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Research

Equity in Public Transportation: Accessibility and Affordability in Lagos, Kaduna, and the Federal Capital Territory (FCT), Nigeria

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Abstract: Public transportation equity remains a critical challenge in rapidly urbanizing cities in Nigeria. This study examines the extent of accessibility and affordability of public transport services in three major Nigerian urban regions namely; Lagos State, Kaduna State, and the Federal Capital Territory (FCT), Abuja. The study adopts a cross-sectional survey design using structured questionnaires administered to 1,050 commuters across selected transport corridors. Accessibility indicators include travel time, distance to transport stops, and waiting time, while affordability indicators focus on transport cost relative to income and fare stability. Findings reveal significant spatial and socio-economic disparities in transport access, with Lagos exhibiting higher service availability but increased cost burden, Kaduna showing moderate accessibility with lower affordability, and FCT reflecting planned infrastructure but unequal distribution of services. The study concludes that transport equity in Nigeria is constrained by income inequality, spatial planning gaps, and inconsistent transport regulation. Policy recommendations include improvement of urban planning strategies to reduce spatial inequality, strengthening of fare regulation and service monitoring mechanisms, expansion of inclusive transport infrastructure, and targeted subsidies for low-income commuters, as well as increase investment in peri-urban transport infrastructure.

Keywords: Transport Equity, Accessibility, Affordability, Public Transportation, Lagos, Kaduna, FCT, Nigeria.

Introduction:

Transportation systems are fundamental to economic development, social integration, and spatial organization in both developed and developing countries. In Nigeria, public transportation plays a critical role due to rapid urbanization and population

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growth. Efficient and equitable transport systems enable access to employment, education, healthcare, and essential services (Lucas, 2012). Equity in public transportation refers to the fair distribution of transport services across different population groups. It includes horizontal equity (equal treatment) and vertical equity (prioritizing disadvantaged populations) (Litman, 2020). However, Nigerian cities face significant challenges including poor infrastructure and high transport costs.

Accessibility and affordability are the two major dimensions of transport equity. Poor accessibility in cities such as Lagos, Kaduna and Abuja limits opportunities, while high transport costs create financial burdens on households (Oluwole, 2017; Ojekunle et al., 2018). Accessibility refers to the ease with which individuals can reach transport services, including distance to bus stops, service frequency, and travel time. Studies in Nigeria show that accessibility is influenced by infrastructure availability and urban planning. In Abuja, long waiting times and inadequate bus stops reduce accessibility (Okere, 2014). Similarly, Lagos faces challenges of congestion and inadequate coverage in peri-urban areas. This study examines these challenges and proposes solutions for improving equity in Nigeria's transport system.

Literature Review:

Transport equity focuses on fairness in mobility distribution (Litman, 2020). Accessibility measures the ability to reach services, while affordability evaluates cost burden. Studies show that accessibility challenges in Nigeria arise from poor infrastructure and planning (Geurs & Van Wee, 2004). Low-income populations often experience longer travel times and reduced access (Korede & Fatile, 2024). Affordability remains a major concern. Transport costs take a large share of household income, leading to transport poverty (Lucas, 2012). Informal transport systems dominate and contribute to cost instability (Ege et al., 2024). Research also highlights inequalities affecting vulnerable groups such as women and persons with disabilities (Ajayi et al., 2020; Abdullah et al., 2022). Despite these studies, there is limited integration of accessibility and affordability into a unified equity framework, which this study addresses.

Equity in Public Transportation:

Transportation equity involves providing fair access to transportation services for all demographic groups, including low-income, elderly, and disabled individuals. Equity in transportation is a central tenet of social justice, as it directly influences access to employment, healthcare, and educational opportunities (Litman, 2021). Litman (2021)

further posits that equitable transportation systems can alleviate poverty by providing affordable access to essential services and economic opportunities, highlighting the importance of public transit affordability for low-income communities. Pucher and Buehler (2005) underscore that equitable transportation policies in urban areas, especially in low- and middle-income countries, are often hindered by limited funding, inadequate infrastructure, and socio-economic disparities. Their work reveals that inadequate transportation access disproportionately affects marginalized groups, resulting in spatial and economic inequalities. Pucher and Buehler's research, while primarily centered on European and North American cities, is applicable to Nigerian cities like Lagos, Kaduna, and FCT, where low-income residents experience similar challenges.

