# Prevalence and correlation of Neighbourhood satisfaction with cognitive function of older adults in Nigerian urban setting

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**Abstract**

**Background:** Sub-Saharan Africa is facing an increasing population of adults older than 60 years with many of them likely to live in unplanned urban neighbourhoods due to rapid rural-urban migration. These neighbourhoods can predispose older adults to health challenges which include cognitive impairment. The prevalence of satisfaction with neighbourhood and cognitive decline, and their relationship was therefore investigated among urban-dwelling older adults in a Nigerian setting. **Materials and Methods:** Satisfaction with neighbourhood was measured on a 10 point scale while self-rated memory and short portable mental status questionnaire were used to assess cognitive decline. A sample of 200 older adults (60-80+ years) was randomly selected from two Nigerian towns for the investigation. **Results**: Dissatisfaction with neighbourhood was indicated by the overall low median score (48 *vs* 110) and statistical analyses showed that it did not differ significantly by age. Respondents with high income or tertiary education had significantly higher median satisfaction scores (P<0.05) although they were not markedly high (51/56 *vs* 110). Prevalence of dissatisfaction with neighbourhood layout for walking and cycling, access to recreation, surroundings and crime was high (>70%). Prevalence of mild, moderate and severe cognitive impairment was 42.0, 22.5 and 19.0%, respectively while normal cognitive function stood at 16.5%. Neighbourhood satisfaction and cognitive function correlated significantly, but the association was stronger with scores obtained via the short portable mental status questionnaire ($r_s$, 0.29 *vs* 0.34, P<0.05). **Conclusion**: Unattractive neighbourhoods in the Nigerian setting may have limited physical and social activities thereby exacerbating the sedentary behaviour normally associated with older adults; and sedentary behaviour has been reported to be a risk factor for cognitive decline.

**Key words:** Older adults; Urban neighbourhood; Cognitive function; Prevalence; Correlation: Nigeria

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## I. INTRODUCTION

Busse (2002) defined cognitive function as "to perceive, to remember, to reason, to make decisions, to solve problems and to integrate complex knowledge". These functions are known to decline with advancing age as has been widely reported. However, there is variation in cognitive decline with advancing age and several reports especially from high-income countries indicate that prevalence of cognitive impairment is associated with educational attainment, socioeconomic conditions and health status (e.g. Elias et al. 1997; Evans et al. 1997; Farmer et al. 1997; Cerhan et al. 1998). Few studies on factors associated with cognitive impairment and its prevalence have been undertaken in sub-Saharan Africa (Payne et al. 2018; Tianyi et al. 2019) whereas the region is undergoing demographic transition with rapid urbanization (Mavrodaris et al. 2013). Thus increasing urbanization in many unplanned cities of sub-Saharan African (SSA) countries creates environmental problems that can predispose inhabitants to health challenges (Boadi et al. 2005); and this may affect the health and cognitive function of older adults in urban neighbourhoods. Thus it is necessary to investigate urban neighbourhoods in SSA for relationship with cognitive function of older adults. This is against the background of increasing population of adults over 60 years in SSA (Velkoff & Kowal 2006), which is likely to be accompanied by higher prevalence of cognitive impairment. According to Mavrodaris et al. (2013), "dementia and cognitive impairment are set to be one of the biggest public health challenges in sub-Saharan Africa in the 21st century".

The quality of the environment that people live and regularly interact with is one of the determinants of health (WHO 2008) and this includes healthy ageing (Hunter et al. 2011). Neighbourhood environment influences human activity and consequently human health as indicated by several reports (e.g. Fabre et al., 1999; Lautenschlager et al., 2008; Rolland et al., 2010; Philips et al., 2011). Physical activities such as walking and

