

Equity and Affordability in Urban Mobility: Analyzing the Travel Challenges of Low-Income Households in Zaria Metropolis, Kaduna State

By

Abubakar Aminu Abdullahi

Department of Geography
Federal University Gashua, Yobe State

Abdulkadir Muhammad Dambazau

Ado Abdu

Bello Umar Musa

Department of Geography
Aliko Dangote University of Science & Technology Wudil, Kano State

&

Suleiman Muktar

Department of Geography
Federal University Gashua, Yobe State

Abstract

The study assessed the problem of travel and affordability of low-income families in Zaria Metropolis, Kaduna State, Nigeria. A quantitative research design was used to collect data on 384 households in Samaru, Sabon Gari, Tudun Wada and Zaria Walled City using a structured questionnaires and field observations. The results revealed that the cost of transportation is a serious economic burden, and 73.7-85.3% of the respondents identified high costs of transport as the main challenge to mobility which are aggravated by accessibility deficits with 87.2% of residents in Zaria Walled City having no nearby transport stops and 44.3 to 55.7% of residents indicating poor access to other transport modes. The dominant safety issues are crime and theft (50.5% to 65.6) with the risks of accidents in the historic core (92.7%). Almost 63.4% to 77.8% of residents are affected by commuting delays on a regular basis which further limits economic participation. Respondents were ready to use the public transport, yet it was conditional that they would be enhanced, which showed that there has been latent demand on equitable mobility opportunities. The study concludes that the problem of transport poverty is a manifestation of lack of infrastructure, spatial disparity, and ineffective policy reactions. Suggestions are subsidies on fares, increasing the coverage of the public transport system to the under-covered zones, developing the infrastructure of walking and bicycle movement, and creating the safety environment to ensure affordable and inclusive city accessibility.

Keywords: transport equity, affordability, low-income households, urban mobility

Introduction

The benefits of urban mobility are unevenly distributed among socio-economic groups in the rapidly urbanising sub-Saharan cities, as urban mobility is a determinant of access to employment, education, healthcare, and social opportunities (Lucas et al., 2016; United Nations Human Settlement Programme [UN-Habitat], 2020). Transportation expenses represent a disproportionate portion of constrained household budgets to low-income households, resulting in what researchers refer to as transport poverty a situation where the affordability, lack of affordability, or even unavailability of transportation options restrict economic engagement and social integration (Mattioli et al., 2022). Urban mobility in Nigeria,

where an informal transport system has dominated mobility systems with more than 51% of the population living in urban environments is important understand the equity of urban travel (National Bureau of Statistics [NBS], 2021).

Transport equity is a notion that includes horizontal equity the equal treatment of people in similar situations and vertical equity unequal treatment to overcome the historical disadvantage or special needs (Litman, 2021). In the Nigerian setting, the issues of vertical equity are prioritised because low-income households are subjected to systematically greater transport burdens in terms of their incomes, lack of access to private transport, and increased use of poor public and informal transportation (Aderibigbe and Gumbo, 2022). One of the aspects of transport equity is affordability, which is usually compared with the value of household spending of 10 or less about their income on transport (UN-Habitat, 2020). Nevertheless, data in cities of sub-Saharan Africa indicate that poor households have always surpassed this figure and frequently use 15-25% of the monthly income on mobility (Salau et al., 2022).

Zaria metropolis is the second largest city in the Kaduna state and the eight most populous metropolitan area in Nigeria and is the one representative of the mobility issues that face the medium-sized African cities with rapid urban growth without the corresponding development of infrastructure (Butler, 2015). The metropolis with a population of over 1.3 million has high levels of socio-economic heterogeneity, transport and mobility structures. Although Zaria metropolis is an educational, commercial, and transportation centre in northern Nigeria, it does not have a well-structured system of transport, which means that its inhabitants have to use informal services, motorcycles (okada) and tricycles (keke napep), which are slow, insecure, and expensive (Usman, 2020).

Past studies on the travel behaviour in Nigerian cities have recorded the role of the socio-economic attributes in mode usage and patterns of the trip. The research by Owoeye et al. (2018) revealed that in Minna, occupation, household size, and owning a car had considerable effects on the travel patterns, whereas walking was the primary mode of transportation in the university community in Akure (Aderinlewo, 2020). Okeke et al. (2021) proved that the quality of intra-urban transit and residential density influence Enugu intra-urban travel. More recently, 21.5% of the variation in peri-urban Ibadan travel behaviour was explained as being due to socio-economic factors that include age, income, and household composition (Oladeji et al., 2022). Yet, these studies were based on bigger cities or segmented groups of the population, excluding the issue of transport equity in one of the medium-sized cities with a historic overlay, such as Zaria metropolis. Therefore, this study examines the travel challenges and affordability constraints of low-income households in Zaria Metropolis by addressing the following objectives: (1) to analyse transportation affordability and its burden on household budgets; (2) to identify mobility challenges faced by residents; (3) to examine spatial variations in commuting delays and safety perceptions; and (4) to assess residents' priorities for transport improvements that could enhance equitable mobility.

Literature Review

Transport Equity and Social Exclusion

Transport and social exclusion relationship has been the subject of growing scholarly interest since the early 2000s with scholars reporting that poor mobility choices marginalise some groups of the population (Kenyon et al., 2002). Lucas et al. (2016) have created a broad model

of conceptualising transport poverty where there are four dimensions that are interconnected, namely transport affordability (spending too much on it in relation to income), transport accessibility (lack of access to necessary services), transport mobility (impossible to move when required), and transport safety (experiencing risks during travel). These dimensions are relevant to developing nations, where formal transport systems tend to be poorly developed, and the informal one occupies the gaps with different levels of reliability and safety (Pojanani & Stead, 2015).