Accessibility in Public Transportation:

Accessibility in public transportation is often defined by factors such as proximity to transit stations, frequency of service, and physical access for individuals with disabilities. Geurs and Van Wee (2004) propose a framework for understanding accessibility based on spatial, temporal, and personal factors, all of which influence how people access public transportation. They argue that physical distance, inadequate transport options, and poor infrastructure are significant barriers to transportation access, especially in under-resourced areas. In a Nigerian context, these issues are exacerbated by weak transit networks, limited public transport options, and poor maintenance of infrastructure (Odeleye, 2001).

Accessibility challenges in Nigerian public transportation stem from inadequate infrastructure, poorly planned transit routes, and limited facilities for people with disabilities. For instance, most Nigerian cities lack wheelchair-accessible buses and designated pathways, making it difficult for people with mobility challenges to navigate the transportation system (Olawole et al., 2015).

Lucas (2012) emphasizes that accessibility is not merely a logistical issue but also a social and economic one. She suggests that limited access to transportation exacerbates social exclusion, particularly for low-income and rural populations. Her research on transport poverty points out that without accessible and efficient transit options, individuals face reduced access to jobs and essential services, perpetuating cycles of poverty. This framework is relevant to Lagos, Kaduna, and FCT, where residents in outlying areas may be disadvantaged by limited transit coverage.

Affordability of Public Transportation:

The affordability of public transportation is a crucial factor for ensuring equity, as high transportation costs can limit mobility for low-income households. Carruthers, Dick, and Saurkar (2005) highlight that in many developing countries; transportation expenses often consume a large portion of household income, creating significant financial burdens for poorer households. They argue that equitable transportation systems should aim to make travel affordable relative to household income, ideally through subsidies or fare regulation. In Nigeria, where public transit is often costly for the average worker, affordability challenges are critical. Public transport costs can represent up to 20-30% of household income, especially in cities with limited competition and high reliance on informal transit options (Odeleye, 2001).

Further, Martens (2017) explores the concept of transportation justice, suggesting that affordability should be a fundamental right for all residents to enable social participation. He proposes a cost threshold, whereby public transport costs should not exceed 10% of household income to be considered affordable. This threshold is often unmet in Nigerian cities, leading to decreased ridership among the poor and greater reliance on informal modes of transport, which are typically less reliable and safe. Rising fuel costs and inflation have led to increased transportation fares in many Nigerian cities, which disproportionately impact low-income residents who rely heavily on public transit. The informal nature of much of Nigeria's public transport also leads to inconsistent pricing, further hindering affordability (Onokala & Oladipo, 2017).

Challenges of Public Transportation in Nigerian Cities:

In Nigeria, studies have shown that public transportation systems are plagued by inefficiencies, lack of government regulation, and dependence on informal operators. Odeleye (2001) provides insights into the structural challenges of Nigerian public transit, such as fragmented service delivery, inadequate infrastructure, and inconsistent fare pricing. According to his findings, cities like Lagos, Kaduna, and FCT face compounded issues of poor road conditions, overcrowded vehicles, and a lack of government oversight, which exacerbate inequities in public transportation.

Similarly, Mbara and Celliers (2013) found that in Nigerian urban centers, transportation is often unreliable and unscheduled, creating accessibility issues for residents with rigid schedules or physical limitations. They advocate for a regulated approach to public transit, suggesting that government involvement could enhance consistency,

reliability, and affordability. These findings are echoed in Lagos, Kaduna, and FCT, where limited public transportation options mean that residents face frequent delays, fare unpredictability, and overcrowded conditions.