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cycling or other recreational activities which promote health are influenced by neighbourhood layout, congestion, traffic and security (Bolivar et al., 2010; Ding et al., 2011; Giehl et al., 2012; Oyeyemi et al., 2012; Solomon et al., 2013; Moran et al., 2014; Oyeyemi et al., 2014).While it is known that the environment or the area surrounding where the individual lives affects health, information on its association with cognitive function of older adults is still limited. However, the review report by Yen et al. (2009) and Wu et al. (2015) indicated the existence of association between community socioeconomic statuses, deprivation index, social environment, built environment, recreation, local services or crime and cognitive function. Unsatisfactory neighbourhood environment can lead to loss of physical function in older adults (Balfour & Kaplan, 2002), which invariably may affect cognitive function. None of the studies reviewed were conducted in SSA. Thus there is paucity of information on the relationship between neighbourhood environment and cognitive function of older adults in SSA urban settings.

The study was therefore designed to ascertain the extent of older adults' satisfaction with their neighbourhood and its association with their cognitive function in urban Nigerian setting. The outcome of the study may be useful to policy makers responsible for health care delivery.

## II.  MATERIALS AND METHOD

*Data source*

A one-on-one interview was conducted with 200 randomly selected adults aged 60-80+ years living in two major cities (Asaba and Warri) of oil-rich Delta State, Nigeria. The interview was based on a questionnaire containing scales for measuring satisfaction with neighbourhood and cognitive function. The background variables considered were income, occupation and educational level attained. Verbal consents of the respondents were obtained by the research assistants prior to conducting the interview.

*Measures*

Respondents were requested to rate their satisfaction with their neighbourhood on a scale of 10: 1, very dissatisfied to 10, very satisfied. Eleven neighbourhood features/items were rated by respondents and they are: layout for walking and cycling; cleanliness/beauty of surroundings; congestion; restaurant services; shopping services, adequate pharmacy stores; access to recreation centres; friendliness of people, speed of vehicles; traffic noise; and security. The total points available stood at 110 at 10/item. With respect to assessment of cognitive function, two measures were adopted. In the first measure, respondents were requested to rate their present memory on a 5-point scale of: 1, poor; 2, fair; 3, good; 4, very good; and 5, excellent. They were also requested to compare their present memory with the past on a similar 5-point scale: 1, much worse; 2, worse; 3, about same; 4, better; and 5, much better. The total points available for both present and past memories stood at 10. Thus higher scores indicate limited or absence of decline in cognitive function. The short mental status questionnaire (Pfeiffer, 1975) was used as the second measure with 10 as the maximum score. Scores ≥8 indicate normal cognitive function (0-2 errors by the usual scoring format). This scoring format was adopted for the purpose of correlation analysis.

*Data analyses*

Median and range were used to describe the data generated from neighbourhood satisfaction and cognitive function measures. The differences within age, education and income groups with respect to neighbourhood satisfaction scores were analysed by Kruskal-Wallis H test and Mann-Whitney U test for multiple comparison. The data was also analysed by population and percentage in order to determine prevalence of non-satisfaction with neighbourhood and cognitive impairment. Respondents scoring less than 55 in overall assessment were regarded as dissatisfied with their neighbourhoods while dissatisfaction with each of the neighbourhood item/feature was based on scores less than 5. The association between neighbourhood satisfaction and cognitive function scores was analysed with Spearman correlation statistical test for ordinal data.

## III. RESULTS

Respondents with secondary education or classified as low income or younger age groups had the highest populations, which exceeded 40%, but slightly below 50% of the sample size (Table 1). The median score for neighbourhood satisfaction was below 50% of the maximum available score when all respondents were taken into account (Table 2). This trend was repeated following analyses of the scores on the basis of background variables except in the case of respondents classified as high income group or had tertiary education where the median scores were marginally above 50% of the maximum available points (Table 2).

