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Research Paper

Assessment of Factors Influencing Transportation Modal Choices in Metropolitan Lagos, Nigeria

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Abstract
Transportation modal choice is a key determinant of urban mobility performance, sustainability, and socioeconomic productivity in rapidly expanding megacities. This study examines the factors influencing transportation modal choice in Metropolitan Lagos, Nigeria, with particular emphasis on socio-demographic characteristics, safety perceptions, and transport system attributes. A quantitative research approach was adopted, drawing data from 630 commuters at the Oshodi transport hub through structured questionnaires, direct field observation, and GPS-supported spatial mapping. Data analysis involved descriptive statistics, chi-square tests, multinomial logistic regression, and conjoint analysis. According to the findings, public transit is the most common way of transportation, making up over two-thirds of commuter trips. In addition to perceived safety, sociodemographic factors including age, gender, and wealth have statistically significant impacts on mode choice. Women commuters are more likely to favour forms of transportation that are seen as safer and subject to stricter regulations. The results of the conjoint analysis show that trip time is the most important factor influencing modal choices, followed by travel expense. Safety, on the other hand, is revealed to be a basic, non-negotiable need rather than a trade-off feature. The study comes to the conclusion that improving public transport systems' effectiveness, dependability, and safety is essential to promoting sustainable urban mobility in Metropolitan Lagos.

Keywords: *Commuters, Modal Choices, Metropolitan, Transportation, Safety and security*

I. Introduction

Urban residents frequently commute to work and engage in other work-related activities. They must therefore choose between active commuting, which includes walking and cycling, and passive commuting, which involves using a bus, train, car, or motorbike (Olasokan et al., 2021). The quality of transportation-related services and infrastructure has been steadily declining, making road transportation the predominant mode in Nigeria's urban centres, thereby increasing vehicle maintenance costs (Oyeyemi et al., 2025). Morimoto (2021) maintains that cities are creatures of the transport system, while Adeniyi (2025) highlighted that transport is the "maker and breaker of cities, since the same transport that produces a city may constitute further problem if not efficiently designed and managed.

The European Commission released the Green Paper on Urban Mobility to address these issues. Over the past year, policymakers, transport operators, researchers, user groups, and government agencies have shown interest in urban mobility, recognizing it as a fundamental problem that requires collaborative solutions. Individuals in urban regions travel between locations, either voluntarily or involuntarily, to engage in socioeconomic and political activities (Osoja et al., 2022). As a result, the transport sector is widely regarded as the engine of the Nigerian economy, a view shared by many other economies globally. The importance of the transportation industry to a nation's economy cannot be overemphasized, because it is instrumental to the flow of goods and services as well as commuter mobility, which is more common in urban areas with extensive commercial activity, such as Lagos, than in rural areas (Olasokan et al., 2021).

Researchers worldwide have studied urban mobility from multiple perspectives to identify novel tools, concepts, and strategies and to understand better the main factors influencing mobility and transportation in urban settings. The efforts aim to improve public transport and commuter mobility and to reduce accident rates, thereby establishing a sustainable urban transport system. Urban mobility, or sustainable transport, is essential to the efficient running of the local and national economies. The unrestricted movement of automobiles is hindered by urban transport issues, including traffic congestion, accidents, and air pollution accounts for 40% of CO2 emissions, whereas other urban activities account for 70% (Crippa et al., 2021). Furthermore, urban road traffic

accidents account for the most significant number of fatalities in towns and cities, while pedestrians and cyclists are the most vulnerable (Hasani et al., 2018).

Modal choice is the result of complex behavior shaped by subjective and objective factors that are interdisciplinary and somewhat interconnected (Gonzalez & Suarez, 2013). Due to its effects on vehicle demand, it significantly affects air quality, sustainability, and traffic congestion (Parthan & Srinivasan, 2013). Measurable factors such as travel duration, cost, distance, trip objectives, age, gender, income, and travellers' occupation often affect the commuter's modal choice (Dėdelė et al., 2020). According to a study by Gonzalez & Suarez (2013), modal choice is influenced by psychological factors such as habits, lifestyle, beliefs, superstition, and intermodal transfer, as well as subjective factors such as comfort, convenience, safety and security, freedom, and flexibility. The decision-making process for mode choice is also significantly influenced by other subjective factors, such as attitudes and perceptions (Devika et al., 2020). Surprisingly, few studies in industrialized nations have considered those parameters (Parthan& Srinivasan, 2013).

