in the US.

Neighbourhood safety and stability is the most important predictor of neighbourhood satisfaction in VISUE. Previous studies such as Tapsuwan et al. (2018) also reported that neighbourhood safety was found as one of the two most desirable neighbourhood features to residents in Cambera, Australia. According to Table 5, it has a beta value of 0.599 and is significant at 0.000. It is 3.6 times more important as a determinant of neighbourhood satisfaction than the second factor which has a beta value of 0.165 and 5.3 times more important than the third factor with a beta co-efficient of 0.113. This factor is made up of seven sub-factors which all have factor loadings above 0.6 (Table 4), indicating they all have high strength as predictors of neighbourhood satisfaction in the segregated environment. The sub-factors in order of loadings on EFA (Table 4), comprises of safety from inter-ethnoreligious

***Table 5.*** *Hierarchical regression models (predictors of neighbourhood satisfaction).*

| | **Model 1** | | | | **Model 2** | | | | **Model 3** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variable | Beta | Std error | t | Sig. | Beta | Std error | T | Sig. | Beta | Std error | t | Sig. |
| *Constant* | | *.779* | *3.744* | *.000* | | *.799* | *1.977* | *.049* | | *.699* | *.142* | *.888* |
| Age | .141 | .087 | 2.334 | .020* | .094 | .081 | 1.674 | .095 | .033 | .064 | .735 | .463 |
| Gender | -.027 | .171 | -.440 | .660 | -.046 | .158 | -.822 | .412 | .029 | .126 | .652 | .515 |
| Status | -.025 | .118 | -.426 | .671 | -.037 | .110 | -.672 | .502 | -.057 | .088 | -1.299 | .195 |
| Ethnic group | .077 | .065 | 1.256 | .210 | .103 | .061 | 1.812 | .071 | .021 | .049 | .450 | .653 |
| Religion | -.048 | .125 | -.763 | .446 | -.041 | .115 | -.706 | .481 | -.060 | .093 | -1.278 | .202 |
| Education level | -.010 | .106 | -.160 | .873 | -.036 | .098 | -.606 | .545 | -.020 | .079 | -.425 | .671 |
| Employment | -.086 | .124 | -1.398 | .163 | -.064 | .115 | -1.124 | .262 | .025 | .091 | .562 | .574 |
| Income | .090 | .063 | 1.471 | .142 | .046 | .060 | .801 | .424 | .054 | .048 | 1.153 | .250 |
| School going children | -.023 | .055 | -.383 | .702 | -.013 | .051 | -.226 | .821 | -.032 | .040 | -.713 | .476 |
| Household members | .095 | .055 | 1.585 | .114 | .044 | .051 | .785 | .433 | .087 | .041 | 1.963 | .051 |
| Length of stay in neighbourhood | -.053 | .078 | -.870 | .385 | -.089 | .073 | -1.561 | .120 | -.060 | .058 | -1.326 | .186 |
| Housing tenure | -.078 | .119 | -1.283 | .201 | -.051 | .109 | -.912 | .362 | -.047 | .087 | -1.068 | .286 |
| Type of the house | | | | | .183 | .073 | 3.066 | .002** | .016 | .060 | .330 | .742 |
| Physical condition of dwelling unit | | | | | -.034 | .086 | -.517 | .606 | .017 | .070 | .312 | .755 |
| Location of your dwelling in the neighbourhood | | | | | -.087 | .088 | -1.268 | .206 | -.067 | .071 | -1.229 | .220 |
| Privacy in the house | | | | | .095 | .072 | 1.490 | .137 | .068 | .057 | 1.335 | .183 |
| Number of bedrooms in the house | | | | | .173 | .077 | 2.702 | .007** | .087 | .062 | 1.683 | .094 |
| Size of the living space in the house | | | | | -.075 | .082 | -1.104 | .271 | -.073 | .065 | -1.338 | .182 |
| Sizes of bedrooms | | | | | -.116 | .091 | -1.521 | .130 | -.093 | .072 | -1.536 | .126 |
| Provision for baths and toilets in the house | | | | | .340 | .093 | 4.441 | .000** | .161 | .025 | 1.795 | .074 |
| | **Factor 1:** Neighbourhood safety and stability | | | | | | | | .599 | .087 | 10.526 | .000*** |
| | **Factor 2:** Social relationships | | | | | | | | .113 | .108 | -2.055 | .041*** |
| | **Factor 3:** Public facilities and services | | | | | | | | .165 | .085 | 3.006 | .003*** |
| | **Factor 4:** Noise and recreation | | | | | | | | -.105 | .081 | -1.880 | .061 |
| | **Factor 5**: Housing and aesthetics | | | | | | | | .059 | .089 | 1.075 | .284 |
| | **Factor 6**: Transport and financial institutions | | | | | | | | .011 | .059 | .221 | .825 |
| | **Factor 7:** Environmental sanitation | | | | | | | | -.010 | .084 | -.209 | .835 |
| | **Factor 8:** Distance to places | | | | | | | | -.029 | .068 | -.620 | .536 |
| | **Factor 9:** Parking and circulation | | | | | | | | -.054 | .077 | -1.006 | .316 |
| | **Factor 10:** Traffic | | | | | | | | .066 | .068 | 1.310 | .191 |