In sub-Saharan Africa, the inequity in transport studies has been featured as a result of the disproportional dues of low-income families, women and peri-urban residents. In a systematic review of socioeconomic and gendered inequity in African travel behaviour, Folley et al. (2022) discovered that the lower socioeconomic groups tended to walk and use paratransit, had a severe lack of affordability, and travelled less generally than higher-income groups. Females and girls were disadvantaged further by depending on walking, having minimal access to personal vehicles, increasing chances of dealing with intimate violence, and having a restrictive culture.

Affordability as a Transport Justice Issue

Transport affordability describes the financial ability of households to get transportation services that are used when engaging in economic and social actions (Litman, 2021). The global standard that transport should not exceed 10 percent of household income is often mentioned, but the critics point out that this metric does not consider differences in household size, place, and service quality (UN-Habitat, 2020). Empirical research in the Nigerian cities has reported the case of affordability crises among the low-income groups. Oni and Okanlawon (2021) had cited that increasing transport costs impact poor households in Lagos disproportionately and they have to make trade-offs between mobility and other basic needs. On the same note, Salau et al. (2022) discovered that the level of transport spending in Kaduna was usually above 20 percent of monthly earnings within families that depend on informal transport and that the effects of such spending were so pronounced on female-headed families and those with more than one school-going child.

The issue of affordability is also worsened by the fact that informal transport is the order of the day in Nigerian metropolis. The informal operators (motorcycle taxis, tricycles, shared minibuses) charged according to market rates, fuel prices, and perceived demand, unlike formal, publicly-funded, and publicly-regulated transport systems that might be able to leverage subsidies and economies of scale to lower fares, which tend to lead to unpredictable and increasing costs to the user (Adheyisi, 2021). Although these modes offer the much needed mobility when there are no formal alternatives, their unregulated nature is a factor that promotes transport poverty among the urban poor.

Safety and Security in Urban Mobility

Another aspect of transport equity is safety, where the fear of accidents or crime causes only a limited mobility, especially among women, children, and the aged (Loukaitou-Sideris, 2020). Traffic accidents have been a primary cause of injuries and mortality in the Nigerian city, and motorcycles and tricycles are disproportionately represented because of the lack of safety laws, road maintenance, and unsafe driving behaviours (Ayanwale et al., 2022). Relation to crime and safety, such as theft, harassment, and assault of the passengers via transportation and at

stops, also deter usage of the available means during the evening or in poorly lit locations (Ahmed and Musa, 2023).

Poku-Boansi et al. (2019) have reported that school children in Accra experienced various hazards during the commutes that included jaywalking, unprotected bicycle riding, and crossing roads during play, which are indicative of poor pedestrian facilities and controls. In Ibadan, Ipingbemi and Adebayo (2016) observed that some of the transport means and routes were avoided by women because of the fear of harassment and consequently, they had to limit their mobility area thus limiting their access to opportunity.

Accessibility and Spatial Inequality

Access to transportation the extent to which they can reach the destinations easily is different among urban spaces, which forms mobility deserts where people have no reasonable access to transport services (Pereira et al., 2017). The theorised historical trends of urban development that generated uneven transport infrastructure in Nigerian cities have resulted in the situation when the urban zones of the city developed during the colonial era, such as Sabon Gari, have a more advanced road system and better coverage of services compared to the native ones, such as Zaria Walled City (Abubakar and Doan, 2022). This geographic disparity is converted into unequal mobility results: people in well-served neighbourhoods receive numerous models of transportation and reduced access durations whereas residents of underserved areas have to walk long distances to stops, limited service schedule, and are forced to use expensive informal ways.

Nuhu (2019) proved that the degree of road network connectivity is a powerful predictor of the quality of life in Abuja, with the areas with the highest connectivity index having greater access to employment, education, and healthcare. Daniel et al. (2021) established poor road network connectivity in the Benue Basin, and beta indices less than 1.0 showed that there are no route options and possible mobility limitations. These results indicate the significance of spatial analysis on the concept of transport equity and the focus of infrastructure investments on underserved regions.

Methodology

Study Area

Zaria Metropolis is located between latitudes 11°00'N and 11°10'N and longitudes 7°36'E and 7°45'E in Kaduna State, northern Nigeria, covering approximately 363 km². The metropolis has two local government areas, including Sabon Gari and Zaria, and four urban zones namely, Samaru, Sabon Gari, Tudun Wada, and Zaria Walled City. These regions represent the urban structure and socio-economic conditions. A blend of students, faculty and support staff is found in Samaru that is mostly controlled by the Ahmadu Bello University and its adjacent institutions. Sabon Gari, which was initially created as a quarter of strangers during the colonial times, has grid-iron street designs and a heterogeneous commercial population. The extension of the traditional city is Tudun Wada that integrates residential and commercial purposes. The historic city centre, the Zaria Walled City, still has traditional Hausa-Fulani urban morphology, narrow and meandering streets and high density.

The estimated population of 2024 taking into consideration the 1991 census and a growth of 3 percent per year is 1,327,688, which is spread over 23 political wards (National Population

Commission [NPC], 1991). The average household size of six persons in the Nigerian Bureau of statistics would be used to estimate the number of households, which is one hundred and ninety-seven thousand two hundred and twenty.

