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Research Article

The Geography of Non-Work Travels in a Secondary African City: Analyzing Journeys for Shopping, Recreation, and Healthcare in Zaria Metropolis, Kaduna State, Nigeria

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ABSTRACT

Non-work travel is an underexplored area of African urban transport research, even though it plays a vital role in the quality of life and the availability of essential services. This paper focused on the spatial arrangements and determinants of travel for shopping, recreation, and healthcare in the Zaria Metropolis. The study assesses the major intra-urban disparities in travel behaviour using a mixed-method approach by combining household surveys (n=384) in the urban zones of Zaria metropolis, including Samaru, Sabon Gari, Tudun Wada, and Zaria Walled City, along with spatial analysis of their road network connectivity using graph-theoretical indices (Alpha, Beta, Gamma). The results show that healthcare trips have the highest travel distances and costs, with 53% of the sample covering 5-10 kilometres and 52.4% paying N500-N700 per trip, whereas shopping trips are mostly short (65-88.5% less than 5 kilometres) but have unexpected cost differences, with 51.3% of the residents of Sabon Gari spending more than N1,000 despite the short travel. Recreational travel reflects patterns of a specific zone, with Samaru at 69% per week and Zaria Walled City at 42.2% per month. Taba and Likoro show higher network connectivity (Gamma = 0.6), while Kerawa exhibits marked weakness (Alpha = 0.0, Beta = 1.1, Gamma = 0.4), with several wards displaying reduced Alpha (0.1) and Beta (≤1.3), reflecting lower network redundancy. The strongest predictors of travel behaviour, according to multiple regression, are travel cost (b=0.390) and mode (b=0.323) (p<0.001). This paper finds that economic constraints, infrastructural gaps, and spatial inequalities are major determinants of non-work mobility and, as such, have implications for sustainable urban planning in Africa's secondary cities.

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1 Introduction

Studies of urban transportation have traditionally focused on work-related travel as a significant aspect of African urban transport, indicating the superiority of economic productivity paradigms in transport planning (Behrens et al., 2016). This orientation clouds the vitality of non-work travel in the formation of urban livelihoods, social inclusivity, and household well-being. Shopping, leisure, and health travel are travel types that directly affect quality of life, service access, and social involvement (Foley et al., 2022).

Infrastructure development during the urbanization periods in African secondary cities has fallen short of the population growth rate, and the transport system is predominantly informal (Poku-Boansi, 2021). In contrast to primary cities like Lagos or Nairobi, which enjoy international research coverage and can organize their transport investments, secondary cities like Zaria, the eighth-largest metropolitan area in Nigeria and the only non-state capital among the ten largest (Butler, 2015), have to work under the conditions of infrastructural deficit, institutional frailty, and weak planning abilities. Zaria Metropolis has a population of more than 1.3 million in the urban zones, including Samaru, Sabon Gari, Tudun Wada, and Zaria Walled City. The city reflects the morphological complexity of urban centres of Nigeria (Mortimore, 1970).

Different urban zones have different socio-economic traits, constructed environments, and patterns of transport accessibility that may influence non-work travel behaviour in various ways. The lack of organized transport and the heavy reliance on unstructured modes, such as tricycles (*Keke Napep*) and motorcycles (*Okada*), further characterize the mobility environment (Usman, 2020). The paper addressed the following research questions: (1) How do shopping, recreation, and healthcare travel patterns differ between the urban zones of Zaria metropolis? (2) What socio-economic and infrastructural considerations explain the variations in travel distance, cost, frequency, and mode choice? (3) What do the trends in healthcare burden, shopping cost-distance paradox, recreational frequency, and network connectivity reveal about spatial equity and accessibility?

2 Literature Review

2.1 Non-Work Travel in Urban Areas

Non-work travel refers to travel undertaken for reasons other than work or education, such as shopping, recreation, health, social visits, and religious tours. Work

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travel is regulated by time, whereas non-work travel is more predictable in its regularity, frequency, timing, and destination selection (Mokhtarian & Cao, 2021). The variation can be attributed to the complex nature of household demands, personal choices, and accessibility of space that determine daily mobility. Studies in the developed setting have determined that non-work travel constitutes a significant percentage of urban travel, 40-60% of all trips in European and North American cities (Santos et al., 2021).

2.2 Shopping Travel Behaviour

In Nigerian cities, researchers have reported short-trip shopping, with most households visiting neighbourhood markets and local vendors daily and visiting central markets once a week or a month to make bulk purchases (Olugbenga & Aloba, 2021). Mode choice in shopping trips is biased towards the flexibility of certain modes, such as walking for local trips, informal transport for medium distances, and vehicle use, which is predominantly used by high-income earners (Aloba & Fadoju, 2021). Gadepalli et al. (2020) reported that shopping travel in Indian cities was more sensitive to waiting time and service frequency than work travel.