Dependent variable: overall neighbourhood satisfaction * Significant predictors in model 1 ($p < 0.05$) ** Significant predictors in model 2 ($p < 0.05$)

*** Significant predictors in model 3 ($p < 0.05$) **$R^2$** = 0.556 (55.6%) **$R^2$ change** = 0.312 (31.2%)

violence, safety of lives and properties, peace level in the neighbourhood, overall neighbourhood stability, ethnoreligious composition of residents, contact with members of other ethno-religious groups and liveliness of the neighbourhood.

These seven sub-factors are well interrelated. They are generally connected to safety of the residents which no doubt, is based on their past experience. The situation that led to the segregation of the city does not only provide an explanation for this but equally justifies it. As noted in the introduction to this study, Jos that was well known for its rich cosmopolitan nature and peaceful co-existence among residents of different ethnoreligious groups for several years was stricken by deadly ethnoreligious violence intensively between 2001 and 2010, leading to massive relocations and huge lives and property loss. This finding has therefore unveiled that safety from such violence is on top of the determinants of neighbourhood satisfaction of the residents. This explains why safety of lives and property is equally considered the next most important determinant by the residents. Safety from violence will no doubt bring about peace in the neighbourhoods and as such making neighbourhoods to be stable. Ethnoreligious composition of residents in the neighbourhood however matters in achieving this target for safety and peace; hence, its rating as a factor by the residents as well. However, despite their desire for safety as a pre-requisite for neighbourhood satisfaction, contact with members of other ethnoreligious group still appears to matter to them, suggesting that their previous experience of the cosmopolitan city lingers in their memory; therefore, it is still considered as a key determinant of their neighbourhood satisfaction by them. Although a section of the city

***Table 6.*** *Overall key predictors of neighbourhood satisfaction in violence-induced segregated urban environment.*

| Factor | Sub-factors |
|---|---|
| Neighbourhood safety and stability | ❖ Safety from inter-ethnoreligious violence |
| | ❖ Safety of lives and properties |
| | ❖ Peace within the neighbourhood |
| | ❖ Overall stability of the neighbourhood |
| | ❖ Ethno-religious composition of residents in the neighbourhood |
| | ❖ Contact with members of other ethno-religious groups |
| | ❖ Liveliness of the neighbourhood |
| Social relationships | ❖ Level of co-operation among members of the neighbourhood |
| | ❖ Participation in neighbourhood social activities |
| | ❖ Proximity to family/relatives |
| | ❖ Contact with members of ethnic group |
| | ❖ Interaction among members of the neighbourhood |
| | ❖ Trust among members of the neighbourhood |
| | ❖ Contact with friends |
| Public facilities and services | ❖ Access to public schools |
| | ❖ Access to police station |
| | ❖ Access to public library |
| | ❖ Power supply |
| | ❖ Public water supply |

(mixed neighbourhoods) possibly still enjoys some level of this, a larger proportion who live in the homogenous Christian or Muslim neighbourhoods are possibly currently not having sufficient contact with other ethnic groups other than the ones in their neighbourhoods.

