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Research Article

Neighbourhood Design, Lifestyle Behaviours, and Self-Rated Health: Evidence from Osogbo, Nigeria

Ayodeji Olusola Ajayi [a], Ismail Adedapo Oyerinde [b], Olayiwola Olayode [b], Busuyi Adonis Fakanlu [c]

[a] Department of Architecture, Osun State University, Osogbo, Nigeria. [b] Department of Urban and Regional Planning, Osun State University, Osogbo, Nigeria [c] CAF Universal LLC, Houston TX.

ABSTRACT

Rising urbanisation in sub-Saharan Africa has raised concerns about the effect of neighbourhood design on health outcomes. Nonetheless, not much empirical evidence on Nigerian cities exists. This paper thus explored the linkage between neighbourhood design, lifestyle behaviours and self-rated health among residents of Osogbo, Osun State, Nigeria. A cross-sectional survey was carried out with 328 residents living in core, transition, and suburban residential areas via multistage sampling. A structured questionnaire was used to gather data on neighbourhood characteristics, physical activity, dietary patterns, and self-rated health, which was analysed using descriptive statistics and inferential statistics. Findings showed that walking was the most used form of transport to open spaces (54.5%), yet physical activity engagement was largely irregular, with 57.2% of respondents walking 0-2 days per week. There was moderate availability of neighbourhood open spaces, though major shortcomings were identified in shaded areas (mean score 2.93/5), cleanliness (3.01/5) and public toilets (3.03/5). The results indicate that neighbourhood design has no statistically significant effect on physical activity ($r = 0.040$, $p > 0.05$) or dietary behaviour ($r = 0.039$, $p > 0.05$). Physical activity, although common, especially walking, was mostly utilitarian, irregular, and of low intensity and not a significant predictor of self-rated health ($\beta = -0.021$, $p > 0.05$). Conversely, dietary behaviour had a significant positive impact on self-rated health ($\beta = 0.171$, $p < 0.05$), with the result showing a nutrition transition marked by high intake of processed and fried foods. The research concludes that lifestyle behaviours among residents in Osogbo are influenced more by socio-economic conditions and food environment than by neighbourhood design. It recommends integrated urban health initiatives that prioritise food environment regulation and the enhanced quality of neighbourhood infrastructure.

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1 Introduction

By 2050, most global urban development will be absorbed by Asian and African cities (United Nations, 2018), raising questions on how the physical structure of these rapidly changing urban landscapes affects the health and wellbeing of its inhabitants (UN-Habitat, 2016; Giles-Corti et al., 2016). Academics in urban planning and public health acknowledge that neighbourhood structure and form have a significant impact on day-to-day behaviours that shape health results (Frank et al., 2019). Neighbourhood components including street connectivity, land-use mix, residential density, and access to basic infrastructure have been found to either promote or inhibit healthy lifestyles (Finlay et al., 2025). As a consequence, neighbourhood design has become a pivotal factor that determines lifestyle behaviours, including physical activity, mobility patterns, and social interaction (Angel et al., 2024).

This interaction is witnessing scholarly focus with studies exploring how pedestrian-friendly designs, green space accessibility, and distance to key public services support healthy lifestyles and improved health (Sallis et al., 2016). As posited by Bird et al. (2018), neighborhoods with poor layouts, due to insufficient infrastructure and quality of the environment, could deter physical activity and promote sedentary behaviour, raising the likelihood of non-communicable diseases (NCDs) such as obesity and cardiovascular conditions. These findings reinforce that urban design has a role to play in influencing behavioural patterns that can ultimately impact health (Pinter-Wollman et al., 2018).

Another significant route by which neighbourhood environments influence health is lifestyle behaviours (Bauman et al., 2012). For example, in neighbourhoods, safe sidewalks, sufficient lighting, and availability of parks could motivate residents to walk or ride on a regular basis (Angel et al., 2024). Conversely, neighbourhoods without such amenities might discourage outdoors activities and, therefore, lead to the development of sedentary lifestyles (Cerin et al., 2017). As a result, lifestyle behaviours can be regarded as a critical intermediary between the neighbourhood design and larger health outcomes (Ding et al., 2011).

Another measure that is commonly used in the field of public health is self-rated health, which is a good measure

Corresponding Author: Oyerinde, I. A. oyerindeismailadedapo@gmail.com Department of Architecture, Osun State University, Osogbo, Nigeria.

of how individuals perceive their health status (Garbarski, 2016). As argued by Hamplová et al. (2022), it is not only a measure of physical health but also captures psychological wellbeing and social conditions and thus is a very useful and practical measure to study the effects of environmental factors on health perceptions among urban dwellers.

Although this nexus is gaining international attention, there is a paucity of empirical studies that investigate the connection between neighbourhood environments and health in most African cities (Oni et al., 2019). This is a major gap, as unique urban peculiarities, in particular, high density of non-motorised transport and the distinct pattern of public space utilisation, mean that the results from Global North cities cannot be directly applied (Arku et al., 2016). Nigerian cities are going through the process of rapid urbanisation with challenges of insufficient infrastructure, poor neighbourhood planning and lack of recreation areas (Adegun & Taiwo, 2020; Aliyu & Amadu, 2022). These circumstances can greatly influence the lifestyle habits and health perceptions of urban dwellers, yet little empirical research exists to explore such dynamics in the Nigerian context (Oyeyemi et al., 2023).

Osogbo, the capital of Osun State, southwestern Nigeria, provides a good context for studying these relationships. Similar to many secondary cities in Nigeria, Osogbo has been experiencing large-scale urban growth in recent decades (Akpootu & Rabiu, 2019; Aremu et al., 2023), leading to a variety of neighbourhood types, both traditional and organically developed residential areas and more recent planned neighbourhoods (Gasu et al., 2020). These differences in neighbourhood design offer a setting to examine the impact of variations in the built environment on the lifestyle behaviour and health perceptions of residents.

It is against this backdrop that this research explores the connection between neighbourhood design, lifestyle behaviours and self-rated health of Osogbo residents in Nigeria. The study offers both empirical evidence in a Nigerian urban centre and adds to the growing body of literature on built environment and health, while providing insights that could inform urban planning and public health policy formulation.