2.3 Recreational Travel and Urban Quality of Life

The provision of recreational services, such as parks, sports facilities, cultural centers, and social meeting spaces, is also a significant aspect of urban quality of life (Errigo, 2018). Nonetheless, the concept of recreational mobility in African cities is grossly under-researched, and the current literature prioritizes tourism over everyday leisure travel (Oyelude & Ogunleye, 2016). The limited evidence indicates that recreational travel in Nigerian urban areas is constrained by several factors: the lack of official recreational facilities, safety concerns, and the cost of transportation, which makes leisure travel prohibitive for low-income families (Ipingbemi & Adebayo, 2016).

2.4 Healthcare Access and Travel Burden

It is shown that travel distance and transportation costs are major barriers to healthcare access in developing nations, and the results of this study are relevant to treatment adherence, use of preventive care, and emergency response (Banke-Thomas et al., 2021). High travel costs to access healthcare for specialist services centralized in cities (Adeyemi et al., 2019). Banke-Thomas et al. (2021) observed that travel times to emergency obstetric services in Lagos ranged from 2 to 320 minutes, with considerable differences by facility type and time of day. Walking and informal transport are common for routine healthcare, yet the costs remain prohibitive for many households, compelling them to make trade-offs between healthcare and other necessities.

3 Materials and Methods

3.1 Study Area

Zaria Metropolis is located between latitudes 11°00'N and 11°10'N and longitudes 7°36'E and 7°45'E. It is a city in Kaduna State, northern Nigeria, covering an area of about 363 km². The metropolis comprises four urban areas with distinct morphological and functional features (Figure 1). Samaru urban zone is a large institutional centre that began as a colonial rural agricultural settlement and is home to Ahmadu Bello University, the Nigerian Institute of Transport Technology, and various research centres. It also includes students, academics, and institutional staff, whose travel needs are unique. The colony created a grid-iron street pattern and a commercial-residential mix in establishing the Sabon Gari urban zone to accommodate migrants from southern Nigeria. It is the main business hub of the metropolis, home to the thick markets, commercial businesses, and a heterogeneous population.

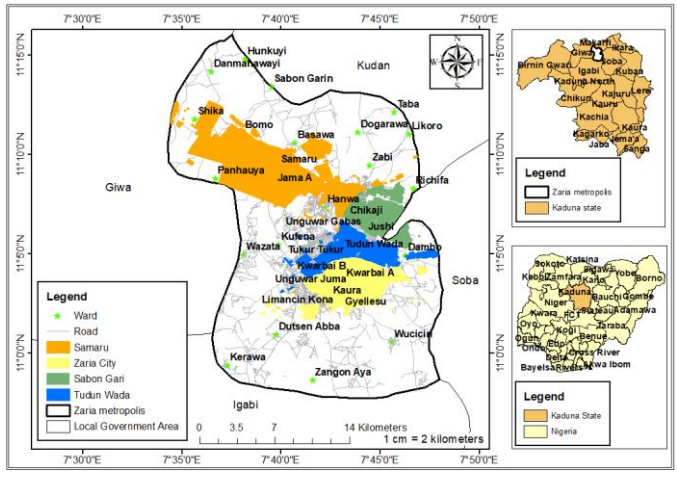


Figure 1: The Study Area
Source: Modified from the Administrative Map of Nigeria (2025)

Tudun Wada urban zone, initially established as a settlement for migrants from northern Nigeria, is characterized by a planned gridiron structure and includes educational institutions such as the Federal College of Education and Ahmadu Bello University Kongo Campus. Zaria Walled City is an embodiment of the traditional centre, Hausa-Fulani morphology, with winding streets, mud-walled compounds, and concentrated traditional institutions. Though it is historic, it has some of the largest healthcare centers, such as Ahmadu Bello University Teaching Hospital.

3.2 Research Design and Sampling

This study adopted the cross-sectional survey design to collect data from January to December, 2024 in the urban

zones of Zaria. The target population comprised all households in Zaria Metropolis. It was estimated that the population of the metropolitan area was 1,327,688, using 1991 data from the National Population Commission, projected to 2024 at an annual growth rate of 3%. Using an average household size of 6 persons, as reported by the National Bureau of Statistics (NBS, 2010), the figure is estimated at 197,220.

The number of households to be used was calculated using the Krejcie and Morgan (1970) formula, yielding 384 households. A multi-stage sampling process was adopted: purposive sampling of five political wards per urban district based on population density and socio-economic features; and systematic random sampling of households in the selected wards using Cochran's (1977) interval formula (K=513), starting at a random point. Sample distribution across urban zones is given in Table 1.

Table 1: Sample Distribution

Urban Zone	Sampled Wards	Estimated Households	Sample Size
Samaru	5	31,165	61
Sabon Gari	5	60,106	117
Tudun Wada	5	49,736	97
Zaria Walled City	5	56,213	109
Total	20	197,220	384

3.3 Data Collection

The data collection instrument is a questionnaire, distributed to heads of households or responsible adults. It was created in English and translated into Hausa for field use. Questionnaires were administered by five trained field assistants face-to-face, and the response rate was 100%. The questionnaire was tested on a pilot population of 20 respondents in the neighbouring urban zones of Shika and Maigana, yielding a Cronbach's alpha of 0.87, indicating high internal consistency.