**Table 1 Age, income and educational characteristics of respondents**

| Variables | | Respondents | |
| --- | --- | --- | --- |
| | | N=200 | % |
| Age | 60-69 | 94 | 47.0 |
| | 70-79 | 66 | 33.0 |
| | 80+ | 40 | 20.0 |
| Education | None/primary | 42 | 21.0 |
| | Secondary | 93 | 46.5 |
| | Tertiary | 65 | 32.5 |
| *Income group | Low | 84 | 42.0 |
| | Middle | 72 | 36.0 |
| | High | 44 | 22.0 |

*Monthly income classification: Low, <N100, 000.00; Middle, N101, 000.00-N200, 000.00; High, >N200, 000.00**.**

Statistical analyses by Kruskal-Wallis H test showed that unlike education or income groups, there were no significant differences in neighbourhood satisfaction scores by age (Table 2). However, significant difference occurred only between respondents with tertiary education and secondary or none/primary school leavers, but none between the latter two education groups (Table 2). With respect to income, significant differences were found between the three groups with the high and low income groups having the highest and lowest scores, respectively (Table 2).

**Table 2 Descriptive statistics of Neighbourhood satisfaction score differences within age, education and income groups.**

| Variables | | *Median | Range | |
| --- | --- | --- | --- | --- |
| | | | Min. | Max. |
| All respondents | | 48.0 | 35 | 62 |
| Age | 60-69 | 50.0 | 42 | 62 |
| | 70-79 | 48.5 | 37 | 59 |
| | 80+ | 46.5 | 36 | 54 |
| | P | >0.05 | NA | NA |
| Education | None/primary | 44.0[a] | 35 | 51 |
| | Secondary | 45.0[a] | 37 | 58 |
| | Tertiary | 56.0[b] | 42 | 62 |
| | P | <0.05 | NA | NA |
| Income group | Low | 44.5[c] | 35 | 49 |
| | Middle | 51.5[c] | 44 | 60 |
| | High | 56.0[c] | 52 | 62 |
| | P | <0.05 | NA | NA |

*Maximum available points=110. NA, not applicable; Significant difference within group: [a]$P>0.05$; [b; c]$P<0.05$

The prevalence of dissatisfaction with neighbourhood exceeded 50% while analyses by neighbourhood characteristics revealed marked variations in prevalence (Figure 1). Prevalence of dissatisfaction with neighbourhood layout for walking and cycling, surroundings, access to recreational facilities and level of crime was high (>65%) as shown in Figure 1. Prevalence of dissatisfaction with pharmacy stores was lowest the (Figure 1).

The results in Table 3 showed that the prevalence of normal and severely impaired cognitive functions were low (<20%) while over 50% of the respondents had mild/moderate cognitive impairment. Table 4 presents the scores based on self-rated memory and the short portable mental status questionnaire. Self-rated memory median scores were generally above 50% of the maximum available points except respondents aged 80+ years where it was lower (Table 4). However, the assessment by the mental status questionnaire did not produce any median or range scores that reached 8 which is the minimum for normal cognitive function (Table 4). The lowest scores came from those 80+ years, low income, none/primary and secondary education as shown in Table 4.
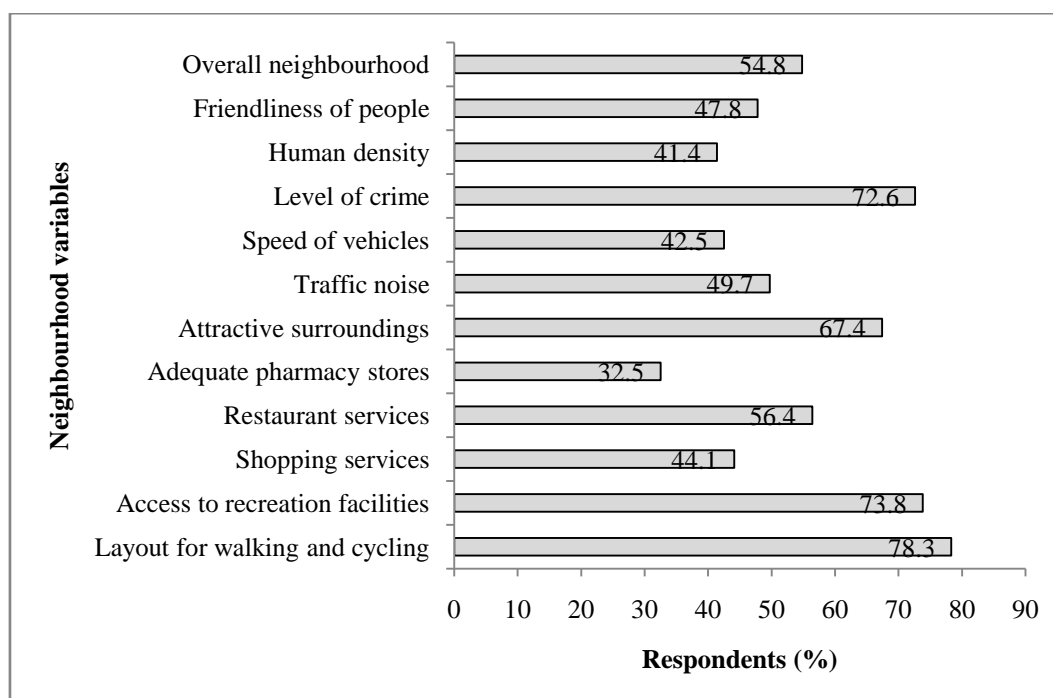
**Figure 1 Prevalence of dissatisfaction with overall neighbourhood and neighbourhood environment variables**