1.1 Literature Review

1.1.1 Neighbourhood Design and Health: Theoretical Foundations

The linkages between the built environment and health lie in a number of complementary theoretical frameworks. The ecological model of health behaviour posits that individual health behaviours are influenced by a variety of levels, including physical environment, social networks, and policy contexts (Sallis et al., 2015). According to this framework, transforming neighbourhood design has the potential to impact population-level health by enhancing the accessibility and convenience of healthy behaviours. Equally, urban health theories underscore the role of city-level processes such as land-use patterns, transport infrastructure, and infrastructure delivery in either promoting or hindering the wellbeing of urban residents (Galea & Vlahov, 2005). These theories provide a justification to examine neighbourhood design as a structural health determinant, different from individual-level factors such as genetics or health preferences.

1.1.2 Neighbourhood Design and Lifestyle Behaviours: Evidence from High-Income Countries

There is a body of empirical data from high-income countries indicating that neighbourhood design has a significant impact on lifestyle behaviours, especially physical activity. Residential density, mixed land use and connected street networks are noted as typical walkable neighbourhoods, which are associated with increased active transport and recreational walking rates (Finlay et al., 2025). Availability of green spaces and recreational amenities has also been linked to higher levels of physical activities and lower sedentary behaviours (Hartig et al., 2014). Sallis et al. (2016) discovered that residents in most walkable neighbourhoods spent 45-89 minutes per week in moderate-vigorous physical activity more than those in the least walkable neighbourhoods.

Nevertheless, such results cannot be generalised to low- and middle-income country (LMIC) settings. First, the neighbourhood qualities that have been given preference in high-income country studies, including formal sidewalks, street lighting, and marked parks, may not truly reflect the key environmental attributes in informal settlements or rapidly urbanising African cities (Giles-Corti et al., 2016). Second, physical activity patterns are fundamentally different: in most African cities, the need to walk and use public transportation is a necessity and not a choice, which means that active living interventions designed in car-dependent Global North settings may be irrelevant or even counterproductive (Oyeyemi et al., 2019). Third, socio-cultural connotations attached to public spaces vary depending on the environment, which determines the users, time and purpose

1.1.3 Neighbourhood Design and Health in Sub-Saharan Africa: An Under-Researched Context

UN-Habitat (2022) projects that the urban population of sub-Saharan Africa will triple between 2020 and 2050. Despite this, empirical studies linking neighbourhood design and health is limited. Conducting a systematic review, Oni et al. (2019) identified only 12 studies in

Saharan Africa that explored built environment correlates of physical activity out of more than 200 studies in North America alone. The given research gap is alarming because African cities are characterised by peculiar environmental issues, including high rates of informal housing, poor drainage and waste disposal, insufficient recreational facilities, and high ambient air pollution (Güneralp et al., 2020).

Of the limited literature, evidence indicates that neighbourhood attributes do have an impact, although not necessarily predicted by high-income country literature. In Ghana, informal settlement dwellers in Accra indicated that they walked less because they feared their safety, there were no walking paths, and there was inadequate lighting (Arku et al., 2016). Physical activity was linked to access to open spaces in Nairobi, Kenya, although most residents noted that open spaces were of low quality, unsafe, or too far or too expensive (Oyeyemi et al., 2019). Adegun and Taiwo (2020) in Lagos, Nigeria, discovered that planned neighbourhood residents had an overall better access to recreational amenities and were more engaged in exercise compared to the residents of unplanned, informal neighbourhoods. These research studies indicate that local conditions, especially perceptions of security, quality of infrastructure, and socio-economic disparities, have mediated the relationship between the neighbourhood design and health in African cities. However, these issues had not been robustly explored in the current literature.

1.1.4 The Nigerian Urban Context: A Critical Gap

Nigeria presents a peculiar case to investigate neighbourhood design and health. As the most populous country in the continent, Nigeria is undergoing a fast urbanisation process, with more than half of the population currently residing in cities, a figure projected to reach 70% by 2050 (World Bank, 2021). This urban restructure has taken place alongside major difficulties: the lack of adequate housing; overcrowded infrastructure; lack of communal open spaces; and increasing non-communicable disease (NCD) rates, such as hypertension, diabetes, and obesity (Adebowale et al., 2019).

In spite of these patterns, there is a dearth in empirical studies that associate neighbourhood design with health outcomes in Nigerian cities. Aliyu and Amadu (2022) conducted a recent scoping review that found eight peer-reviewed studies that investigated the relationship between the built environment and health in Nigeria. The majority of these were interested in the quality of housing and infectious diseases (e.g., malaria, respiratory infections), and only a few of them investigated the role of neighbourhood design in defining lifestyle behaviours or risk factors of NCD. It is noteworthy that Oyeyemi et al. (2019) found that perceived neighbourhood walkability and access to recreational spaces in Maiduguri and Ibadan, respectively, predicted higher and lower levels of physical activity and body mass index, respectively.

Also, existing literature on Nigeria has focused on big cities such as Lagos, Ibadan, Kano, and Abuja, with minimal attention on secondary cities such as Osogbo. This is a major gap, as secondary cities are growing at the most rapid pace and possibly demonstrate varied patterns of neighbourhood development, infrastructure provision and lifestyle behaviours compared to megacities (UN-Habitat, 2022).

2 Materials and Methods

2.1 Study Area

This research was conducted in Osogbo, Osun State, Nigeria (Figure 1). Osogbo is the capital of Osun State and became the capital in 1991 when the state was established. It is 88km by road Northeast of Ibadan, 108km South of Ilorin and 108km Northwest of Akure (Akpootu & Rabiu, 2019). The Metropolis occupies an area of approximately 144km^2 which includes Osogbo Local Government Area, Olorunda and Egbedore Local Government Areas (Figure 2). The Metropolis is located on Latitude 7^{o}43^1 N and 7^{0}56^{1}N and Longitude 4^{o}33^{1}E and 4^{0}35^{1}E (Aremu et al., 2023) and has an average elevation of approximately 285m above sea level. River Osun drains the area and passes through the metropolis in a sinuous way and has numerous tributaries (UN-Habitat, 2014).