The second overall key predictor of neighbourhood satisfaction in VISUE as revealed by our model in Table 5 and highlighted in Table 6, is social relationships. This is a very important factor that can make residents to derive maximum satisfaction from their neighbourhood. This factor also consists of seven interrelated sub-factors: co-operation among members of neighbourhood, participation in neighbourhood social activities, proximity to family and relatives, contact with members of ethnic group, interaction among members of the neighbourhood, trust among neighbourhood members and contact with friends. The segregated status of the city similarly provides an insight into why residents should perceive social relationship as an important determinant of their neighbourhood satisfaction. Residents who reside in neighbourhoods that are homogenous in nature possibly enjoy close contact with members of their ethnic groups, friends and family as revealed by some previous studies like Tajfel (1981). Those in mixed sections possibly enjoy the same since members of such neighbourhoods did not relocate and have established such contacts within the neighbourhoods over a long period. Li and Wu (2013) for example, found a relationship between neighbourhood attachment and neighbourhood satisfaction in their study in China.

Close contact among residents at different levels enhances trust among them and this might have resulted into positive interactions, co-operation and participation in neighbourhood social activities; all of which can eventually enhance the neighbourhood satisfaction of the residents. Findings regarding these attributes are generally consistent with reports of the previous researches in different environmental contexts. Temelova and Slezavoka (2014) and Afacan (2015) found good relationships and interactions among neighbours as significant predictors of neighbourhood satisfaction. Similarly, trust was found to be a determinant of neighbourhood satisfaction by Osborne et al. (2012) and Oshio and Urakawa (2012). There is also consistency between these findings and the stance of Kasarda and Janowitz (1974) in their systematic model noting that attributes of the social environment had higher influence on neighbourhood satisfaction than the neighbourhood density, while contending the density-dependent theory.

Public facilities and services is the last significant factor that predicts neighbourhood satisfaction in the study area based on the regression results (Table 5). Five sub-factors make up this factor. These are access to children's school, police station and public library as well as power and water supply. Although some parts of this factor was not expected. However, accessibility seems to have been assessed in terms of availability in some cases by the respondents. The interpretation of the researchers was therefore based on this assumption. Public schools are actually available to some extent in different parts of the study area and residents' access to such schools portend not a serious problem even though the quality of services rendered and the quality of the environment are not of good standard based on the researchers' observation while on the field for survey.

Police stations possibly played a significant role in the period of violence in the city and in the process of the segregation, most especially in uprisings between the periods of the major inter-ethnoreligious violence that culminated into segregation of the city. This is a suggestive factor of why it emerges a significant predictor of neighbourhood satisfaction. Two main public libraries are found in the study area; one owned by the federal government and the other by the state, apart from those owned by individual tertiary institutions which are quite many in number. The two public libraries are strategically located, one in the city area and the other at the intermediate location between the suburb and the central area

of the city. The combination of these portends a possible ground for why residents' neighbourhood satisfaction is also predicted by access to library. Power supply as a predictor of neighbourhood satisfaction in Jos is not a surprising outcome because power supply in Nigeria is generally quite unsatisfactory. Respondents' consideration in this regard possibly rests on their desires for better power and water supplies as predictors of their neighbourhood satisfaction.

## 6. Conclusion and direction of future studies

In this paper, we have indicated the need to understand factors that determine neighbourhood satisfaction in every environmental setting considering the role played by the latter in the overall wellbeing of humans. Hence, we modelled the predictors of neighbourhood satisfaction in VISUE. Hierarchical regression models were estimated to identify the overall key factors that predict neighbourhood satisfaction on a representative sample of the three types of neighbourhood identified in Jos This is to enable identification of the attributes that are needed to be prioritized to improve neighbourhood satisfaction of the residents. In doing this, extraneous variables that might lead us to getting superfluous outcome from the analysis, were controlled for. On this basis, three regression models were estimated. 12 SEDA were input into the regression equation in the model 1 and only age was significant on the model. In model 2, 8 DA were added in addition to the initial SEDA. Neither age nor any of the other SEDA was significant on the model. 3 DA: type of house, number of bedrooms, and provision for baths and toilets, were however significant on the model.