3.4 Spatial Analysis

The administrative maps were used to extract road network data and digitise it in ArcGIS 10.8. Network connectivity was analysed by using graph-theoretical indices:

i. **Alpha (α) Index:** is a measure of network circuitry,

$$\alpha = \frac{(e - V + 1)}{(2V - 5)}$$

Where:
e = is the number of edges (road segments)
v = is the number of nodes (intersections).

The value ranges from 0 (no circuits, tree-like network) to 1 (maximum circuits, highly interconnected).

ii. **Beta (β) Index:** This is the degree of connectivity, and it is calculated as:

$$\beta = \frac{e}{v}$$

These values, which are less than 1, represent simple, tree-like networks, and those greater than 1 represent complex, interconnected tree networks.

iii. **Gamma (γ) Index:** The completeness of connexions is:

$$\gamma = \frac{e}{[3(v\ 2)]}$$

The values will range from 0 to 1, with higher values indicating greater connectivity. The analysis of the spatial clustering of road nodes was based on the Average Nearest Neighbour (ANN) analysis, and a value of Nearest Neighbour Ratio (NNR) that is less than 1 was determined to show a clustering pattern, and a value that is greater than 1 was determined to show a dispersion pattern. Spatial autocorrelation was assessed using the Moran index.

3.5 Statistical Analysis

SPSS version 28 and STATA version 17 were used to analyse quantitative data. The travel patterns across the urban zones were analysed using descriptive statistics (frequencies, percentages, means, standard deviations). A multiple linear regression model was estimated to assess the effects of five independent variables: travel frequency, average distance, average travel time, average cost, and mode of transport on the dependent variable: household travel behaviour. The dependent variable was operationalized as a composite index of household travel behaviour, constructed from standardised scores of trip frequency, distance, and cost across the three non-work travel purposes (shopping, recreation, and healthcare), with a significance level of $p<0.05$.

4 Results

4.1 Socio-Demographic Characteristics of Respondents

Table 2 presents the socio-demographic characteristics of respondents who participated in this study.

Table 2: Socio-Demographic Characteristics of Respondents

Characteristic	Category	Frequency	Percent
Gender	Male	246	64.1
	Female	138	35.9
Age	18-25 years	71	18.5
	26-35 years	66	17.2
	36-45 years	104	27.1
	46-60 years	97	25.2
	60+ years	46	12.0
Marital Status	Married	300	78.1
	Divorced/Separated	30	7.8
	Widowed	54	14.1
Household Size	1-5	46	12.0
	6-10	117	30.5
	11-15	126	32.8
	15+	95	24.7
Education	Secondary	100	26.0
	Diploma/NCE	161	41.9
	University	106	27.7
	Non-formal	17	4.4
Employment	Full-time	263	68.5
	Casual	71	18.5
	Retired	18	4.7
	Unemployed	32	8.3
Monthly Income	< ₦30,000	56	14.6
	₦31,000-₦60,000	152	39.6
	₦61,000-₦90,000	80	20.8
	₦91,000-₦120,000	36	9.4
	> ₦121,000	60	15.6
Vehicle Owned	Private car	105	27.3
	Tricycle	122	31.8
	Motorcycle	114	29.7
	Bicycle	18	4.7
	None/Other	25	6.5
Total	-	384	100

The results show that the majority of respondents were male (64.1%), married (78.1%), and aged 36-45 years (27.1%). Household sizes show that 32.8% consist of 11 to 15 members, while the level of education showed that 41.9% had Diplomas/NCE and 27.7% had university degrees, who are full-time (68.5%), and casual workers (18.5%). 39.6% of them earn ₦31,000-₦60,000 and 20.8% earning ₦61,000-₦90,000 monthly. Informal transport ownership was indicated by vehicle ownership: tricycles (31.8%), motorcycles (29.7%), and private cars (27.3%), and bicycle ownership was the least (4.7%).

4.2 Shopping Travel Pattern

Table 3 presents the shopping travel characteristics of respondents in the study areas. The result shows that Samaru residents shopped the most (37.7, 46% daily, respectively), whereas Tudun Wada residents shopped only monthly (69.1). Zaria Walled City shows intermediate trends, with 42.2 per cent weekly shopping. The dominant travel distances were also short: 88.5% of Samaru, 80.4% of Tudun Wada, 73.4% of Zaria Walled City, and 65% of Sabon Gari residents commuted less than 5 kilometres to go shopping. Travel time distribution was also not the same in the short routes: Samaru (59% took 30-60 minutes), Sabon Gari (63.2% took less than 30 minutes), Tudun Wada (48.5% took 30-60 minutes), Zaria Walled City (51.4% took 30-60 minutes). Cost patterns showed unexpected differences across urban zones.