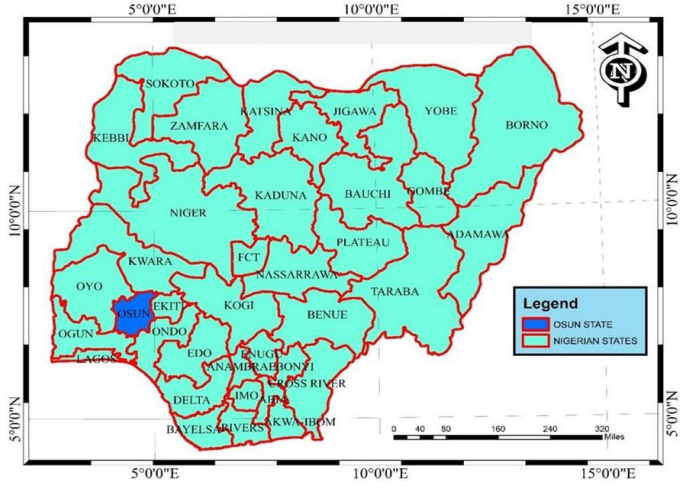

Figure 1: Osun State within the context of Nigeria
Source: National Space Research and Development Agency (NASRDA), 2023

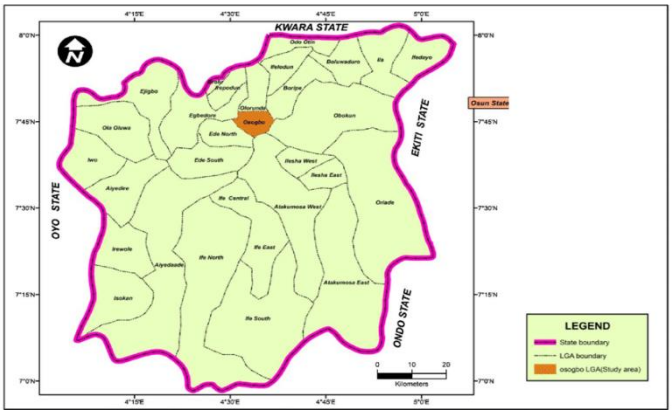

Figure 2: Osogbo within the context of Osun State
Source: Source: National Space Research and Development Agency (NASRDA), 2023

2.2 Research Design

The study employed a cross-sectional research design that involved the use of questionnaires and direct field observations. The questionnaire elicited data around neighbourhood attributes, lifestyle habits and self-rated health of participants. The availability and distribution of neighbourhood facilities, including open spaces, markets and restaurants, were recorded through observational data. Also, secondary data were collected through government reports and other academic literature.

2.3 Sampling Technique

A multi-stage sampling method was used to ensure representativeness. During the initial phase, the metropolis was stratified into three residential areas: core, transition, and suburban, according to the current urban classification frameworks (Fadare & Olawuni, 2008; Gasu et al., 2020). One hundred and eighty residential areas were identified across the metropolis, with 54 in the core zone, 29 in the transition zone, and 25 in the suburban zone.

The second stage involved random selection of 3% of the residential areas, which resulted in four study areas: Okebaale and Alekuwoda (core zone), Tinumola (transition zone), and Oroki Estate (suburban zone). During the third phase, a reconnaissance survey revealed that there were a total of 67 streets in the selected residential areas across the three zones. Systematic sampling was employed to select 50% of the streets in each zone.

The fourth stage involved sampling of residential buildings along the selected streets using a systematic sampling approach. One out of ten buildings was selected, with the first building chosen randomly and subsequent selection based on set interval. This procedure resulted in a total sample of 328 respondents being obtained across the three residential zones (see Table 1).

2.4 Data Analysis

Data analysis was carried out using the Statistical Package for the Social Sciences (SPSS) version 25. The data were summarised using descriptive statistics (frequencies, percentages) while inferential statistics were performed to analyse relationships between neighbourhood design, lifestyle behaviours and self-rated health.

Table 1: Streets and Estimated Number of Houses for Sample Selection in Osogbo Metropolis

Residential Zones	Residential Areas	Number of Available Streets	Number of Selected Streets (50%)	Number of Available Buildings in the Selected Street	Selected Buildings (10%)
Core	Okebaale, Alekuwodo	41	20	2,463	246
Transition	Tinumola	12	6	347	35
Suburban	Oroki Estate	14	8	469	47
Total		**67**	**34**	**3,279**	**328**

3 Results

3.1 Socio-Demographic Characteristics of Respondents

The socio-demographic characteristics of respondents gives valuable information about the study population features as presented Table 2. Regarding gender profile, the sample constituted female respondents (56.7%) than males (43.3%), indicating a slight female pre-eminence in sample. This may indicate increased accessibility or readiness of women to participate in household-based survey.

In terms of age group, demographics of the population are fairly young and active. The majority of respondents (51.9%) fell under the age category of 19 to 35 years, followed by those who fell under the age category of 36-45 years (27.8%). A low percentage (3.1%) were aged 56 years and above. This young population profile is important as this population tends to be more mobile and possibly more sensitive to environmental factors on lifestyle behaviours.

In terms of educational level, most of the respondents had tertiary-level education, with 58.4% of respondents having BSc/HND/NCE/OND, qualifications. An even smaller percentage (18.0%) received vocational or technical education, while the percentage of those with postgraduate education (Masters/PhD) was only 10.1%. It

is interesting to note that a minimal percentage (0.9%) indicated that they were not educated at all. This means that the population of the study is reasonably educated which may have some impact on the awareness and interest in health-related behaviours.

The distribution of marital status reveals that almost half of the respondents were married (49.8%), while 39.6% were single. Smaller percentages were separated (6.9%), or widowed (3.7%). Also, income distribution analysis shows that a majority of the respondents are in the low- to middle-income bracket. The largest proportion (42.4%) earned between ₦71,000 and ₦150,000 monthly, while 31.5% earned ≤ ₦70,000. Only 19.6% reported earning ₦201,000 or more. This implies that economic limitations could be a contributing factor towards lifestyle decisions such as access to leisure amenities and nutritious foods.

The data on household size indicate that most of the respondents (50.6%) lived in a household of 2-4 people showing moderate household sizes. The number of larger households (5–7 persons) was 24.4, and only 7.2% of households had eight or more people. Smaller households (≤1 person) were 17.8%. The number of people living in a household is a significant variable, as this can affect the socialisation, distribution of resources, and the lifestyle behaviour at home.