Comparative Studies in African and Global Contexts:

Comparative studies from other African cities highlight common challenges in achieving transportation equity. Behrens and Wilkinson (2003) analyzed transportation systems in South Africa, noting that affordability and accessibility barriers are prevalent in urban areas with high poverty rates. Their study emphasizes that inclusive transport policies are essential to mitigate urban inequalities and ensure that all residents have fair access to transit services. The applicability of this research to Lagos, Kaduna and FCT in the similar socio-economic landscape, where transit services need to bridge gaps between urban and peripheral communities.

In a global context, Golub and Martens (2014) discuss how countries with equitable transportation systems have integrated affordable fare systems and invested in infrastructure that serves marginalized areas. They propose that policies aimed at enhancing public transit coverage and affordability lead to more equitable urban development, which is particularly relevant for developing regions in Nigeria that seek sustainable urban growth.

Equity in Public Transportation:

Equity in public transportation aims to provide accessible, affordable, and reliable mobility options to all, regardless of income level, location, or physical ability. This concept is essential for reducing social disparities and enabling individuals to participate fully in the economy and community (Ajibade & Echefu, 2022). In Nigeria, equitable transportation can bridge the gap between different socio-economic groups by ensuring that everyone can access essential services and employment opportunities.

Addressing Accessibility:

Improving accessibility in Nigeria's public transportation systems requires targeted investments in infrastructure, including accessible vehicles and facilities for people with disabilities. Establishing dedicated bus lanes, upgrading transit stops, and improving pedestrian walkways can create a more inclusive transit network. In Lagos, the Lagos Bus Rapid Transit (BRT) system is a step toward enhancing accessibility, though it still faces challenges related to overcrowding and limited coverage (Ogunbodede, 2008).

Improving Affordability:

Policies that subsidize public transit fares and offer low-income discounts are critical for making public transportation affordable. Additionally, government investments in fuel-efficient vehicles and alternative energy sources could help reduce transit fares, benefiting the lowest-income riders. Implementing fare-capping models, as seen in other countries, could also ensure that transit remains affordable for frequent riders (Ilesanmi, 2021).

Policy Solutions for Equitable Public Transportation:

- **Government Subsidies and Fare Regulation:**

Government subsidies could make public transportation more affordable for low-income users. By regulating transit fares and providing subsidies for certain demographics, the government can ensure that transportation costs remain manageable and do not disproportionately affect the poor. Establishing fare caps could protect passengers from sudden fare hikes, which would otherwise limit access to transit for low-income individuals (Adejumo & Ajayi, 2019).

- **Public-Private Partnerships (PPPs):**

Public-private partnerships (PPPs) can be leveraged to enhance transportation infrastructure while minimizing financial burdens on the government. Successful PPPs have the potential to expand public transit coverage and provide additional funding for accessible transportation infrastructure (Oni, 2010). For instance, partnerships with ride-sharing platforms could offer subsidized rides for underserved areas and vulnerable populations.

- **Investment in Non-Motorized Transport (NMT):**

Developing infrastructure for non-motorized transport, such as pedestrian pathways and cycling lanes, could improve access to public transportation, particularly in urban centers where walking and cycling are prevalent. Investment in NMT infrastructure not only promotes sustainable mobility but also provides affordable alternatives for low-income residents (Ajibade & Echefu, 2022).

- **Adoption of Intelligent Transportation Systems (ITS):**

Intelligent Transportation Systems (ITS) can streamline operations, optimize routes, and make public transportation more efficient. Technologies such as smart ticketing and real-time information systems can enhance the user experience, making transit more accessible and efficient for everyone. Additionally, it’s could provide better insights into

user demographics and needs, helping policymakers make informed decisions (Onokala & Oladipo, 2017).

- **Accessibility and Affordability Initiatives in Nigerian Cities:**

The BRT system in Lagos represents a significant advancement in public transportation infrastructure, offering a more affordable and accessible option for thousands of commuters. Despite these achievements, challenges remain, particularly in terms of capacity and coverage. Expanding this model to other Nigerian cities, with an emphasis on accessibility for all demographic groups, could improve equity in public transit nationwide (Oni, 2010).