Despite 65% of those having less than 5 kilometres of travel, had 51.3% of those surveyed spent more than ₦1,000 per shopping trip, Sabon Gari registered the highest proportion in all districts. On the other hand,

moderate costs were exhibited by Tudun Wada (87.6% spending ₦500-₦700) and Samaru (64.6% spending ₦500-₦700). Zaria Walled City had a biform distribution of 61.5% expenditure (₦800-₦900), 22.9% less than N500. Mode choice was a demonstration of the characteristics of the zone: Samaru: mixed modes (private car 39.4%, tricycle 31%, motorcycle 19.6%); Sabon Gari: motorcycle (37.6%) and private car (33.3%); Tudun Wada: tricycle (58.8%); Zaria Walled City: motorcycle (62.4%), walking/cycling (33%).

Table 3: Shopping Travel Pattern

Urban Zone	Frequency	Distance	Travel Time	Cost	Mode
Samaru	Daily: 37.7% Bi-weekly: 46% Weekly: 6.6% Monthly: 9.8%	<5km: 88.5% 5-10km: 11.5%	<30min: 41% 30-60min: 59%	<₦500: 34.4% ₦500-₦700: 64.6%	Private car: 39.4% Tricycle: 31% Motorcycle: 19.6% Walk/Bike: 10%
Sabon Gari	Daily: 30.7% Bi-weekly: 25.6% Weekly: 24% Monthly: 19.7%	<5km: 65% 5-10km: 35%	<30min: 63.2% 1-2hrs: 36.8%	<₦500: 4.3% ₦800-₦900: 44.4% >₦1,000: 51.3%	Private car: 33.3% Public bus: 1.7% Tricycle: 27.4% Motorcycle: 37.6%
Tudun Wada	Daily: 14.4% Bi-weekly: 7.2% Weekly: 9.3% Monthly: 69.1%	<5km: 80.4% 5-10km: 19.6%	<30min: 36% 30-60min: 48.5% 1-2hrs: 15.5%	<₦500: 11.3% ₦500-₦700: 87.6% ₦800-₦900: 1.1%	Private car: 13.4% Tricycle: 58.8% Motorcycle: 14.4% Walk/Bike: 13.4%
Zaria Walled City	Daily: 5.5% Bi-weekly: 23.9% Weekly: 42.2% Monthly: 28.4%	<5km: 73.4% 5-10km: 26.6%	<30min: 48.6% 30-60min: 51.4%	<₦500: 22.9% ₦500-₦700: 15.6% ₦800-₦900: 61.5%	Public bus: 0% Tricycle: 4.6% Motorcycle: 62.4% Walk/Bike: 33%

4.3 Healthcare Travel Pattern

Table 4 presents the distances and costs of healthcare travel incurred by the respondents in the study area. In Samaru, 53% made 5-10 kilometres, and 35.5% made 11-20 kilometres, which is much farther than typical shopping trips. Travel time was used to measure these distances: 54.8% took between 30 and 60 minutes, and 31.6% took between 1 and 2 hours. There were also costs on the high side: 52.4% at N500 to N700, and 24.6% at N1,000 and above. The most preferred modes were the tricycle (39.3) and the motorcycle (34.4).

Table 4: Healthcare Travel Pattern

Urban Zone	Frequency	Distance	Travel Time	Cost	Mode
Samaru	Weekly: 54% Twice monthly: 16.4% Monthly: 26.2%	<5km: 11.5% 5-10km: 53% 11-20km: 35.5%	<30min: 13.6% 30-60min: 54.8% 1-2hrs: 31.6%	<₦500: 8.3% ₦500-₦700: 52.4% ₦700-₦900: 14.7% >₦1,000: 24.6%	Private car: 23% Tricycle: 39.3% Motorcycle: 34.4% Walk/Bike: 3.3%
Sabon Gari	Twice monthly: 40.2% Monthly: 59.8%	5-10km: 59% 11-20km: 41%	30-60min: 55.6% 1-2hrs: 44.4%	₦700-₦900: 18.8% >₦1,000: 81.2%	Public bus: 26.5% Tricycle: 58.1% Motorcycle: 15.4%
Tudun Wada	Twice monthly: 39.2% Monthly: 60.8%	<5km: 34% 5-10km: 66%	30-60min: 25.8% 1-2hrs: 69.1% >2hrs: 5.2%	<₦500: 15.5% ₦500-₦700: 46.4% ₦700-₦900: 30.9% >₦1,000: 7.2%	Public bus: 12.4% Tricycle: 48.5% Motorcycle: 33% Walk/Bike: 6.2%
Zaria Walled City	Twice monthly: 4.6% Monthly: 95.4%	<5km: 78% 5-10km: 22%	<30min: 31.2% 30-60min: 24.8% 1-2hrs: 38.5% >2hrs: 5.5%	<₦500: 13.8% ₦500-₦700: 63.3% ₦700-₦900: 22.9%	Private car: 21.1% Tricycle: 37.6% Motorcycle: 41.3%