A study by Ettema et al. (2015) found that subjective beliefs such as freedom, safety, comfort, and anxiety influenced passengers' modal choice. In contrast, Allard and Moura (2018) used seat availability and the number of intermodal transfers to explain the role of comfort and convenience in modal choice. Göransson and Andersson (2023) found that, when choosing among trains, cars, and buses, passengers' subjective preferences for comfort and flexibility were highly significant. According to Munshi (2016), land-use planning incorporates transit-oriented development and new urbanism, which has a significant subjective impact on mode choice. Although each of these variables influences travel mode choice, particularly in developing nations, no comprehensive study has examined their combined significance as predictors of travel mode choice, even in affluent nations.

In cities worldwide, security and safety have become growing concerns. The security and safety of commuters significantly affect their mode choice. A person's or an organization's priorities are considered during the decision-making process. One of the main goals of public transit should be to address the sensitive nature of some social situations, such as terrorism, kidnapping, abuse, public assaults, etc. To help the public transportation system prepare for and respond quickly to security and safety threats and emergencies, the government and specific transportation stakeholders have implemented several measures. Modal choice studies analyze the relationship between modal choice and characteristics. They enable commuters to value time and various trip types, as well as to determine how frequently they use the mode. This information aids in calculating the time-related benefit of choosing a specific mode of transportation.

1.1 Statement of Problems

Ibrahim-Adedeju et al. (2019) used primary data to investigate commuters' perceptions of the overall service quality of Bus Rapid Transit (BRT) in relation to its physical appearance and reliability. The study found that although BRT is aesthetically pleasing, further research is needed to enhance its functionality in Lagos State. These studies have contrasted the evaluation of security and safety with other factors such as comfort and reliability. This research failed to give adequate attention to safety and security. The goal of Soto et al. (2022) was to describe the relationships among socio-demographic characteristics, travel circumstances, system design components, and fear of crime across three contexts (buses, bus stops, and stations) of the Barranquilla (Colombia) BRT system. The research reveals that fear of crime significantly affects the use of BRT, followed by fear of criminality on buses. The most significant predictor of fear of crime was being a female user, while fear of crime was also influenced by money.

A study by Adebola et al. (2014) that evaluated the security and safety of the BRT in Lagos, Nigeria, a case of Mile 12-Tafawa Balewa Square (TBS), the study involves terms of exposure to risks and problems as it pertained to the riders' experience. Threats and signs of vulnerability at a low level were positively correlated with the distance between BRT bus stops and dwellings or places of employment. The research evaluated only CCTV and other monitoring equipment, focusing on the BRT's exterior factors. The study did not investigate additional BRT safety and security circumstances or elements related to the BRT service that could have influenced respondents' perceptions or modal choice. To increase patronage and improve transportation security, it is helpful to understand commuters' perceptions of the system's safety and security.

In many instances, knowing passengers' opinions on security and safety is as crucial as knowing the BRT's actual state. The attitudes of the people concerned are reflected in perception. The explanatory power and conversations surrounding safety and security are greatly influenced by attitudes and experiences with dangers, as well as traffic orientation. This study therefore examined commuters' transportation patterns and modal choices in Metropolitan Lagos, Nigeria and also identifies factors influencing transportation modal choices in Metropolitan Lagos, Nigeria.

1.2 The Study Area

In Lagos, Nigeria, there is a thriving neighbourhood called Oshodi. It is renowned for its thriving transit system and is one of the city's main transport hubs. A few years ago, Oshodi was a maelstrom of heavy, uncontrollable traffic, a symbol of Lagos' rapidly expanding population, and a sobering reminder of the necessity of an extensive transit network to accommodate the demands of the city's more than 20 million residents. It was also a nightmare for those entangled in the city's underbelly. Oshodi was a fitting metaphor for traffic congestion and uncertainty during its scary, nerve-wracking, and dismal heyday.