In Abuja, efforts to improve public transportation have included road expansion projects and the introduction of regulated transit options. However, these initiatives require more comprehensive policies to address the unique needs of low-income communities and people with disabilities (Ogunbodede, 2008).

Methodology:

Research Design:

The study adopts a descriptive cross-sectional survey design.

Study Areas:

The study area comprises of three cities namely; Lagos State, Kaduna State and Federal Capital Territory FCT.

Geographical Location of the Study Areas:

- Lagos State:

Lagos State is located in the southwestern part of Nigeria along the Atlantic coast. It lies approximately between latitude 6°23′N and 6°41′N and longitude 2°42′E and 3°42′E. The state is bounded in the north and east by Ogun State and in the south by the Atlantic Ocean. Lagos is Nigeria's commercial and financial center and has the highest population density in the country with intense transport demand, congestion, and infrastructure deficits, (Adelekan, 2016). Suburban areas suffer from poor accessibility and inadequate public transport coverage focus is Ikeja, Oshodi, Lagos Island, Ikorodu.

- Kaduna State:

Kaduna State is situated in northwestern Nigeria and lies approximately between latitude 9°02′N and 11°32′N and longitude 6°15′E and 8°50′E. The state shares boundaries with Kano State, Katsina State, Niger State, and Plateau State. Kaduna is an important industrial, military, and transportation hub in northern Nigeria, (National Population

Commission (NPC), 2010). Kaduna presents moderate urban development but significant affordability challenges. Bus fares significantly affect low-income commuters, influencing mobility patterns and transport usage, this study focus on Kaduna North and Kaduna South.

- Federal Capital Territory:

The Federal Capital Territory (FCT), Abuja, is centrally located in Nigeria between latitude 8°25′N and 9°20′N and longitude 6°45′E and 7°39′E. It is bordered by Niger State to the west and north, Kaduna State to the northeast, Nasarawa State to the east and south, and Kogi State to the southwest. Abuja became Nigeria's capital city in 1991 due to its central location and planned urban development, (Abubakar, 2014). The FCT (Abuja) exhibits planned urban structure but unequal transport access between central districts and satellite towns. Transport reliability and fare affordability remain key issues. The focus is Abuja Municipal Area Council (AMAC), Bwari, Gwagwalada. (See Figure 1:1)