Table 2: Socio-Demographic Characteristics of Respondents

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	142	43.3
	Female	186	56.7
Level of Education	Masters/PhD	32	10.1
	Completed Secondary School	40	12.6
	BSc/HND/NCE/OND	185	58.4
	Vocational/Technical Training	57	18.0
	No Formal Education	3	0.9
Marital Status	Married	160	49.8
	Single	127	39.6
	Widowed	12	3.7
	Separated	22	6.9
Age Group	Less than 18	6	1.9
	19–35	166	51.9
	36–45	89	27.8
	46–55	49	15.3
	56 and above	10	3.1
Average Monthly Income	≤ ₦70,000	58	31.5
	₦71,000 – ₦150,000	78	42.4
	₦151,000 – ₦200,000	12	6.5
	≥ ₦201,000	36	19.6
Household Size	≤ 1	32	17.8
	2–4	91	50.6
	5–7	44	24.4
	≥ 8	13	7.2
Length of Stay (Years)	≤ 1	24	11.7
	2–5	88	42.9
	6–9	42	20.5
	≥ 10	51	24.9

The length of residence also indicates that a large percentage of the respondents had lived in their neighbourhoods for a moderate to long period of time. The greatest proportion (42.9%) had stayed in the area between 2-5 years, with 24.9% have lived there for 10 years or above. Only 11.7% had resided in the area less than one year. This implies that there is a comparatively stable population and enough exposure to the neighbourhood environments, making the responses to be more reliable to neighbourhood design and its effects on lifestyle behaviours and health.

3.2 Neighbourhood Built Environment Characteristics and Utilisation Pattern

Table 3 shows that the most commonly available open spaces in neighbourhoods included primary and secondary school playgrounds (47.4%), incidental open spaces (26.8%), while formal recreational facilities like neighbourhood parks (11.9%) and sport facilities (13.2%) were comparatively scarce. This implies that the residents depend on informal or institutional space as opposed to purposely-built recreational spaces. This scarcity of organised recreational amenities is indicative of urban planning challenges of in Nigerian cities, where open spaces are usually underprovided or poorly maintained.

Table 3: Availability of Neighbourhood Open Spaces

Type of Open Space	Frequency (n)	Percentage (%)
Primary/Secondary School Playground	143	47.4
Neighbourhood Incidental Space	81	26.8
Neighbourhood Sport Facilities	40	13.2
Neighbourhood Park	36	11.9
Others	2	0.7

The number of visits made to open spaces gives a mixed pattern of participation, as shown in Table 4. Although a considerable percentage of respondents stated they had been to open spaces at least once or twice (16.8% and 18.0% respectively) per week, a notable percentage (11.6%) said they did not visit open spaces at all. This highlights variability in the utilisation, indicating that access does not necessarily lead to utilisation. The moderate level of usage may indicate the counteracting factors of time availability, safety or absence of appealing facilities.

The time of the day during which residents visit neighbourhood open spaces is also shown in Table 4. The majority of visits happened in the evening (32.1%), followed by the afternoon (25.0%), and in the morning (17.5%). This trend is probably a representation of everyday activity routines, as most residents usually do recreational or leisure activities after work or school. It can also reflect the effect of environmental conditions like temperature and sunlight that is more applicable in tropical urban environments.

The table further shows that the most prevalent mode of access was walking (54.5%), followed by cycling (18.6%), which means that open spaces are usually within walkable distances to many residents. Motorised modes of transport like cars (12.0%), motorbikes (8.6%), and buses (6.3%) were less commonly used. This emphasises the significance of proximity and accessibility in the influencing utilisation patterns, highlighting the function played by neighbourhoods design in fostering active mobility.

The number of respondents who travelled less than 10 minutes was high (40.6%), while 25.3% travelled between 10 and 20 minutes. Very few (3.0%) travelled over 30 minutes. These results indicate the fairly good spatial accessibility to open spaces in the study area. Nonetheless, with this proximity, utilisation rates are still moderate, which means that other variables like quality, safety, and functionality might also have an impact on usage.

Regarding the length of time spent in open spaces, the majority of the respondents (44.2%) spent between 2 and 3 hours during visits, while 27.4% spent less time (less than 1 hour). A minimal percentage (9.1%) spent over 3 hours. This indicates that once residents access open spaces, they are likely to spend meaningful time, implying that open spaces can enable long-lasting physical and social activities.

Table 4: Utilisation Patterns of Neighbourhood Open Spaces

Variable	Category	Frequency (n)	Percentage (%)
Visit Frequency (Times/Week)	None	38	11.6
	Once	55	16.8
	Twice	59	18.0
	Three times	38	11.6
	Four times	20	6.1
	Five times	23	7.0
	Six times	18	5.5
	Seven or more	6	1.8
Time of Visit	Morning	54	17.5
	Afternoon	77	25.0
	Evening	99	32.1
Mode of Transport	On foot	164	54.5
	Bicycle	56	18.6
	Motorbike	26	8.6
	Car	36	12.0
	Bus	19	6.3
Travel Time	< 10 minutes	133	40.6
	10–20 minutes	83	25.3
	21–30 minutes	24	7.3
	> 30 minutes	10	3.0
Time Spent	< 1 hour	90	27.4
	1–2 hours	63	19.2
	2–3 hours	145	44.2
	> 3 hours	30	9.1

3.3 Perceived Quality of Neighbourhood Open Spaces

Quality of neighbourhood open space was measured through multiple indicators, with mean weighted values (MWV) utilised to rank perceptions of the respondents. Generally, the results (Table 5) indicate a moderate degree of satisfaction with the quality of open spaces, as most of indicators had mean scores slightly above 3.0 based on a five-point scale.

Among the evaluated factors, quality of open space, sufficiency of facilities, and overall beauty of the environment had high mean scores (MWV = 3.27), indicating that respondents tend to have a positive view of these factors. Also, the amount of greenery (MWV = 3.23) and the presence of sitting and rest facilities (MWV = 3.20 3.22) were also rated in a fairly good manner, indicating that there are basic environmental aesthetics and functionality on a rather decent scale.