Having controlled for the influence of the two blocks of variables (SEDA and DA) contained in model 1 and 2, model 3 which was the final model was estimated with all the attributes in the first and second models together with the 10 factors explored through the EFA. In this model, three factors (neighbourhood safety, social relationships, and neighbourhood facilities and public utilities) were revealed as the overall key predictors of neighbourhood satisfaction in the study area. The three factors are made up of 14 items of NSEA and 5 NFPU.

NSEAs are therefore generally more significant in predicting neighbourhood satisfaction in VISUE than both the NPEA and NFPU. Both the SEDA and DA are also not important predictors of neighbourhood satisfaction in this type of urban environment. This seems to decline from some previous studies such as Basolo and Strong (2002) who conclude that neighbourhood satisfaction is driven by personal household characteristics and quality of the physical environment. This implies that for any city planning programme or policy instrument that aims at improving neighbourhood satisfaction in this type of cities to be effective, NSEAs must be given utmost priority. This finding appears to be peculiar to VISUE as previous studies have well reported attributes of the physical environment as more important to residents' satisfaction with their neighbourhoods. This revealed knowledge will enable city planners to strategize in planning for the segregated inhabitants as their emphasis will be on the specific factors identified under the social environment and public facilities and services rather than guessing. It provides hints to urban planners and policy makers in this type of city, that policies can be made to improve neighbourhood satisfaction of residents without recourse for consideration on SEDA such as income level, education level, age, duration of stay in neighbourhood tenureship and others.

Also worthy of note in the findings of this study is the revelation that NPEAs are of less importance in predicting neighbourhood satisfaction in VISUE. Notwithstanding, it has posed a challenge to both city planners and policy makers on the need to improve on these attributes in order to integrate them with those of the social environment so as to have a more robust living environment for residents in these cities. This is quite essential since previous studies have reported relationship between physical environment attributes and neighbourhood satisfaction and it appears residents' previous experience of urban violence seems to be centrally responsible for the findings obtained.

The methodological process of this research and its result outcomes have triggered other aspects of neighbourhood satisfaction studies that need to be investigated in order to further enrich knowledge on neighbourhood satisfaction studies, both in theory and practice. It will be of interest to examine predictors of neighbourhood satisfaction in other violence-induced segregated cities that possibly have taken place fewer years than that of Jos, where residents can still be able to vividly recollect their level and determinants of their neighbourhood satisfaction in their previous neighbourhoods. In other words, there is the need for a longitudinal study that will make comparison between neighbourhood satisfaction of residents in their current neighbourhoods with those of the previous ones. This type of study can provide a broad based knowledge upon which to conclude whether the same sampled population are more satisfied with homogenous neighbourhood than their previous mixed neighbourhood experience. The suggested study may equally be combined with cross-section analysis to draw more robust conclusions upon which policies can be made.

Although previous studies (Lee et al., 2016; Mouratidis, 2017; Permentier et al., 2011) have established the importance of subjective assessment over objective evaluation in neighbourhood satisfaction studies; since none of these studies was neither conducted in a developing nation nor a violence-induced segregated urban environment, it is recommended that future studies should conduct an objective evaluation of neighbourhood satisfaction in a violence-induced segregated city most especially in the developing countries. It should however be noted with emphasis that unlike a city like Jos, such a study can only be carried out in an organized urban setting where adequate measurement can be taken. It is also recommended that future studies should look into the possibility of examining the relationship between neighbourhood satisfaction and specific attributes of socio-demographic characteristics such as age, income, education, tenureship, and duration of stay in neighbourhood in any VISUE. This will give room for a more detailed analysis and possibly further revelations on whether these attributes individually contribute to neighbourhood satisfaction in such an urban setting as well as specific variations that may exist between neighbourhood satisfaction and subsets of each of these attributes.

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