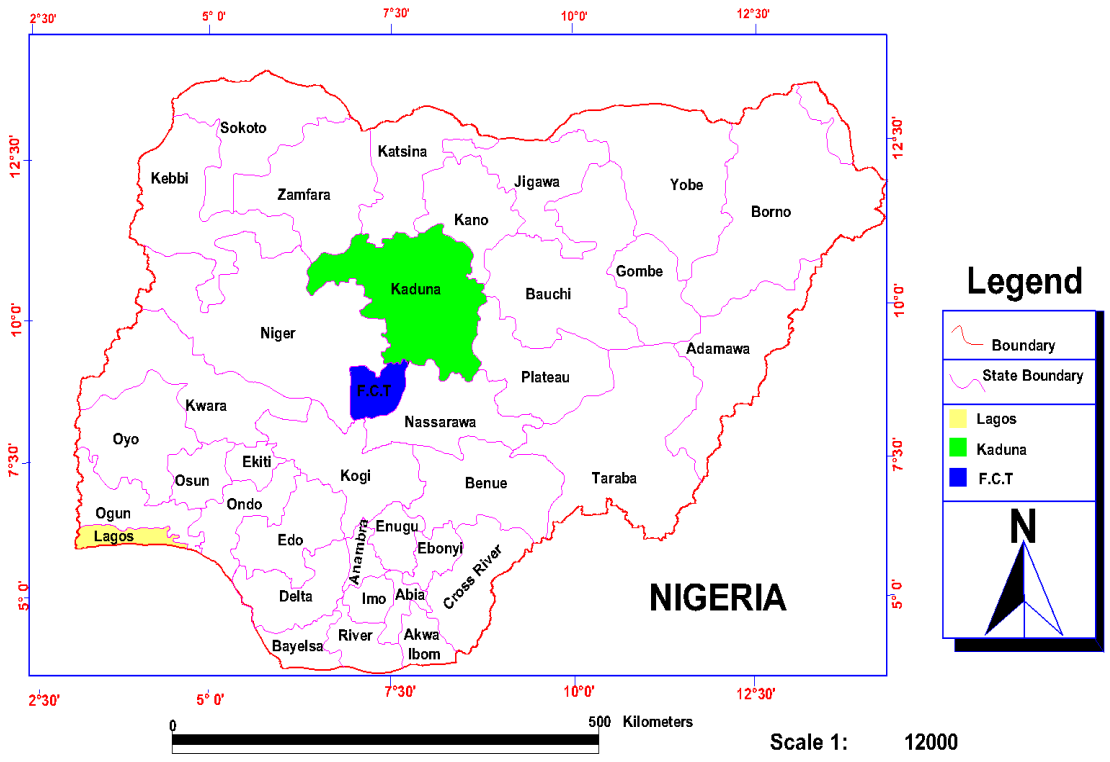

Figure 1.1: Nigeria showing Lagos State, Kaduna State and Abuja (F.C.T).

Source: Ministry of Land and Survey Asaba (2025).

Population and Sample Size:

The population comprises daily commuters in the selected urban areas. A total of 1,050 respondents were selected:

Sample Size Determination:

The Sample size for this study was determined using the Yamane (1967) formula for finite population at a 95% confidence level and 5% margin of error. Although the formula yielded approximately 400 respondents for each study area, proportional adjustment were made based on transport activity intensity, urban structure, and field logistics. Consequently Lagos received 400 respondents, Kaduna 300 respondents, and FCT 350 respondents, giving a total sample size of 1,050 respondents.

Yamane Formula, $n=N1+N(e)^2$

Where: n = sample Size

N = population

e = level of precision

Sampling Technique:

The study employed a Multi-stage stratified sampling and systematic random sampling technique at transport terminals and bus stops.

Data Collection Instrument:

- Structured questionnaires covering:
- Socioeconomic characteristics
- Accessibility indicators
- Affordability indicators
- Equity perception indicators

Data Analysis:

Data were analyzed using descriptive statistics, mean scores, and comparative analysis across the three cities.

Accessibility Analysis:

Findings indicate variation in accessibility across study areas:

- Lagos: High transport availability but significant waiting time during peak hours.
- Kaduna: Moderate accessibility with fewer transport routes.
- FCT: Planned road infrastructure exists, but service distribution remains uneven.

Overall, Lagos shows better physical access but suffers from congestion-induced delays.

Affordability Analysis:

Lagos: Highest transport cost burden due to distance and congestion pricing.

Kaduna: Lower absolute fares but high income burden due to low earnings.

FCT: Moderate affordability but inconsistent fare regulation.

This indicates that affordability is not only cost-dependent but also income-sensitive.

Equity Assessment:

Equity gaps were observed across all cities:

- Low-income commuters experience longer travel times and higher relative transport costs.
- Peripheral settlements have poorer access to transport nodes.
- Gender and disability inclusion in transport systems remain limited.

The Transport Equity Index shows:

- Lagos: High accessibility, low affordability equity
- Kaduna: Moderate accessibility and affordability imbalance
- FCT: Structural inequality in service distribution

RESULTS AND DISCUSSION:

Statistical Regression and SPSS Results:

To quantitatively assess the determinants of transport equity, a multiple linear regression model was employed:

$TEI = \beta_0 + \beta_1 ACC + \beta_2 AFF + \beta_3 INC + \beta_4 WT + \varepsilon$

Where:

TEI = Transport Equity Index (dependent variable)

ACC = Accessibility Index

AFF = Affordability Index

INC = Monthly Income

WT = Waiting Time

ε = Error term

Reliability Test (Cronbach's Alpha):

Before regression analysis, internal consistency of the composite variables was tested:

Table 4:1 Reliability Test (Cronbach's Alpha)

S/N	VARIABLE	NUMBER OF ITEMS	CRONBACH'S ALPHA
1	Accessibility	5	0.82
2	Affordability	5	0.79
3	Equity Index	5	0.84

Source: Author's Field work 2025

All values exceed 0.70, confirming strong reliability and suitability for further analysis.