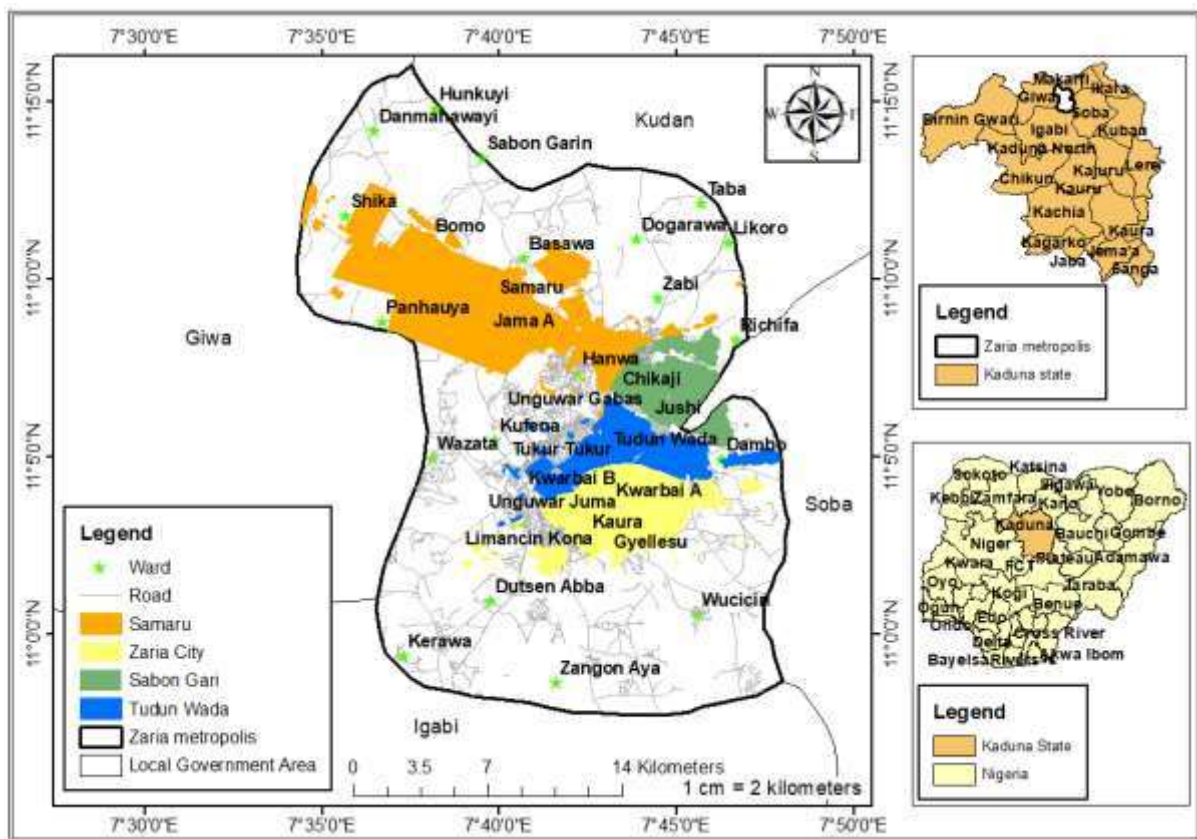


Figure 1: Study area

Source: Extracted and Modified from the Administrative Map of Nigeria (2024)

Research Design and Sampling

A quantitative cross-sectional survey research design was adopted using data retrieved through a structured questionnaires. A sample of 23 political wards was purposively selected in the metropolis on the basis of population density and socio-economic diversity to ensure proportional representation across the four major zones including samaru, Sabon Gari, Tudunwada, and Zaria Walled City. The formula given by Krejcie and Morgan (1970) was used to calculate the sample size of 384 households out of the population size of 197,220. A systematic random sampling technique was adopted in the selection of household heads along each streets Cochran (1977) standard formula. The first house were selected by the used of random numbers with a random number starting with one (1) and all subsequent units in the sample were chosen at uniform intervals of five hundred and thirteen (513) households.

Data Collection

The data were collected in the period between October and December, 2024 in the form of structured questionnaires to house heads. The questionnaire consisted of five parts namely (A) socio-demographic characteristics, (B) factors affecting travel behaviour, (C) travel behaviour patterns, (D) transport infrastructure and (E) urban mobility challenges. The questions about affordability of transportation (perceptions of cost, fare changes, budget impacts), the

accessibility issues (proximity to stops, route availability, access to alternative modes), safety considerations (accidents, crime, lighting, road conditions), commuting delays (frequency of disruptions) and suggestions regarding transport improvement were included in the sections of interest to this analysis. Five field assistants were employed and trained to deliver questionnaires in local languages where it was imperative. Pilot-testing was done with the device in two out-of-sample urban zones (Shika and Maigana) to obtain a Cronbachs alpha of 0.87, which was found to be very high.

Data Analysis

The data were analysed through descriptive statistics (frequencies and percentages) enabling to describe the mobility problems and the affordability trends within the urban zones. Spatial discrepancies in issues were studied using cross-tabulation. The results were presented in tables.

Results

Socio-Economic Characteristics of Respondents

Table 1 presents the social-economic characteristics of the respondents that participated in this study. The result reveals that 39.5% of the respondents earn between ₦31,000 and ₦60,000, 20.8% earn ₦61,000-₦90,000 and 14.5% earn less than ₦30,000 monthly. There is a high level of educational attainment as 42% have diplomas or NCE and 27.6% have university degrees. Employment status shows 68.3% on full-time-employed with the largest share of 38.8% on civil servants and 26.0% on traders. Household size shows that 33% of respondents declared 11 to 15 members and 24.4% having above 15 members in the family.

Table 1: Socio-Economic Characteristic of Respondents

Characteristic	Category	Frequency	Percentage (%)
Household Monthly Income	Less than ₦30,000	56	14.5
	₦31,000 - ₦60,000	152	39.5
	₦61,000 - ₦90,000	80	20.8
	₦91,000 - ₦120,000	36	9.4
	₦121,000 and above	60	15.6
Educational Status	Secondary School	100	22.6
	Diploma/NCE	161	42.0
	University	106	27.6
	Non-formal	17	7.8
Employment Status	Full Time	262	68.3
	Casual	71	18.4
	Retired	26	6.8
	Unemployed	25	6.5
Household Size	1-5	46	11.9
	6-10	117	30.4
	11-15	126	33.0
	15 and above	94	24.4

Source: Field Survey (2024)

Transportation Affordability

Table 2 presents the perceptions of the respondents on the affordability of transportation in this study. The results indicate that 73.7% of the Samaru residents noted that the recent increase in

fares has affected household budgets, 51% believe that transport is very expensive while 19.5% noted that transport is only affordable or very affordable.