A number of key gaps were, however, found. The lowest score was on adequacy of shaded areas (MWV = 2.93) which was a measure of inadequate provision of protection against weather conditions like heat and exposure to the sun. This is relevant especially in tropical climates where shade is a prerequisite for outdoor activity. Furthermore, level of cleanliness (MWV = 3.01) and the availability of public toilets (MWV = 3.03) scored relatively low, which also highlights issues related to the maintenance and sanitation facilities in open spaces.

The comparatively lower score of car parking (MWV = 3.17) and play areas (MWV = 3.18) indicates that while these facilities exist, they may not be sufficient in size and quality to address the users' needs. This indicates the lack of correspondence between infrastructure functionality and availability.

In general, the findings reveal that although the open spaces within the neighbourhoods in the study area are moderately functional and aesthetically satisfactory, there are significant deficiencies in critical support infrastructures like shading, sanitation, and maintenance. Such inadequacies can restrict the beneficial use of such spaces and decrease their ability to enhance active lifestyles and wellbeing among Osogbo residents.

Table 5: Perceived Quality of Neighbourhood Open Spaces

S/N	Quality Indicator	E (5)	VG (4)	G (3)	F (2)	P (1)	Weighted Score (AWV)	Mean Score (MWV)
1	Quality of open space	13	107	93	28	17	843	3.27
2	Types of seats	23	81	86	45	18	815	3.22
3	Adequacy of facilities	14	101	86	29	18	812	3.27
4	Adequacy of car parking	7	119	116	47	12	953	3.17
5	Adequacy of public toilets	20	95	122	35	29	911	3.03
6	Adequacy of shaded places	14	90	134	39	24	882	2.93
7	Level of cleanliness	10	104	123	46	17	902	3.01
8	Amount of greenery	23	106	108	46	18	973	3.23
9	Areas to play in general	17	86	154	31	11	952	3.18
10	Things to play or relax with	19	101	131	40	10	962	3.20
11	General beauty of the place	19	80	148	41	0	941	3.27

Key: Excellent (E), Very Good (VG), Good (G), Fair (F), and Poor (P)

3.4 Physical Activity Behaviour of Residents

Table 6 presents the physical activity behaviour of respondents in terms of participation, frequency and duration. Physical activities were divided into vigorous physical activities (sports, heavy lifting, digging, jogging, and fast bicycling), moderate physical activities (fast walking, stair climbing and bicycling), walking, and sedentary behaviour (sitting or lying down).

The most frequently reported activity was walking (76.8%), moderate physical activity (59.8%), and vigorous physical activity (47.4%). Nonetheless, participation does not always equate to regular engagement with most activities being carried out at low frequency (0-2 days/week) especially vigorous (45.0%) and moderate activities (38.7%). This implies that although residents are engaged in various types of physical activities, the engagement is mostly irregular and may not be within the recommended physical activity recommendations.

Regarding duration, most respondents indicated they spent less than one hour daily on physical activities, with vigorous and walking activities having the highest percentage (56.4% and 53.4% respectively). Even though there were a few respondents who were involved in longer periods, they were comparatively less frequent. Sedentary behaviour was also significant, with 54.7% of the respondents being engaged in activities like sitting or lying down, and 63.1% spending less than one hour a day, although a significant proportion of respondents spent longer sedentary time.

The results generally show while physical activity exist among the residents, especially in the form of walking, it is usually of low intensity, irregular frequency and minimal duration. This trend indicates that neighbourhood conditions might facilitate basic mobility and habitual movement, but are not potent to promote intensive, systematic and health-promoting physical activity behaviours.

Table 6: Physical Activity Behaviour of Residents

Activity Type	Participation (%)	Low (0–2 days/week)	Moderate (3–4 days/week)	High (5–7 days/week)	<1 hr (%)	1–2 hrs (%)	3–4 hrs (%)	≥5 hrs (%)
Vigorous Activity	47.4	45.0	18.6	12.5	56.4	11.3	12.2	20.1
Moderate Activity	59.8	38.7	7.9	13.7	42.7	17.7	24.1	15.5
Walking	76.8	57.2	15.9	14.9	53.4	27.8	10.1	8.7
Sedentary Behaviour	54.7	63.4	15.6	17.7	63.1	11.2	12.8	12.9

3.5 Dietary Behaviour of Residents

3.5.1 Frequency of Food Consumption

Table 7 displays the frequency of consumption of different food types by residents within the last month. The findings indicate a heterogeneous trend in dietary behaviour, noted by moderate intake of healthy and unhealthy food products.

Regarding healthy food options, the highest proportion of respondents (48.5%) consumed vegetables and fruits 3-4 times per week, but very few (0.9%) ate them daily. Likewise, legumes and beans that are primary sources of vegetarian protein were eaten most frequently 3-4 times per week (55.1%), but not daily (2.8%). These results indicate that although residents have healthy foods in their diets, they might not consume them regularly to meet the dietary recommendations.

Conversely, there was a relatively high consumption of less healthy food items. Foods that were mostly eaten 3-4 times weekly were deep-fried foods (67.4%), processed meats (64.1%), pastries and snacks (58.0%), and sugar-sweetened beverages (57.3%). This shows that there is a high intake of high-energy, low-nutrient foods in the dietary habits of Osogbo inhabitants. Also, street foods (43.3%) and sweets (47.7%) were also often eaten, indicating dependence on easily accessible and convenient food.

The intake of red meat, poultry and fish was more balanced, with 36.8% consuming them 3-4 times weekly and a significant percentage indicating frequent (5-6 times) or daily intake. Although this can contribute positively to protein intake, over-consumption of this can have long-term health outcomes effects based on how one prepares them.

The results, in general, suggest that the dietary habits of the residents are characterised by moderate dietary consumption of the healthy foods and excessive dietary consumption of the unhealthy, processed, and fried food. This nutritional imbalance implies a nutrition shift pattern, with the traditional diet being more and more substituted or supplemented with convenience and processed foods. These trends can also lead to a higher risk of non-communicable diseases and demonstrate the necessity to investigate the impact of neighbourhood food environments on diet.