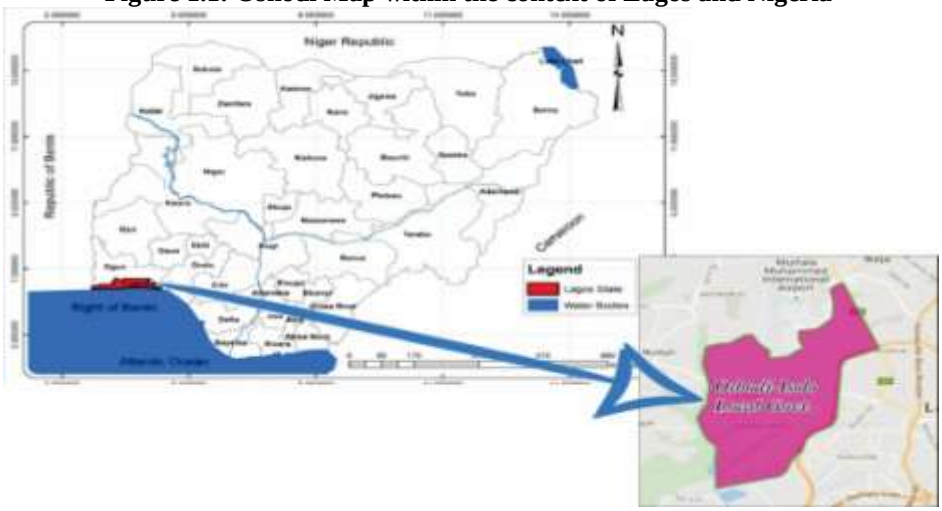
Oshodi is a significant location in Lagos State that residents and visitors across the state frequent. With thousands of buses loading daily, it is the busiest transportation junction in Nigeria. Every day, new bus terminals are constructed in the city, giving Lagos a distinctive architectural character and aesthetic appeal. The Oshodi interchange is the largest and best-known of them. To enable Lagos to function like other megacities in the industrialised world, the government constructed several bus terminals, including the Ikeja Bus Terminal, Berger Bus Terminal, Yaba Bus Terminal, Oyingbo Bus Terminal, and Race Cross Bus Terminal; Oshodi Bus Terminal is the most notable among them.

The Lagos-Apapa Motorway and the Agege Motor Road cut across the Oshodi Bus Terminal, which opened for business in May 2019. Terminals 1, 2, and 3 comprise the terminal's three sections. Loading bays, ticketing booths, driver lounges, parking lots, bathrooms, and several other amenities are available at each bus station. This transport interchange with distinct terminals altered public transit in the state. Drivers, commuters, and residents have anticipated greater benefits from the long-term operation of the Oshodi Transport Interchange in addressing traffic, environmental, and security issues in and around the Oshodi region.

One of Lagos's main transit hubs is the transport intersection. A hub for several bus routes in the city, including Ikorodu Road, Yaba, Mile 2, Lagos Island, and Agege Motor Road, this contemporary bus terminal serves as a modern bus station. The terminal was built to reduce traffic and boost the effectiveness of the local bus system. A fully integrated BRT system operates within the interchange. Numerous lines of the Lagos BRT system travel through Oshodi. The terminal is also equipped with additional options such as shared taxis and minibuses. For short-distance travel within the neighbourhood and its environs, these cars provide a convenient and reasonably priced mode of transportation.

The Lagos train system is also linked to the Oshodi interchange. Train services that stop at Oshodi are operated by the Nigerian Railway Corporation, providing passengers traveling to various regions of Lagos with an additional mode of transportation. Inaugurated by President Bola Hamed Tinubu on September 4, 2024, the Lagos Red Line was built to improve communication between various sections of Lagos. The Oshodi terminal is connected to the Red Line rail network. This 37-kilometre North-South rail line connects Agbado to eight stations: Agbado, Iju, Agege, Ikeja, Oshodi, Mushin, Yaba, and Ebute Metta. The Oshodi Terminal 3 is a transport interchange for bus and train routes. Oshodi is at the intersection of major roads, including the Lagos-Abeokuta Expressway and Western Avenue. These roads connect Oshodi to different parts of Lagos and facilitate the movement of private and commercial vehicles. There is a transit interchange for bus and train lines at Oshodi Terminal. Significant thoroughfares like the Lagos-Abeokuta Motorway and Western Avenue converge near Oshodi. These highways facilitate travel by private and commercial vehicles between Oshodi and other areas of Lagos.