Table 2: Transportation Affordability Perceptions

Urban Zone	Very Affordable	Affordable	Neutral	Expensive	Very Expensive
Samaru	4 (6.5%)	8 (13.0%)	18 (29.5%)	-	31 (51.0%)
Sabon Gari	-	5 (4.3%)	47 (40.2%)	23 (19.7%)	42 (35.9%)
Tudun Wada	2 (2.1%)	10 (10.3%)	12 (12.4%)	64 (65.9%)	9 (9.3%)
Zaria City	-	-	13 (11.9%)	96 (88.1%)	-

Source: Field Survey (2024)

In Sabon Gari, 35.9% finds transport very expensive as 76.1% cited negative budget effects of recent fare hikes while 55.6% report having affordability strain but 40.2% are resigned to high prices and those whose income cushions against price changes. In Tudun Wada, 65.9% believe transport to be costly, 75.2% believe they have an issue finding it affordable. The high levels of vulnerability are confirmed by the 79.4% reporting budget effects of fare increases. In Zaria Walled City, 88.1% reported transport fare to be very expensive.

Transportation and Accessibility Challenges

Table 3 presents the transportation and accessibility problems of the respondents in the study area. The result demonstrates that high transportation costs is the predominant problem with 73.7% in Samaru, 76.1% in Sabon Gari, 79.4% in Tudun Wada, and 85.3% in Zaria Walled City. The space of safety concerns varies; In Samaru, 9.7% mention safety as one of the challenges whereas 23.9% in Sabon Gari. Safety concerns are reported in 14.7% in Zaria Walled City.

Table 3: Transportation and Accessibility Challenges

Challenge Type	Samaru	Sabon Gari	Tudun Wada	Zaria City
Transportation Challenges				
Traffic congestion	2 (3.6%)	-	-	-
Safety concerns	6 (9.7%)	28 (23.9%)	-	16 (14.7%)
High transport costs	45 (73.7%)	89 (76.1%)	77 (79.4%)	93 (85.3%)
Security issues	8 (13.0%)	-	20 (20.6%)	-
Accessibility Challenges				
Lack of nearby stops	12 (11.4%)	-	43 (44.3%)	95 (87.2%)
Limited operating hours	15 (24.5%)	22 (18.8%)	-	3 (2.8%)
Insufficient routes	7 (19.6%)	33 (28.2%)	-	11 (10.1%)
Inaccessibility of alternatives	27 (44.2%)	62 (53.0%)	54 (55.7%)	-

Source: Field Survey (2024)

In Samaru and Tudun Wada, the reported security issues are 13% and 20.6%. Affordability issues are complicated by issues of accessibility. In Samaru, 44.2% indicate inaccessibility of other modes of transport, 24.5% indicate it due to limited availability of operating hours and 19.6% due to lack of routes. Sabon Gari demonstrates even worse accessibility loss: 53% have no access to other means of transport, 28.2% is not enough routes, and 18.8% do not have enough working time. The residents of Tudun Wada divided their accessibility issues into the unavailability of local stops (44.3%), and unavailability of alternatives (55.7%). Zaria Walled City portrays the most significant accessibility crisis, where 87.2% do not have adjacent transport stops.

Commuting Delays and Safety Concerns

Table 4 presents the commuting time and safety issues in the study area. The result shows that in Samaru, delays occur in 46%, occasionally and 24.5% always make it a combined 70.5% who experience disruptions on a regular basis. Sabon Gari exhibits the most delay frequency with 77.8% saying that they occasionally experience delay and 22.2% experiencing delay frequently. Tudun Wada has a more dispersed distribution: 61.9% sometimes, 21.6% often and 16.5% always. Zaria Walled City indicates 63.4% of sometimes delay and 25.6% delays in all cases.

Table 4: Commuting Delays and Safety Concerns

Category	Samaru	Sabon Gari	Tudun Wada	Zaria City
Delay Frequency				
Never	6 (10.0%)	-	-	-
Sometimes	28 (46.0%)	91 (77.8%)	60 (61.9%)	69 (63.4%)
Often/rarely	12 (19.5%)	26 (22.2%)	21 (21.6%)	12 (11.0%)
Always	15 (24.5%)	-	16 (16.5%)	28 (25.6%)
Safety Concerns				
Accident/collision	21 (34.4%)	-	20 (20.7%)	101 (92.7%)
Crime/theft	40 (65.6%)	75 (64.1%)	49 (50.5%)	8 (7.3%)
Unsafe roads	-	42 (35.9%)	28 (28.8%)	-

Source: Field Survey (2024)

There is an impressive spatial specialisation in safety issues. Crime and theft are the main (65.6%) and the second (34.4) in Samaru. The same is witnessed in Sabon Gari (64.1%), which is comparable to crime dominance (unsafe roads and the rest 35.9%). Tudun Wada is a more balanced one: crime and theft (50.5%), unsafe roads (28.8%), and accidents (20.7%). This trend is radically changed in Zaria Walled City: accidents and collisions form 92.7% of safety issues, and crime and theft are low (7.3%).