The pattern of healthcare access was most limited at Sabon Gari: all respondents drove between 5-10 kilometres (59%), 11-20 kilometres (41%), and 30-60 kilometres (55.6%), or took 1-2 hours (44.4%). The cost

was very high, and 81.2% of those paying more than ₦1,000 per trip was the highest across all purposes and urban zones. The dominant ones were tricycles (58.1%), and the complements were the public buses (26.5%). Tudun Wada exhibited 66% travelling 5-10 kilometres and 34% travelling below 5 kilometres, less than other urban zones. Nevertheless, the duration of travel increased: 69.1% took 1-2 hours, and 25.8% took 30-60 minutes, which is ineffective even for moderate distances. Prices were more in the middle: 46.4% of N500-N700, 30.9% N700-N900. It was dominated by tricycles (48.5%) and motorcycles (33).

The minimum healthcare distances in the Zaria Walled City were the lowest: 78% had to travel less than 5 kilometres, and 22% had to travel between 5 and 10 kilometres, due to the presence of Ahmadu Bello University Teaching Hospital in the district. Travel times were, however, large: 38.5% took 1-2 hours, 31.2% less than 30 minutes, 24.8% 30-60 minutes -indicating congestion or roundabout routing. The expenses were moderate: 63.3% expended N500-N700, 22.9% expended N700-N900. Motorcycles (41.3) and tricycles (37.6) prevailed.

4.4 Recreational Travel Patterns

Table 5 presents the frequency of variation in recreational travel in the study area. The result shows that Samaru had the highest participation rate: 69% per week and 31% per day. Sabon Gari presented variable trends: 40.2/day, 29/day, 22.2/week. Tudun Wada: 41.3 per day, 27.8 per week, 18.5 per twice a week. Zaria Walled City had the lowest contribution rates: 42.2% per month, 38.5% per week, and 19.3% per day. Most of the distances were small: Samaru (78.6% <5km), Sabon Gari (68.4% 5-10km), Tudun Wada (58.8% 5-10km), Zaria Walled City (75.2% <5km). The travel durations were different: Samaru (54%<30min, 56%30-60min), Sabon Gari (51.3% 30-60min), Tudun Wada (44.3% 30-60min,34% 1-2hrs), Zaria Walled City (71.6% 30-60min). Expenses were concentrated around medium price points: Samaru (70.4% N500-N700), Sabon Gari (49.6% N500-N700), Tudun Wada (78.4% N500-N700), Zaria Walled City (55% N500-N700). Mode choice was also different: Samaru (tricycle 50.6%, walk/bike 25.8%), Sabon Gari (tricycle 42.7%, motorcycle 41%), Tudun Wada (tricycle 56.7%, motorcycle 21.6%), Zaria Walled City (tricycle 45.9%, motorcycle 45%).

Table 5: Recreational Travel Pattern

Urban Zone	Frequency	Distance	Travel Time	Cost	Mode
Samaru	Daily: 31% Weekly: 69%	<5km: 78.6% 5-10km: 21.4%	<30min: 54% 30-60min: 56%	<₦500: 21.4% ₦500-₦700: 70.4% ₦700-₦900: 1.7% >₦1,000: 6.5%	Private car: 23.6% Tricycle: 50.6% Walk/Bike: 25.8%
Sabon Gari	Daily: 40.2% Twice daily: 29% Weekly: 22.2% Monthly: 8.6%	5-10km: 68.4% 11-20km: 25.6% >20km: 6%	<30min: 51.3% 30-60min: 34.2% >2hrs: 14.5%	<₦500: 23.1% ₦500-₦700: 49.6% ₦700-₦900: 21.4% >₦1,000: 6%	Private car: 12% Public bus: 4.3% Tricycle: 42.7% Motorcycle: 41%
Tudun Wada	Daily: 41.3% Twice weekly: 18.5% Weekly: 27.8% Monthly: 12.4%	<5km: 39.2% 5-10km: 58.8% 11-20km: 2.1%	<30min: 21.6% 30-60min: 44.3% 1-2hrs: 34%	<₦500: 17.5% ₦500-₦700: 78.4% ₦700-₦900: 4.1%	Private car: 8.2% Tricycle: 56.7% Motorcycle: 21.6% Walk/Bike: 13.4%
Zaria Walled City	Daily: 19.3% Weekly: 38.5% Monthly: 42.2%	<5km: 75.2% 5-10km: 24.8%	<30min: 28.4% 30-60min: 71.6%	<₦500: 41.3% ₦500-₦700: 55% ₦700-₦900: 3.7%	Tricycle: 45.9% Motorcycle: 45% Walk/Bike: 9.1%

4.5 Spatial Analysis of Road Network Connectivity

Table 6 presents the average nearest-neighbour analysis for the clustering of road nodes across all urban zones in the study area. The result shows that the observed mean distances were significantly less than the expected: Samaru (76.47m vs. 146.47m observed vs. expected, NNR=0.52, z= -37.42, p<0.001); Sabon Gari (66.48m vs. 132.90m); Tudun Wada (59.96m vs. 115.34m); Zaria Walled City (58.35m vs. 94.18m). Clustering was confirmed (NNR=0.44, z=-113.24, p<0.001) by metropolitan-wide analysis. The non-random spatial distribution was detected using spatial autocorrelation

(Moran's I = 0.0438, z = 28.29, p < 0.001).