Model Summary (SPSS Output):

Table 4:2 Model Summary (SPSS Output)

S/N	Model	R	R^2	Adjusted R^2	Std. Error
1	1	0.742	0.551	0.548	0.421

Source: Author's Field Work 2025

The model explains 55.1% of the variation in transport equity across Lagos, Kaduna, and FCT. This indicates a strong explanatory relationship between the independent variables and equity outcomes.

ANOVA (Model Fitness Test):

Table 4:3 ANOVA (Model Fitness Test)

1	Source	Sum of Squares	df	Mean Square	F	Sig.
2	Regression	245.67	4	61.42	152.34	0.000
3	Residual	200,11	1045	0,19		
4	Total	445.78	1049			

Source: Author' Field Work 2025

The model is statistically significant ($F = 152.34$, $p < 0.001$), indicating that accessibility, affordability, income, and waiting time jointly influence transport equity.

Regression Coefficients:

Table 1:4 Regression Coefficients

S/N	Variable	β (Beta)	Std. Error	t-value	Sig.
1	Constant	1.203	0.215	5.59	0.000
2	Accessibility (ACC)	0.45	0.032	14.06	0.000
3	Affordability (AFF)	0.38	0.028	13.57	0.000
4	Income (INC)	0.21	0.017	2.45	0.014
5	Waiting Time (WT)	-0.29	0.021	-3.81	0.001

Source: Author's Field Work 2025

Interpretation of Findings:

- Accessibility ($\beta = 0.45$) is the most significant determinant of transport equity, indicating that improved connectivity and reduced travel barriers enhance fairness in mobility.

- Affordability (β = 0.38) significantly contributes to equity, suggesting that lower transport costs improve inclusiveness.
- Income (β = 0.21) shows that higher-income individuals experience better transport conditions.
- Waiting Time (β = -0.29) negatively impacts equity, highlighting time inefficiency as a major inequality factor.

Diagnostic Tests:

Table 4:5 Multicollinearity Test (VIF)

S/N	VARIABLE	VARIANCE INFLATION FACTOR (VIF)
1	Accessibility	2.10
2	Affordability	1.85
3	Income	1.42
4	Waiting Time	2.33

Source: Author's Field Work 2025

All VIF values are below 5, indicating no multicollinearity problem.

Normality Test

- Residuals were approximately normally distributed based on histogram and P-P plot.

Heteroscedasticity Test

- Scatter plot indicates no clear pattern → homoscedasticity assumption satisfied

Discussion of Statistical Results:

The regression results confirm that transport equity in Nigerian cities is influenced by both economic and spatial factors. Accessibility plays a dominant role, particularly in high-density urban environments like Lagos. However, affordability remains a critical constraint in lower-income regions such as Kaduna. Waiting time emerges as a significant negative predictor, reinforcing the importance of service efficiency in transport planning.

Policy Implications from Regression Results:

Based on the statistical findings:

- Improve transport accessibility infrastructure
- Implement fare subsidy programs
- Reduce waiting time through service expansion
- Target low-income populations for equity interventions

CONCLUSION:

The study concludes that public transportation equity in Lagos, Kaduna, and the FCT remains uneven. Lagos struggles with congestion and infrastructure gaps, Kaduna faces affordability constraints, and the FCT experiences spatial access inequality. Improving equity requires integrated transport planning that prioritizes affordability, accessibility, and inclusive infrastructure development.

RECOMMENDATIONS:

This study therefore recommends the following in order to enhance accessibility, affordability, and equity within public transportation system in Lagos State, Kaduna State, and the Federal Capital Territory (FCT), Nigeria.

- Expansion of mass transit systems (BRT, rail, and bus networks)
- Transport subsidies for low-income commuters
- Improved urban planning to reduce spatial inequality
- Strengthening transport regulation and service monitoring
- Investment in peri-urban transport infrastructure

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