Spatial Variation in Improvement Priorities

Table 5: Observed Frequencies of Improvement Priorities

Urban Zone	Cost Reduction	Safety Improvement	Travel Time Reduction	Accessibility	Comfort	Reliability
Samaru	62	15	10	8	6	6
Sabon Gari	38	18	12	8	6	6
Zaria Walled City	50	17	9	7	7	6
Tudun Wada	24	41	10	6	6	6

Source: Field Analysis (2024)

Table 6: Distribution of Priorities

Urban Zone	Cost Reduction	Safety Improvement	Travel Time Reduction	Accessibility	Comfort	Reliability
Samaru	57.9%	14.0%	9.3%	7.5%	5.6%	5.6%
Sabon Gari	43.2%	20.5%	13.6%	9.1%	6.8%	6.8%
Zaria Walled City	52.1%	17.7%	9.4%	7.3%	7.3%	6.2%
Tudun Wada	25.8%	44.1%	10.8%	6.5%	6.5%	6.5%

Source: Field Analysis (2024)

Table 7: Chi-Square Test for Zone-Priority Association

Test	Result
Chi-Square (χ^2)	36.87
Degrees of Freedom (df)	15
Sample Size (N)	384
P-value	0.001322 ***
Cramér's V	0.179

Note: *** $p < 0.001$ (statistically significant at $\alpha = 0.05$)

Table 8: Standardized Residuals by Priority

Urban Zone	Cost Reduction	Safety Improvement	Travel Time Reduction	Accessibility	Comfort	Reliability
Samaru	1.94	-2.06	-0.42	-0.03	-0.37	-0.27
Sabon Gari	-0.30	-0.63	0.85	0.53	0.11	0.21
Zaria Walled City	0.99	-1.21	-0.39	-0.09	0.30	0.00
Tudun Wada	-2.79	4.04	0.02	-0.39	-0.02	0.08

Note: Values > 2 indicate significant cell contributions ($p < 0.05$)

Table 9: Dominant Improvement Priorities

Zone	Sample Size (n)	Dominant Priority	Percentage (%)
Samaru	107	Cost Reduction	57.9%
Sabon Gari	88	Cost Reduction	43.2%
Zaria Walled City	96	Cost Reduction	52.1%
Tudun Wada	93	Safety Improvement	44.1%

Source: Field Analysis (2024)

The chi-square test revealed a statistically significant association between urban zone and improvement priority, $\chi^2 (15, N = 384) = 36.87, p < 0.001$. The effect size, as measured by Cramér's V, was 0.179, indicating a small practical significance. This suggests that approximately 3.2% of the variance in priority selection is explained by zone membership.

Analysis of standardized residuals identified specific cells contributing most to the significant association: Samaru - Safety Improvement: residual = -2.06 ($p < 0.05$), Tudun Wada - Cost Reduction: residual = -2.79 ($p < 0.05$), and Tudun Wada - Safety Improvement: residual = 4.04 ($p < 0.05$). Table 9 shows cost reduction was the dominant priority in Samaru (57.9%), Sabon Gari (43.2%), and Zaria Walled City (52.1%). In contrast, safety improvement was the top priority in Tudun Wada (44.1%), representing a marked departure from the pattern observed in other zones.