Table 7: Frequency of Food Consumption

Food Category	Never (%)	<1x/week (%)	1–2x/week (%)	3–4x/week (%)	5–6x/week (%)	Daily (%)
Vegetables & Fruits	5.6	33.6	4.3	48.5	7.1	0.9
Legumes/Beans	8.4	16.5	7.2	55.1	10.0	2.8
Red Meat / Poultry / Fish	16.4	14.9	6.8	36.8	12.7	11.5
Processed Meats	0.0	21.1	5.0	64.1	8.0	1.9
Deep-Fried Foods	0.0	23.7	1.3	67.4	3.2	4.4
Sugar-Sweetened Drinks	0.0	25.1	1.2	57.3	8.7	7.7
Sweets/Chocolates	0.0	38.4	6.2	47.7	3.4	4.3
Pastries & Snacks	0.0	30.1	4.2	58.0	2.9	4.8
Street Foods	0.0	39.6	7.4	43.3	5.0	4.6

3.5.2 Eating Patterns and Food Environment

Table 8 reveals that most respondents eat at home (40.5%) or at their workplace (36.5%) implying that day-to-day activity and work requirements determine eating behaviour to a great extent. Nevertheless, a significant percentage (16.4%) depends on street food sellers, which underscores the impact of the neighbourhood food environment on dietary choice.

Regarding the number of meals, the majority of the respondents had two meals daily (58.3%), with only a smaller percentage consuming the recommended three meals daily (13.4%). Furthermore, 25.0% of the respondents claim that they consumed more than three times a day, which is quite high and could be an indicator of snacking behaviour as opposed to a regular meal. This uncharacteristic eating habit implies the possibility of unbalanced food consumption.

In addition, there was a high rate of people consuming meals that were prepared outside the house, with more than half of the respondents (54.0%) indicating that they consumed this kind of meal occasionally while 20.4% consumed the meal every day. This dependence on externally prepared food could be used to explain the previously reported high intake of processed, fried, and convenience foods, as these are generally more readily available in the outside environment.

Table 8: Eating Patterns and Food Environment

Variable	Category	Frequency (n)	Percentage (%)
Place of Eating	At home/family	123	40.5
	At work	111	36.5
	Street food vendors	50	16.4
	At school	9	3.0
	Restaurants	2	0.7
	Others	9	3.0
Meals per Day	One	10	3.3
	Two	179	58.3
	Three	41	13.4
	More than three	77	25.0
Meals Prepared Outside Home	Never	32	10.4
	Occasionally (1–2x/week)	167	54.0
	Frequently (3–5x/week)	38	12.3
	Daily	63	20.4

3.5.3 Dietary Habits and Nutrition Practices

Table 9 reveal moderate but inconsistent nutrition practices among residents. When it comes to water consumption, most respondents drank 2 to 3 bottles of the water per day, with the lowest numbers (16.8%) drinking 4 or more bottles of water per day, which implies that maximum levels of hydration may not be maintained all the time.

In terms of salt intake, the percentage of people who said they never (35.7%), or hardly ever (44.8%), added additional salt to their foods, means that dietary behaviour in this respect is relatively good. Nevertheless, even a smaller percentage noted frequent salt addition, which can put hypertension and other cardiovascular diseases at risk.

Table 9: Dietary Habits and Nutrition Practices

Variable	Category	Frequency (n)	Percentage (%)
Water Intake (Daily)	1 bottle	82	25.5
	2 bottles	74	23.1
	3 bottles	111	34.6
	≥4 bottles	54	16.8
Adding Extra Salt	Never	114	35.7
	Rarely	143	44.8
	Sometimes	40	12.5
	Often	21	6.6
	Always	1	0.3
Type of Cooking Oil	Mainly palm oil	49	15.5
	Mainly groundnut/vegetable oil	150	47.5
	Butter/margarine	26	8.2
	Combination (palm + vegetable oil)	88	27.8
	Others	3	0.9

Mixed dietary practices are indicated further by the type of cooking oil used. Although almost half of the respondents (47.5%) used groundnut or vegetable oil, which is usually considered to be healthier, a considerable number of respondents were dependent on palm oil (15.5%) or a mixture of oils (27.8%). There is a possibility

that the use of saturated fats like palm oil could have some long-term health consequences, especially when used together with high intake of fried and processed food as reported previously.

3.6 Self-Rated Health Status of Residents

Table 10 shows that most respondents had a positive view of their health. More than two-thirds (35.5%/36.1%) of them rated their health as good or very good; while a lower percentage rated their health as fair (14.7%) or poor (3.7%). This implies an overall positive attitude towards health among residents, although there were environmental and lifestyle issues diagnosed in the previous sections.

Table 10: General Self-Rated Health

Health Status	Frequency (n)	Percentage (%)
Poor	12	3.7
Fair	48	14.7
Good	116	35.5
Very Good	118	36.1
Excellent	33	10.1

Both physical and emotional health point to role limitations where underlying issues are also demonstrated. A significant percentage of the respondents reported that they often accomplish less than they wanted to because of physical health (42.5%), but emotional health also had a role in decreased productivity, though it was not as high. These results suggest that even in the case of a positive overall health perception, there are health conditions that can influence day-to-day functioning and productivity.

The assessment of mental and social wellbeing looks like a mixed picture. Although the level of pain interference was low in most respondents and they were relatively stable emotionally, a significant percentage of respondents reported moderate to high rates of emotional distress, fatigue, and decreased social participation. More than 17% said they often felt depressed or often had pain that interfered. Also, a few of the respondents reported having restrictions in social interaction because of physical or emotional health reasons.

Generally, the results indicate that though residents tend to rate their health positively, there are real underlying physical, emotional, and social health limitations that might not be well reflected by general measures of self-rated health. This disparity illustrates the need to study various aspects of health to gain a clearer insight into how lifestyle behaviours, neighbourhood environments and overall wellbeing are related.

Nonetheless, additional physical functioning analysis (Table 11) shows that there are significant limitations. Although some respondents said that they had no restrictions in taking part in vigorous activities (34.2%), most of them claimed they were restricted a little (54.0%), with a smaller yet significant percentage of respondents saying that they were restricted significantly. The same tendencies were found in climbing stairs, with more than half of the respondents indicating that they were limited to some degree. These results indicate that despite the perceived overall health as being good, many individuals may have limited functional capacity.