Table 6: Average Nearest Neighbour Analysis Summary

Urban Zone	Observed Mean (m)	Expected Mean (m)	NNR	z-score	p-value
Samaru	76.47	146.47	0.52	-37.42	<0.001
Sabon Gari	66.48	132.90	0.50	-19.71	<0.001
Tudun Wada	59.96	115.34	0.52	-32.81	<0.001
Zaria Walled City	58.35	94.18	0.62	-32.35	<0.001
Metropolis Total	58.63	132.60	0.44	-113.24	<0.001

Figure 2 and Table 7 present the graph-theoretical analysis used to identify significant differences in ward connectivity in the study area. The results reveal that most wards exhibit a consistent pattern of moderate connectivity, characterized by Gamma values of 0.5, Beta values between 1.3 and 1.5, and Alpha values of 0.2, indicating a typical network with a moderate degree of circuitry.

Taba and Likoro stand out with higher Gamma (0.6), suggesting relatively greater connectivity, though Likoro's lower Alpha (0.1) indicates limited circuit formation despite its edge density. At the lower end, Kerawa shows marked weakness across all metrics (Alpha = 0.0, Beta = 1.1, Gamma = 0.4), reflecting a sparse, nearly treelike structure. Several wards, including Kwarbai B, Dutsen Abba, Wuciciri, Gyellesu, and Panhauya, display reduced Alpha (0.1) and Beta (≤1.3) values, pointing to lower network redundancy and connectivity.