Figure 1: Improvement priorities

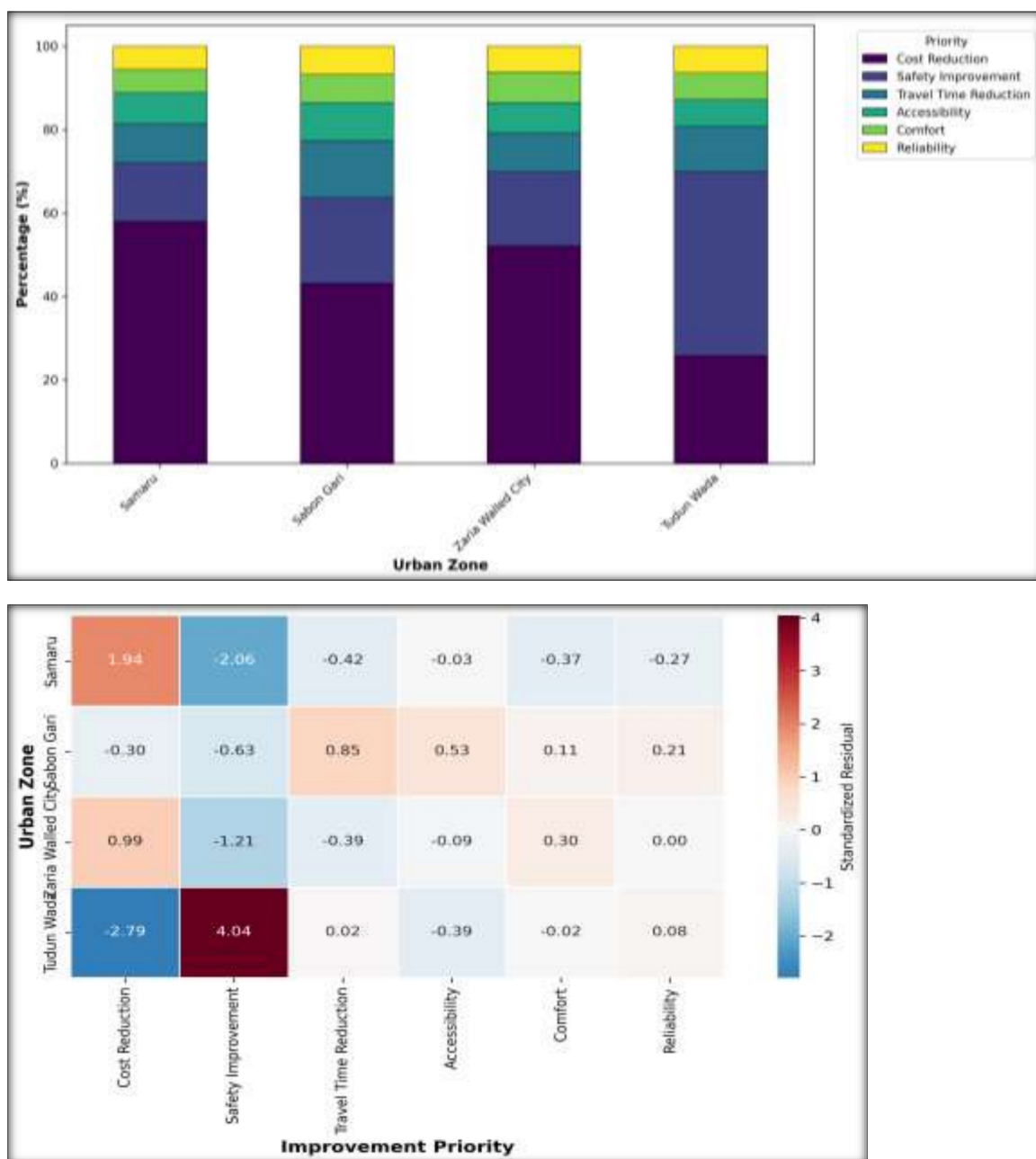


Figure 2: Heat-map of standardized residuals

Note: $r > 2$ indicates significant contribution

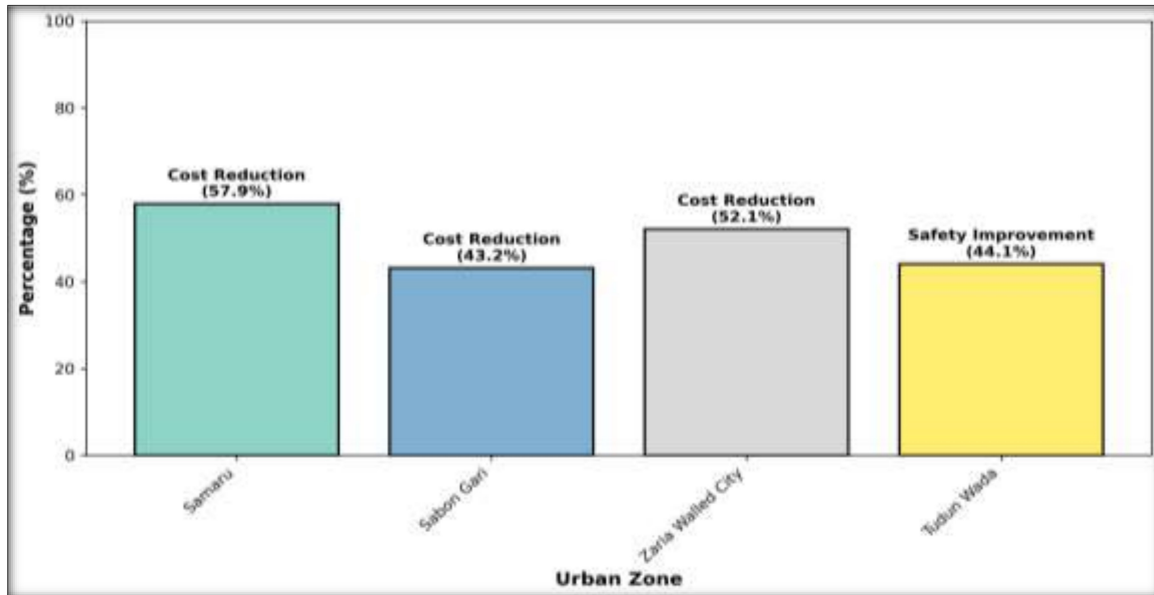


Figure 3: Dominant improvement priority

Recommendations for Transport Improvement

Table 5 presents the respondents recommendations on how to improve public transport in the study area. The result shows that reduction of costs is recommended in Samaru (51.6%), Sabon Gari (41.9%), and Zaria Walled City (51.3%). Better coverage of transport is second in Samaru (33.9%) and Zaria Walled City (33.2%) and is an indication of the common awareness of the value of service extension in order to alleviate reliance on the expensive informal substitutes.

Improvement in safety has an uneven prioritisation where it is ranked as third in Samaru (12.9%), Zaria Walled City (15.5%), and first in Tudun Wada (43.2%). This high safety in Tudun Wada is probably an indication of the balanced safety issues in the urban zone, with both crime and accidents having significant proportions of influence. In Sabon Gari (24.8%), there is moderate support towards better traffic management, which perhaps represents grid street pattern and commercial density of the urban zone. The infrastructure of walking and biking receives rather little support in Sabon Gari (11.9%), as well as in Tudun Wada (17.5%), which implies that there is a degree of openness to non-motorised options, assuming that the infrastructure is developed.

Table 10: Recommendations to Enhance Public Transportation

Recommendation	Samaru	Sabon Gari	Tudun Wada	Zaria City
Improve transport coverage	21 (33.9%)	12 (10.2%)	-	36 (33.2%)
Reduce transport cost	32 (51.6%)	49 (41.9%)	35 (36.3%)	56 (51.3%)
Improve safety	8 (12.9%)	5 (4.2%)	42 (43.2%)	17 (15.5%)
Reliability of public transport	-	8 (6.8%)	-	-
Better traffic management	-	29 (24.8%)	-	-
Walking/biking infrastructure	-	14 (11.9%)	17 (17.5%)	-

Source: Field Survey (2024)

Discussion

Transport Affordability as the Primary Equity Challenge

Affordability as the equity issue is established by the fact that majority of the respondents mentioned transport costs as their main impediment to mobility. This is consistent with the evidence at the international level, demonstrating that families with low income in developing cities spends a disproportionate amount of money on transport (UN-Habitat, 2020). The crisis in Zaria Walled City, with 88.1% rate transport as very expensive indicates the disadvantages of the people of traditional urban cores: limited formal transport, reliance on informal transport, and limited income per household.