Table 11: Functional, Physical, and Psychosocial Health Indicators

Domain	Indicator	Low/None (%)	Moderate (%)	High (%)
Physical Functioning	Limitation in vigorous activities	34.2	54.0	8.1
	Limitation in climbing stairs	26.8	44.5	11.2
Role Limitations (Physical Health)	Accomplished less due to physical health	30.7	26.9	42.5
	Limited in activities due to physical health	63.0	25.4	11.0
Role Limitations (Emotional Health)	Accomplished less due to emotional health	65.8	21.7	12.6
	Reduced work quality due to emotional health	60.8	25.7	13.5
Mental & Social Wellbeing	Pain interference	54.4	27.8	17.8
	Felt calm and peaceful	53.8	28.0	18.1
	Had energy	57.8	24.9	17.3
	Felt downhearted	59.6	22.6	17.7
	Unable to socialise	62.3	25.6	12.0

3.7 Relationship Between Neighbourhood Design and Lifestyle Behaviour

From Table 12, the Spearman rank correlation analysis was used to test the relationship between neighbourhood-built environment characteristics and lifestyle behaviours. The findings suggest that a neighbourhood index has a very weak and non-significant positive correlation with physical activity ($r = 0.040$, $p = 0.479$) and dietary behaviour ($r = 0.039$, $p = 0.488$). This indicates that neighbourhood design differences including accessibility, quality, and accessibility to open spaces do not have significant effects on the physical activity of residents and their eating habits in the study area.

Nonetheless, there was a statistically significant negative correlation between physical activity and dietary behaviour ($r = -0.120$, $p < 0.05$). this shows that respondents who reported increased level of physical activity were less likely to demonstrate healthier dieting patterns, however, the strength of this relationship is weak.

These findings suggest that lifestyle behaviours can be affected by other factors beyond neighbourhood design, such as socio-economic status and cultural traditions, as well as personal interests.

Table 12: Correlation Between Neighbourhood Design and Lifestyle Behaviour

Variables	Neighbourhood Index	Physical Activity behaviour	Dietary behaviour
Neighbourhood Index	1.000	0.040	0.039
Physical Activity behaviour	0.040	1.000	-0.120*
Dietary behaviour	0.039	-0.120*	1.000

3.8 Influence of Lifestyle Behaviour on Self-Rated Health

As indicated in Table 13, multiple regression analysis was carried out to investigate the effect of lifestyle behaviours on self-rated health. The findings indicate that dietary behaviour has a statistically significant positive effect on self-rated health ($\beta = 0.171$, $p = 0.002$). This indicates that residents with healthy eating patterns are more likely to report positive health outcomes.

Physical activity, on the other hand, did not show a significant effect on self-rated health ($\beta = -0.021$, $p = 0.705$). This shows that the changes in physical activity levels do not significantly predict self-rated health among respondents in this study. Regression model indicates that diet is a more significant predictor of health perception than physical activity within the study context.

Table 13: Regression Analysis of Lifestyle Behaviour on Self-Rated Health

Variable	B	Std. Error	Beta (β)	t-value	p-value
Constant	1.899	0.214	—	8.877	0.000
Physical Activity behaviour	-0.018	0.048	-0.021	-0.379	0.705
Dietary behaviour	0.196	0.064	0.171	3.061	0.002

4 Discussions

This study explores the relationship between neighbourhood design, lifestyle behaviours, and self-rated health among residents of Osogbo, Nigeria. The results offer valuable insights about how these relationships function within a low-and middle-income urban environment and highlights trends that agree with and dispute recent empirical studies.

One of the key findings of this research is that there is no statistically significant correlation between neighbourhood design and lifestyle behaviours. Although current literature confirms that built environment variables like walkability, accessibility and the presence of recreational facilities have been correlated with higher levels of physical activity in high-income neighborhoods (Sallis et al., 2020; Cerin et al., 2022), new data in low- and middle-income countries indicate that these links are generally weaker or inconsistent because of contextual factors (Adlakha et al., 2019; Oyeyemi et al., 2019). The results of this research thus concur with the new findings that show that environmental determinants of behaviour in African urban centres are mediated by the socio-economic realities, lack of infrastructure, and safety issues (Osei-Kwasi et al., 2020; Kolbe-Alexander et al., 2021).

The nature and quality of the neighbourhood open spaces can explain the weak association that was experienced in this study. Even though a number of respondents shared the closeness with open spaces, these

were more or less informal and incidental spaces, like school playgrounds, which did not have the needed infrastructure (shade, sanitation and maintenance). Recent research highlights the crucial role of the usability and quality of the open spaces over the availability of open spaces in the physical activity engagement (Cerin et al., 2022; Veitch et al., 2021). Poorly maintained or unsafe spaces have been identified to cause a substantial decrease in utilisation, even in urban areas where access is relatively high (Oyeyemi et al., 2019; Adlakha et al., 2019).

Additionally, the type of physical activity highlighted in this study gives a further explanation why there was no significant association. Walking was noted as the most widespread mode of activity but in most urban low-income areas, the activity is more utilitarian than recerational. Recent research revealed that in sub-Saharan Africa, physical activity is driven by necessity, like commuting and job-related requirements trather than being deliberate health behaviour (Muthuri et al., 2020; Kolbe-Alexander et al., 2021). This means that this activity might not be intense, frequent or organised enough to generate quantifiable health effects or capture the effect of neighbourhood design. The low frequency and duration of physical activity observed also corroborate this interpretation, which is in line with the results of recent studies in similar context (Oyeyemi et al., 2023).

Conversely, dietary behaviour emerged as a significant predictor of self-rated health, which underscored the importance of dietary behaviour in shaping health outcomes. This observation aligns with the recent global data on the fact that unhealthy nutrition is one of the primary causes of morbidity and mortality, especially in low-and middle-income nations (Afshin et al., 2019; GBD 2019 Risk Factors Collaborators, 2020). The eating habits in this research, characterised by moderate eating of fruits and vegetables and high eating of fried, processed, and foods sweetened with sugar, highlights current nutrition transition linked with urbanisation (Popkin et al., 2020).