**Table 3 Prevalence of cognitive impairment by overall assessment**

| *Cognitive function | *Error score | Prevalence | |
|---|---|---|---|
| | | n | % |
| Normal function | 0-2 | 33 | 16.5 |
| Mild impairment | 3-4 | 84 | 42.0 |
| Moderate impairment | 5-7 | 45 | 22.5 |
| Severe impairment | ≥8 | 38 | 19.0 |

*Based on the short portable mental status questionnaire (Pfeiffer, 1975)

**Table 4 Cognitive function score of respondents**

| Variables | | Cognitive function score | | | | | |
|---|---|---|---|---|---|---|---|
| | | Self-rated memory | | | Mental status | | |
| | | Median | Min. | Max. | Median | Min | Max |
| All respondents | | 6.5 | 3 | 8 | 4.5 | 3 | 8 |
| Age | 60-69 | 6.5 | 4 | 8 | 6.0 | 4 | 8 |
| | 70-79 | 6.0 | 4 | 8 | 5.5 | 4 | 6 |
| | 80+ | 4.5 | 3 | 6 | 3.5 | 2 | 5 |
| Education | None/primary | 5.5 | 3 | 5 | 3.5 | 3 | 5 |
| | Secondary | 5.5 | 3 | 6 | 4.0 | 3 | 5 |
| | Tertiary | 6.0 | 5 | 8 | 6.0 | 4 | 8 |
| Income group | Low | 5.0 | 3 | 5 | 3.5 | 3 | 5 |
| | Middle | 6.5 | 4 | 8 | 6.0 | 4 | 7 |
| | High | 6.5 | 4 | 8 | 6.0 | 4 | 8 |

The association between neighbourhood satisfaction and cognitive function was significant when all respondents were considered (Table 5). The association tended to be stronger with cognitive function assessed by the mental status questionnaire as indicated by the correlation coefficient (Table 5). Significant correlations were found between neighbourhood satisfaction and the cognitive function with all the background variables when the cognitive function assessment was by the mental status questionnaire. However, it was limited to

respondents aged 80+, having less than tertiary education or in low and middle income groups when cognitive function assessment was by self-rated memory (Table 5).

**Table 5 The association between satisfaction with neighbourhood and cognitive function**

| Variables | | Spearman correlation coefficient ($r_s$) | |
|---|---|---|---|
| | | Self-rated memory | By mental status questionnaire |
| All respondents | | 0.29* | 0.34* |
| Age | 60-69 | 0.20 | 0.25* |
| | 70-79 | 0.18 | 0.36** |
| | 80+ | 0.29* | 0.41** |
| Education | None/primary | 0.32* | 0.42** |
| | Secondary | 0.30* | 0.41** |
| | Tertiary | 0.19 | 0.20* |
| Income group | Low | 0.33* | 0.40** |
| | Middle | 0.28* | 0.31* |
| | High | 0.20 | 0.21* |