The budgetary effects that are reported by most respondents suggest that households are compelled to make hard choices in order to sustain mobility at the expense of food, healthcare or education. To families that have an average of 11-15 members, the compounding effect of the transport burden is enormous, since several family members must travel every day to work, attend school, and so on. This observation verifies the concept of transport poverty as a multidimensional phenomenon by Lucas et al. (2016) in which excessive spending has a direct negative impact on other aspects of well-being. The fact that affordability issues are concentrated at the lower-middle income levels implies that the phenomenon of transport poverty involves not only the poorest households but stretches in the rural urban working masses.

Spatial Heterogeneity in Urban Mobility Priorities

The significant association between urban zone and improvement priority ($\chi^2(15, N=384)=36.87, p<0.001$) provides empirical evidence that resident mobility preferences are spatially heterogeneous within the metropolitan area. The concentration of cost reduction priorities in Samaru, Sabon Gari, and Zaria Walled City reflects several socioeconomic and infrastructural factors. These zones typically have lower average household incomes, making transport expenditure a substantial burden on household budgets (United Nations Habitat, 2022). Additionally, residents in these areas rely heavily on informal paratransit modes with volatile pricing structures and limited fare regulation. The absence of integrated ticketing systems across different transport services further increases effective trip costs, reinforcing cost as the primary concern. The prioritization of safety improvement in Tudun Wada represents a notable spatial divergence attributed to road geometry and traffic composition, the presence of vulnerable road users such as pedestrians, cyclists, and school children in mixed-traffic environment, and potentially recent high-profile accidents that heightened risk awareness among residents.

Spatial Inequalities in Accessibility and Service Provision

The deficit in Zaria Walled City of empty next-door transport facilities is the result of the long-standing tradition of urban morphology with small, irregular streets that do not provide a formal position of stops and prevent access to vehicles. This aligns with Abubakar and Doan (2022) who noted that the core of an historical city in Nigeria tends to have road systems that are poorly adapted to the requirements of the transport system.

The accessibility issues at Sabon Gari can be significant due to a lack of routes and alternative mode of access-problems that could be improved with the help of service extensions and a

diversification of the mode. Colonial grid street form gives the zone a grid street form that offers a more flexible infrastructure base as compared to that of the Walled City which is organic. This confirms the argument by Okonkwo and Eze (2023) that legacy urban cores have to be provided with differentiated infrastructure strategies, some regions need basic retrofitting, and others should enjoy services optimization. The mode captivity or reliance on one type of transport is common because the number of residents who have no alternative options such as using another mode of transport is high (44.2% to 55.7%). Mode captivity only worsens the affordability issues by removing competition that potentially keeps fares in cheque and providing operators with the power to price users who lack choices (Gadepalli et al., 2020).

Spatial Differentiation of Safety Concerns

The spatial difference in safety issues, in which crime and theft were prevalent in the peripheral urban zones and accidents dominated in the Walled City, offers valuable information to be used in interventions. This crime density in Samaru, Sabon Gari and Tudun Wada could be due to the nature of these urban zones: a greater share of non-residents (students, traders), more business-related activity that leads to theft and potentially weaker informal social networks than in the Walled City. This observation is corroborated by the observation by Ahmed and Musa (2023) that perceived safety within the Nigerian urban transport depends on neighbourhood social composition and built environment features.

This physical infrastructure (poor visibility at crossing the intersections, narrow streets, and the absence of pedestrian facilities) in the zone of Zaria Walled City is the cause of the accident prevalence (92.7%). The mixed conditions of traffic when vehicles, motorcycles, and pedestrians share the same space are the main source of the accident. This result complements the record of Ipingbemi and Adebayo (2016) of traditional urban structure providing risks of accidents and is indicative that safety intervention should be spatially varied: crime prevention in peri-urban areas and traffic control and pedestrian infrastructures in the historic central business urban zone. The reporting safety is also a pervasive mobility barrier with the majority of minority groups reporting safety concerns in all of the urban zones (greater than 50% in at least one category of concern). The safety issue of women, children and elderly residents can limit the frequency of travel, timing and destinations of travel and therefore, reduce their mobility space and access opportunities (Loukaitou-Sideris, 2020).

Conclusion

This study demonstrates that the lack of transport equity is undermined due to limitations of affordability, high transport costs, systematic lack of accessibility, safety issues that are uneven, and high levels of commuting unreliability. The geographical dissimilarity events of mishap-laden safety issues and mode-deficient extreme accessibility to the peripheral areas of the city in terms of safety and mode captivity illustrates the need of differing and reliable transport policies. A one-size-fits-all metropolitan strategy would not solve the challenges in infrastructure faced by the Walled City, or the service growth demands of the peripheral urban zones. To counter the problem of transport poverty, a combination of solutions is needed: regulation of fares and subsidies to make them more affordable; service development in the areas lacking them; infrastructure development in the historical centre; crime prevention in the outer areas; and the engagement approach to planning to make sure the interventions are relevant to the priorities identified locally.