Figure 1.1: Oshodi Map within the context of Lagos and Nigeria



Source: Researcher output, 2025

Figure 1.2: Aerial view of Oshodi Transportation Interchange

Source: Planet Project, 2019

II. LITERATURE REVIEW

2.1 Conceptual Framework

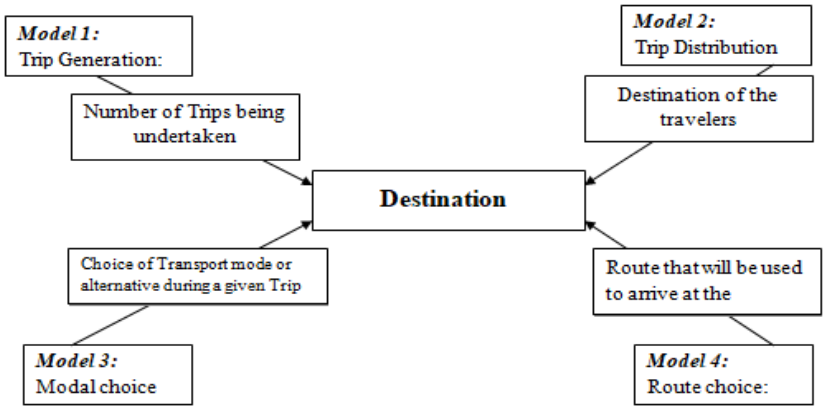
2.1.1 Modal Choice

The term "modal choice" refers to how travelers prefer to commute. As a result, it is a decision-making process that entails selecting a mode of transportation from among various options. This is due to several factors, including individual socio-demographic factors, spatial characteristics, and socio-psychological factors (Witte et al., 2013). According to González and Suarez (2013), it typically results from a complex decision-making process that integrates objective and subjective factors across several interconnected fields. Traveller characteristics such as age, income, gender, literacy, and household size; travel mode characteristics such as cost, time, convenience, safety, and security; and built environment characteristics are factors that influence modal choice in the empirical literature (Munshi, 2016).

According to Madhuwanthi, Marasinghe, Rajapakse, Gharmawansa, and Nomura (2015), one of the most traditional models in transportation planning is the choice of travel mode. Traditionally, Transportation Planning divides travel behaviour into four parts using a Model called the Four-Step Model (Ortuzar & Willumsen, 2011), which are presented as follows:

i. **Trip Generation:** The Model deals with how many Trips are being undertaken by people using public or Private Transport within a given period of time.
ii. **Trip Distribution:** It is concerned with the destination of the travellers for every trip undertaken.
iii. **Modal choice:** This involves the choice of Transport mode or alternative during a given Trip.
iv. **Route choice:** This involves the route that will be used to arrive at the Traveller's destination (Yadav et al., 2021).

Figure 2.1: Traditional Four-Step Transportation Model



Source: Researcher Output, 2025, adopted from Yadav et al., 2021

Each of the four is a crucial component of mode selection and transportation planning. The third factor in the model, modal choice, will be the primary focus of this investigation. The decision to utilise a specific mode of transportation in an urban setting is neither static nor random; rather, it is a modal choice. In any metropolitan region, the mobility offered by the transport system is crucial to social well-being and business operations (Akinde & Olasokan, 2019). However, commuter annoyance include long commutes, lost productivity, higher accident and motor insurance rates, high fuel consumption, high transportation expenses, and environmental degradation are all consequences of persistent traffic congestion. Public transit is receiving greater attention due to the country's growing population, worsening traffic, and environmental and energy challenges in many urban and suburban regions.

2.2. EMPIRICAL REVIEW

Globally, faster industrialisation has raised incomes, accelerated growth rates, and raised the need for mobility. Congestion and environmental issues associated with increased car ownership in cities lead to traffic disruptions, including delays and accidents, which collectively cause significant annual financial losses. Given the comfort level of mass transit facilities, encouraging private-vehicle users to use mass transit appears to be a solution, but it is not always feasible. Researchers have conducted studies to examine the relationship between mode choice and the factors that influence it, with the aim of improving transportation conditions. Environmental factors such as waiting times and transportation costs can also affect an individual's mode choice.

Madhuwanthib et al. (2016) identified trip characteristics as a factor influencing mode choice. Tour complexity significantly affects mode choice, according to researchers such as Ho & Mulley (2013). The preferred mode of commuting is primarily determined by residential location, neighbourhood type, and urban form (Akinde & Olasokan, 2019). In many parts of the world, commuting to work constitutes a substantial share of everyday urban travel. Commuter mobility to and from work accounts for the majority of citywide movement, and it is more pronounced during peak periods. Which method most workers choose to utilise is a significant question frequently addressed in studies of commutes to work. Transport modes are the means by which people move goods and services, and they can be classified into three main categories: air, sea (shipping), and land (road, rail, and pipeline). People who commute face challenges because the variety of transportation options makes it difficult to access effective transit. This is because people must make a difficult choice about the most appropriate mode of transportation for their commute.