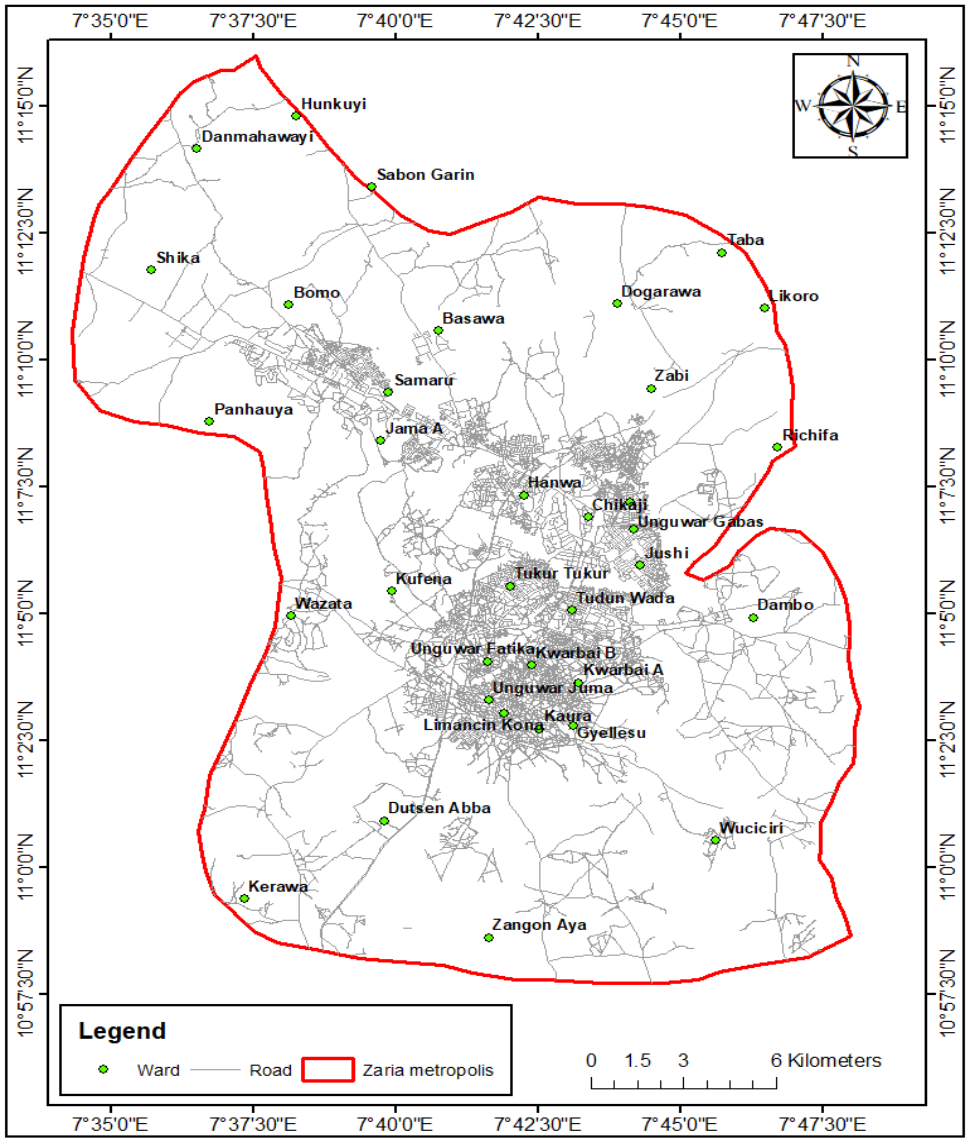


Figure 2: Road Network

Table 7: Road Network Connectivity Indices

Ward	Node (V)	Edges (E)	Alpha	Beta	Gamma
Muchiya	263	367	0.2	1.4	0.5
Chikaji	270	361	0.2	1.3	0.4
Unguwar Gabas	93	132	0.2	1.4	0.5
Tudun Wada	363	532	0.2	1.5	0.5
Unguwar Juma	146	197	0.2	1.3	0.5
Tukur-Tukur	857	1229	0.2	1.4	0.5
Kwarbai B	631	783	0.1	1.2	0.4
Limancin Kona	202	291	0.2	1.4	0.5
Kwarbai A	871	1238	0.2	1.4	0.5
Kaura	308	445	0.2	1.4	0.5
Kerawa	24	26	0.0	1.1	0.4
Jama A	287	391	0.2	1.4	0.5
Dogarawa	316	417	0.2	1.3	0.4
Zabi	454	641	0.2	1.4	0.5
Likoro	7	9	0.1	1.3	0.6
Basawa	424	607	0.2	1.4	0.5
Richifa	13	18	0.2	1.4	0.5
Sabon Garin	24	32	0.2	1.3	0.5
Hanwa	767	1105	0.2	1.4	0.5
Jushi	406	571	0.2	1.4	0.5
Wazata	24	33	0.2	1.4	0.5
Taba	12	17	0.2	1.4	0.6
Dutsen Abba	469	573	0.1	1.2	0.4
Kufena	974	1391	0.2	1.4	0.5
Zangon Aya	18	22	0.1	1.2	0.5
Wuciciri	239	289	0.1	1.2	0.4
Gyellesu	789	999	0.1	1.3	0.4
Unguwar Fatika	357	509	0.2	1.4	0.5
Dambo	324	425	0.2	1.3	0.4
Danmahawayi	19	24	0.1	1.3	0.5
Shika	39	52	0.2	1.3	0.5
Samaru	350	496	0.2	1.4	0.5
Bomo	428	617	0.2	1.4	0.5
Panhauya	37	43	0.1	1.2	0.4

4.6 Factors Influencing Non-Work Travel Behaviour

Table 8 presents the results of the multiple linear regression analysis used to identify the key predictors of household travel behaviour in the study area. The result shows a statistically significant model ($F=43.968$, $p<0.001$) with $R^2=0.975$. The standardized coefficient of average cost per travel ($b=0.390$, $p<0.001$), mode of transport used ($b=0.323$, $p<0.001$), average travel time ($b=0.171$, $p<0.001$), travel frequency ($b=0.125$, $p=0.002$), and average distance ($b=0.016$, $p=0.002$) had the highest standardized coefficients.

Table 8: Multiple Regression Coefficients for Travel Behaviour

Variable	Unstandardized B	Std. Error	Standardized β	t	p-value
(Constant)	-1.327	0.029		-45.687	<0.001
Travel frequency	0.106	0.006	0.125	18.669	<0.001
Average distance	0.079	0.026	0.016	3.045	0.002
Average travel time	0.626	0.027	0.171	23.417	<0.001
Average cost	1.037	0.024	0.390	43.968	<0.001
Mode of travel	0.974	0.024	0.323	40.997	<0.001

Dependent Variable = Factors Influencing Household Travel Behaviour (shopping, recreation, and healthcare)

5 Discussion

5.1 Spatial Inequality in Non-Work Travel

The differences in non-work travel are in healthcare travel: residents of Sabon Gari, who are in the main commercial hub of the metropolis, have the longest travel distance and pay the most, and 81.2% of them spend more than ₦1,000 per trip. This trend indicates that the spatial distribution of economic activities and medical facilities is not aligned in Nigerian cities (Banke-Thomas et al., 2021). On the other hand, residents of Zaria Walled City have the advantage of close access to healthcare facilities but have a high travel distance, indicating that physical proximity is not necessarily linked to efficient access in congested or circuitous road networks (Okonkwo & Eze, 2023). Ward-level connectivity indices demonstrate that locations with high network performance are probably able to get around better, while others are inadequate, which can complicate accessibility. These findings are consistent with Abbas and Hashidu (2019), who recorded variable connectivity in North-Eastern Nigeria and generalised their results to show the effect of network structure on non-work travel outcomes.