References

- Abubakar, I. R., & Doan, P. L. (2022). Urban districts of Nigeria: walkability and road node density. *African Journal of Urban Studies*, vol 7, issue 1, pp 77-92.
- Aderibigbe, A. (2022). Implementation of integrated transport system in sustainable transport planning and development. *Journal of Inclusive Cities and Built Environment*, 2(1), 41-44.
- Aderibigbe, O. O., & Gumbo, T. (2022). The impact of socio-economic characteristics on travel behaviour within the rural location of Nigeria: To a sustainable rural planning and development. *Urban, Planning and Transport Research*, 10(1) 181-199.
- Aderinlewo, O. O. (2020). Travel behaviour evaluation of a university residential community: the Federal University of technology Akure, Ondo State, Nigeria. *International Journal of Advanced Academic Research*, 6:5.
- Adheyisi, F. (2021). Motorcycle to tricycle: political economy of informal urban transport in Nigeria. *Researcher Life*, 3.
- Ahmed, N. A., & Musa, K. A. (2023). An examination of the perceived safety in transit and its role in travel choice in sub-Saharan African metropolitan areas. *Journal of African Transport Research*, 14(1) 34-52.
- Ayanwale, A. O., Eze, C. U., & Lawal, M. O. (2022). Urban transportation challenges in northern Nigeria: a case study of reliability, infrastructure and risks. *International Journal of Transport Economics and Policy*, 7(1), 25-46.
- Butler, R. A. (2015). Population.mongabay.com - City population.
- Daniel, P. D., Davidson, A., Vesta, U., Jacob, A., Fanan, U., and Timothy, T. G. (2021). Topography of road network connectivity in the Benue basin in Nigeria. *International Journal of Geography and Regional Planning Research*, 6(1), 62- 75.
- Foley, L., Brugulat-Panes, A., Woodcock, J., Govia, I., Hambleton, I., Turner-Moss, E., and Randall, L. (2022). Socioeconomic and gendered disparities in travelling behaviour in Africa: Mixed-method systematic review and meta-ethnography. *Social Science & Medicine*, 292, 114545.
- Gadepalli, R., Tiwari, G., & Bolia, N. (2020). Impact of socio-economic and travel features of the user in the mode choice between informal and city bus services: Findings based on household survey in Visakhapatnam, India. *Journal of Transport Geography*, 88, 102307.
- Ipingbemi, O., & Adebayo, A. (2016). Communication and ease of movement in Ibadan metropolis places of worship. *Journal of Transport and Spatial Planning in Africa*, 4 (1), 42-57.
- Kenyon, S., Lyons, G., & Rafferty, J. (2002). Transport and social exclusion: Researching how to facilitate the idea of inclusion by means of virtual mobility. *Journal of Transport Geography*, 10(3): 207-219.
- Krejcie, R. V., & Morgan, D. W. (1970). Calculating the sample size of research work. *Educational, Psychological Measurement*, 30, 607-610.
- Litman, T. (2021). Transportation and environmental policy: Good practises towards sustainability. Victoria Transport Policy Institute.

- Loukaitou-Sideris, A. (2020). Gendered perspective of mobility and transport: Future directions and next steps. K. Lucas, K. Martens, F. Di Ciommo and A. Dupont-Kieffer (Eds). 75-90. Measuring transport equity. *Elsevier*.
- Lucas, K. (2022). Transport justice: Developing theory and practise. *Journal of Transport Geography*, 102, 103371.
- Lucas, K., Mattioli, G., Verlinghieri, E., and Guzman, a. (2016). Poverty of transportation and its negative social impacts. *Proceedings of the Institution of Civil Engineers - Transport*, 169(6), 353-365.
- Mattioli, G., Lucas, K., & Marsden, G. (2022). Transport poverty and inequality: The effects of limited car travel in the UK. *Routledge*.
- National Bureau of Statistics. (2021). Transport statistics report. Abuja: NBS.
- National Population Commission. (1991). Federal Republic of Nigeria 2006 population and housing census. Abuja: NPC.
- Nuhu, H. T. (2019). Road network spatial connectivity appraisal at Abuja City, Nigeria. *Adamawa State University Journal of Scientific Research* 7(2).
- Okeke, F., Echendu, I., & Rosemary, N. O. (2021). Intra-urban travel determinants in southeast Nigeria, this is seen in the city of Enugu. *Transport Problems*, 16(4).
- Okonkwo, C. U., & Eze, C. U. (2023). Traffic congestion and strain infrastructures in old urban cores: retrofitting old urban transport systems in Nigerian cities. *International Journal of Urban Infrastructure and Management*, 9(1), 72-89.
- Oladeji, P. B., Agbabiaka, H. I., and Adewole, H. A. (2022). The socioeconomic differences of travel behaviour of the households in the peri-urban Ibadan, Nigeria. *Zeszyty Naukowe. Transport/Politechnika Slaka*, 114, 115-130.
- Oni, A. A., & Okanlawon, O. (2021). Hiking of transport fares and their effects to low income urban households in Nigeria. *Journal of Urban Economics and Transport Policy*, 13(3), 215-232.
- Owoyemi, A. S., Fadare, S. O., and Ojekunle, J. A. (2018). The socio-economic nature of households and their urban travel behaviour in Minna Metropolis, Nigeria. *International Journal of Research Publications*, 9.
- Pereira, R. H., Schwanen, T., and Bannister, D. (2017). Transportation distributive justice and equity. *Transport Reviews*, 37(2), 170-191.
- Pojani, D., & Stead, D. (2015). Sustainable urban transport in the developing world: Past megacities. *Sustainability*, 7(6), 7784-7805.
- Poku-Boansi, M., Amoako, C., and Atuah, D. O. (2019). The travel habits and the safety of school children in the Urban areas of Accra, Ghana. *Journal of Transport & Health*, 15, 100660.
- Salau, S., Lawal, M., & Obadeyi, B. (2022). Travel planning and mobility trends in transport in Nigerian secondary cities: the case of Minna, Nigeria. *Journal of Transport and land use*, 13(1), 547-566.

- United Nations Human Settlement Programme. (2020). Africa Cities status -2020: Transport affordability and urban livelihoods. UN-Habitat.
- Usman, A. (2020). The Nigerian cities are experiencing issues of urban transport and environmental effects. *Journal of Transport Urban Studies*, 15: 2, 45-58.
- Vasudevan, N., Gore, N., Zope, R., Arkatkar, S., and Joshi, G. (2021). The mode shift elasticity would be determined using the household income and travel cost. *Transportation Economics*, 85, 100771.