*$P<0.05$; **$P<0.01$

## IV. Discussion

On the average, the older adults were generally dissatisfied with their neighbourhood as indicated by the satisfaction scores that were generally lower than 50% of the maximum points. The differences on the basis of income or education do not markedly detract from the trend of dissatisfaction. The dissatisfaction was not unexpected because several reports have shown that many urban dwellers in sub-Sahara Africa live in poor environmental conditions that are characterised by slums, squatter camps, poor road networks and drainages, and refuse dumps (Boadi et al., 2005; Olotuah, 2010; Daramola and Ibem, 2010; Amao, 2012). The high prevalence of dissatisfaction with neighbourhood surrounding and layout for walking and cycling substantiates these reports. The implication is that the older adults become sedentary as social engagement is not promoted and physical activities like walking, jogging and cycling become limited. The fear of violence indicated by the high prevalence of dissatisfaction with security or level of crime in the neighbourhood discourages engagement in social and physical activity (Bolivar et al., 2010; Ding et al., 2011; Giehl et al., 2012; Oyeyemi et al., 2012; Solomon et al., 2013; Moran et al., 2014; Oyeyemi et al., 2014). The nearly 50% prevalence of dissatisfaction with friendliness of the people in the neighbourhood is attributable to limited social interaction due to poor neighbourhood layout and insecurity.

Physical activity is known to promote successful ageing including cognitive function (Fabre et al., 1999; Lautenschlager et al., 2008; Rolland et al., 2010; Philips et al., 2011). Several reports have also shown that social engagement tends to retard the impairment of cognitive function in older adults (e.g. Barnes et al. 2004; Holtzman et al.2004; Krueger et al. 2009; Ejechi, 2015). It can therefore be inferred that neighbourhood tends to influence cognitive function through its effect on physical and social engagement. Thus it was not a surprise that majority of the older adult respondents were in the category of mild/moderate cognitive impairment which was also reflected by the average range median scores arising from the self-rated memory and the mental status tests. The trend of cognitive impairment tended to be reflected in dissatisfaction with neighbourhood and this was corroborated by the significant correlation between neighbourhood satisfaction and cognitive function. This finding tended to be consistent with the reports of Yen et al. (2009) and Wu et al. (2015) that indicated an association between cognitive function of older adults and their environment.

The result of this investigation substantiates the report by WHO (2008) that the "quality of the environment people live and interact with" is one of the determinants of health including successful ageing (Hunter et al. 2011). Unattractive neighbourhood enables sedentary life among older adults who ordinarily are becoming inactive due to ageing. Sedentary lifestyle has been reported to be a risk factor for cognitive decline (Wheeler et al. 2017). This can portend danger in SSA because of the rapid urbanization that is not matched with development of the cities unlike high-income countries. Thus Nigeria and SSA countries at large need to focus on planning for attractive neighbourhood layouts in the cities and efficient waste disposal in order to reduce the burden of non-communicable diseases which includes cognitive impairment in older adults. The limitations to be addressed in future studies include investigating underlying health problems that may in conjunction with unsatisfactory neighbourhood, increase cognitive decline in older adults.

# V. CONCLUSION

The results indicated that urban-dwelling older adults in the Nigerian settings investigated tended to be dissatisfied with their neighbourhood especially the layout for walking and cycling, access to recreational facilities, level of crime and surroundings. This was reflected in their cognitive function by the substantial prevalence of mild to moderate cognitive impairment and low prevalence of normal and severely impaired cognitive function. This trend was corroborated by the significant correlation between satisfaction with neighbourhood and cognitive function. Thus the unattractive neighbourhoods may have exacerbated sedentary behaviour which has been reported to be a risk factor for cognitive decline. The implication of this finding is that given the demographic changes accompanied by rapid urbanization and limited geriatric care in SSA (Dotchin et al. 2013), the burden of cognitive decline in urban-dwelling older adults will increase with time if the urban environments remain undeveloped.

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