The prominence of dietary behaviour in shaping health outcomes also highlights the significance of neighbourhood food environment. A high percentage of the respondents claimed to be consume meals outside the house with many depending on street food vendors. Recent literature emphasizes that African cities are shifting towards more informal food vendors that sell cheap, yet energy-dense and nutrient-poor foods which dominate the city food landscape (Osei-Kwasi et al., 2020; Turner et al., 2020). These habitats influence the nutrition patterns through availability, affordability, and convenience, often superseding personal intentions or knowledge. Food environment can thus have a more direct effect on dietary behaviour than on physical design of neighbourhood spaces.

The study further noted that there is no significant relationship between physical activity and self-rated health. Although this might seem contrary to the existing evidence on the beneficial effects of physical activity on health outcomes, recent studies indicate that health benefits of physical activity are contingent on both participation and intensity, duration, and consistency (Piercy et al., 2018; WHO, 2020). The fact that, in this study, low-intensity and irregular activity is dominant, could be the reason why a measurable impact on health was not found. Moreover, self-rated health is a subjective scale, which is affected by a variety of factors, such as diet, mental health, and socio-economic status (Lorem et al., 2020).

Combined, these results indicate that the mechanisms by which neighbourhood design, lifestyle behaviours and health are interconnected in this study are not necessarily the same in high-income settings. Although the ecological model is an effective framework, recent research noted that it needs to be modified to capture the reality of low-income urban settings, where structural and socio-economic factors tend to have more influence (Sallis et al., 2016; Rydin et al., 2021). This suggests that economic constraints, cultural practices, and food environment may influence lifestyle behaviours in the context of Osogbo more than neighbourhood design would.

Policy-wise, the results highlight the significance of the holistic and context-specific approach to health promotion. Although enhancing the infrastructure of neighbourhoods is still a significant issue, recent findings indicate that food environment interventions, including enhancing access to healthy and affordable foods and informal food systems, can have a more direct influence on health outcomes (Swinburn et al., 2019; Turner et al., 2020). On the same note, improving the quality, safety, and usability of open spaces will be more efficient as opposed to just increasing their number.

Furthermore, informal systems and daily realities should be taken into consideration when developing urban planning strategies in the Nigerian cities. Recent urban health studies highlight how informal practices, community dynamics, and economic limitations should be included into planning processes (UN-Habitat, 2020; Rydin et al., 2021). This necessitates the need to transcend imported designs of urban design and come up with locally led interventions that are based on the lived experiences of the residents.

Overall, the research adds to the increasing literature on neighbourhood environments and health in sub-Saharan Africa. Future studies should examine other components such as safety, social cohesion, and the quality of the environment and how they relate to socio-

economic factors. Longitudinal and mixed-method designs may also be valuable to capture causal mechanisms and the complexity of behaviour in fast urbanisation settings.

The findings indicate that although neighbourhood design is a critical element of urban living, its effects on lifestyle behaviours and health are less significant in more socio-economically and food environment-influenced contexts. In particular, dietary behaviour emerges as a major determining factor of self-rated health, which underscores the importance of integrated, context-specific approaches to enhance health outcomes in urban African environments.

5 Conclusion

This study investigated the relationship between neighbourhood design, lifestyle behaviours, and self-rated health among residents of Osogbo, Nigeria. Using an ecological approach, it aimed to identify the effect of built environment features on physical activity and dietary behaviour and how these behaviours, in turn, affect health outcomes. The results present valuable insights about dynamics of urban health in a low- and middle-income environment, revealing the intricacy of the interactions between environmental and behavioural phenomena. Overall, dietary behaviour, not neighbourhood design, is the primary predictor of self-rated health among residents of Osogbo, Nigeria.

The findings showed that the neighbourhood design did not significantly affect the lifestyle behaviours, such as physical activity and dietary behaviours. Despite a good number of residents indicating that they had access to neighbourhood open spaces, the spaces were most informal and did not have the required infrastructure such as proper shading systems, sanitation and maintenance systems. Therefore, their prospects to encourage meaningful and sustained physical activity were restricted. In addition, walking was more commonly reported among residents but was usually utilitarian (motivated by necessity more than by motivation to health) and was characterised by low intensity and sporadic frequency. This could explain why physical activity was not a significant predictor of self-rated health in this study.

Conversely, dietary behaviour turned out to be a major determinant of health outcomes. Residents demonstrated varied dietary patterns, combining moderately consumed healthy foods, including fruits and legumes, as well as larger consumption of fried, processed and sugar-sweetened foods. The heavy dependence on street foods and foods cooked outside the home also hints that foods are heavily influenced by the neighbourhood food environment, especially due to availability, affordability and convenience. These trends are in line with the current nutrition transition in most urban African contexts and have significant implications on the rising non-communicable disease burden.

In general, the research posits that, in the context of Osogbo, socio-economic factors and food environment impact lifestyle behaviours, specifically, dietary practices, more strongly than neighbourhood design does. The finding refutes the premises made based on the high-income context and highlights the necessity of context-specific approaches of urban health research and intervention.

On the basis of these conclusions, a number of recommendations are made. First, efforts of urban planning agencies should go beyond just providing open spaces but also enhancing the quality, safety and functionality of the space. Shaded region and sanitation facilities, as well as seating and maintenance, should be invested in to improve usability and promote long-term physical activity. Second, specific interventions in the food environment are needed. The Osun State Ministry of Environment should look at measures to enhance access to affordable and healthy food supplies such as regulation and encouragement of street food vendors to adopt healthier food preparation methods.

Third, public health interventions should prioritise nutrition education and behaviour change programmes that promote awareness of healthy eating habits and dangers of overconsumption of processed and fried foods. These programmes must be locally rooted and responsive to socio-economic realities of residents. Fourth, there is the necessity to incorporate health into urban policy via a multisectoral partnership between urban planners, professionals in public health and local government.

Lastly, prospective studies should consider more built environment attributes that may impact health behaviours, such as safety, social cohesion, and economic constraints, and use longitudinal designs to have a gathered nuanced understanding of the causal relationships. A more holistic and context-sensitive approach can help policymakers and researchers create more effective policies to enhance health outcomes in a rapidly urbanising city such as Osogbo.

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