5.2 The Paradox of Shopping Travel Costs

The majority of Sabon Gari residents travel within five kilometres to do their shopping; their spending is higher than that on long healthcare trips in other urban zones, which challenges the traditional belief that travel cost is directly proportional to distance and indicates that the mode of transportation, pricing schemes, and market features independently affect expenditure (Gadepalli et al., 2020). This trend can be attributed to Sabon Gari, where motorcycles and private cars are the leading modes, with higher per-kilometre prices than tricycles or walking. The lack of an official means of transport and the prevalence of informal, unregulated pricing might allow fare systems to be independent of distance covered (Ukam et al., 2024). Shopping patterns in Tudun Wada are mostly monthly, tricycle-based, and moderate-cost, indicating that people shop less frequently but for longer durations as a result of consolidating shopping into the same budgeting process for managing transport (Vasudevan et al., 2021).

5.3 Recreational Travel and Quality of Life

Patterns of recreational travel indicate district-specific use of recreational opportunities, which can be influenced by both supply-side (facility presence) and demand-side (income, time, tastes, etc.) factors. The high recreational participation (69% weekly and 31% daily) in Samaru is probably attributable to the district's institutional nature, where demand and supply are closely aligned due to university-related recreational facilities and the student/youth population (Oyelude & Ogunleye, 2016). Zaria Walled City shows the opposite trend, with 42.2% monthly participation, which could indicate the absence of formal recreational areas, as streets and dense traditional housing provide very little space for parking or athletic facilities (Okonkwo & Aderamo, 2021). The fact that tricycles and motorcycles are used for recreational travel across all urban zones implies that even discretionary travel relies on informal means, and that only walking is important in Samaru and Zaria Walled City. This reliance on motorized informal transportation for leisure, even though distances are short in most instances (Afolabi & Gbadamosi, 2021).

5.4 Economic Determinants of Travel Behaviour

Cost is the most suitable predictor of household travel behaviour, followed by mode, which confirms that mobility decisions in Zaria are organized by economic factors, which take priority over considerations of time and distance. The findings align with the evidence provided by Vasudevan et al. (2021), who have shown that low-income populations are more sensitive to travel costs, and by Foley et al. (2022), who reported affordability as the main obstacle to equitable mobility in African contexts. The mode choice coefficient (b=0.323) indicates how the transport choices available to households, which depend on household income, vehicle ownership, and access to services, limit or enable travel behaviours. The prevalence of motorcycles and tricycles in non-work settings demonstrates that families face trade-offs between cost and safety, comfort, and reliability when using informal transport, which is cheap and accessible (Adetunji, 2021).

5.5 Limitations and Future Research

The cross-sectional structure also only records travel patterns at a single point in time, thus not being able to analyse seasonal changes or adaptations to transport policy changes. Although it attempts to be representative, the household survey may miss intra-household differences in travel behaviour, especially gender-based. The study relied on self-reported travel costs, which may be subject to recall bias and variability in informal transport pricing, affecting the precision of cost-related findings. Although the patterns of network connectivity are determined through spatial analysis, it does not calculate accessibility to particular destinations, a direction for future research in GIS-based accessibility modeling. Future studies ought to investigate: (1) longitudinal monitoring of non-work travelling trends in response to infrastructure spending; (2) qualitative analysis of the household bargaining of non-work travelling requirements; (3) gendered aspects of non-work travelling, especially to care-related travel; (4) comparative studies of secondary cities in Africa to

develop general patterns.

6 Conclusion

This paper confirms that non-work travel in the Zaria Metropolis is typified by steep spatial disparities, financial constraints, and informal reliance on transport, which influence household movement for shopping, recreation, and access to healthcare in a distinctive manner. Healthcare travel creates the greatest burden because it involves long distances and travel time, and can undermine the provision of vital services due to high costs. Shopping travel reveals paradoxical cost-distance associations that defy traditional assumptions and emphasize the role of mode choice and pricing arrangements. Leisure travel participation fluctuates, which can be attributed to the availability of opportunities and the affordability of transportation.

The spatial analysis of the road networks shows that differences in connectivity exacerbate these issues, and some wards have serious network deficiencies that restrict accessibility regardless of the distance to the destination. The cost factor is the leading determinant of travel behaviour, proving that economic considerations form the basic structure of mobility decision-making in this matter. To plan urban transport sustainably in secondary African cities, the findings highlight the importance of interventions that: (1) solve the spatial inequity in healthcare accessibility by decentralizing facilities or using transport subsidies; (2) control the informal transport price and insure modal competition to lower household spending; (3) make the city more walkable to allow access to underserved wards by non-motorized transport; (4) enhance network connectivity to underserved wards; and (5) acknowledge that affordability rather than infrastructure provision is the key determinant of equitable mobility.

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