In urban transport, commuters' modal choice is a complicated phenomenon. It is a key determinant in the contemporary transportation sector. Conventional traffic procedures are thought to be predicated on the idea that travellers minimise their travel time or distance and typically employ fundamental indicators of travel imprudence, such as travel time, distance, cost, generalised travel, and other factors (Akinde & Olasokan, 2019). Researchers have shown that most urban dwellers' intra-urban mobility needs cannot be met by a single mode of transport, particularly in areas such as Lagos State, where the geography is dominated by land and water (Yakubu et al., 2023). A modal split is required to distribute the total number of journeys among modes of transport, and, if successful, it would undoubtedly reduce traffic congestion on a given route. In their research on traffic delays in Ibadan, Oladejo et al. (2024) found that traffic delays can reduce traffic volume on roadways.

Urban mobility has been studied from a variety of perspectives by the academic and scientific communities, as well as by other research and development initiatives. In a study on the relationship between land use and spatial planning, Oyeyemi et al. (2025) helped to clarify how much the residential environment's spatial structure and planning can explain mobility in general and the mode of transportation in particular, as well as which planning and traffic management factors are important in this regard. Their study showed that features of the spatial environment directly affect mobility and the transportation modes people choose.

Nwankwo and Baridoma (2019) investigated essential variables influencing the choice of public transport modes in Nigeria's Abuja Federal Capital Territory. The study identified four main criteria influencing commuters' choice of public transport and, consequently, their adoption of it in the Federal Capital Territory (FCT) of Abuja, Nigeria. The study found several vital elements were critical to increasing commuters' access to public transport in the Federal Capital Territory (FCT), including walking distance to bus stops/terminals, public transport pricing, comfort, dependability, and adherence to predicted departure and arrival times. The report suggests that the Federal Capital Territory's public transport planning and management objectives include ongoing service-level improvement. The quality of life, overall productivity, and territorial growth may all be impacted by transportation, making the adoption of these ideas crucial.

Oloye and Oloruntoba (2022) examined workers' commuting expenses in metropolitan Lagos and mode choice. Despite the enormous potential these modes of transport offer in the study area, the study reveals that most Lagos residents do not commute by train, and a larger proportion do not commute by ferry. As a

result, road transport is the predominant mode of commuting in the metropolis, with attendant negative consequences. It is now suggested that politicians increase their efforts to create an easily accessible network of metro line train systems for reasonably priced worker mass transit. The study advice is based on the idea that the working poor's ability to move about economically and choose their mode of transportation is heavily influenced by their availability of inexpensive transportation alternatives. As a result, sufficient funding must be allocated to all forms of public transport, including road, rail, and inland waterways. Doing so will ensure the most cost-effective mass worker mobility and high-quality environmental sustainability and will create a well-balanced transport system within Lagos' urban area.

Hansson et al. (2019) examined user preferences for regional public transit in a literature study. The study investigated passenger preferences. Commuters frequently cite comfort, reliability, regularity, trip duration, and network coverage as top priorities. There are some recommended significant variations in local public transit. First and foremost, comfort on board is a top concern for regional passengers, and it becomes increasingly critical as trip duration increases. Secondly, because regional public transport networks are more scattered, network coverage and coordination are more noticeable characteristics of regional public transport.

It has been determined that the catchment regions for high-quality regional public transport services suitable for bicycling and walking can be significantly more significant than the often anticipated 400 or 800-meter radius. These distinctions and the fact that regional public transportation requirements usually differ considerably from those of local and interregional public transportation lend credence to the classification's ongoing usage in public transportation studies. According to the research, the influence of trip length or travel duration should also be included within each area. Research indicates that trains are often preferred to buses. For this reason, the research recommends further developing and assessing bus designs influenced by trains.

The Modal Choice Behaviour of Commuters in Ibadan, Oyo State, Nigeria, was examined by Olayinka (2021). The findings show that mode replacement depends on the properties and efficiency of each transport mode. Compared with the other two local government districts, travel time and safety from Ibadan-North are more significant determinants of modal choice. The study highlights the key variables that influence travellers' decisions to choose private or public transport from their starting point to their destination. Fewer people use private automobiles when maintenance costs are higher. Additionally, each determining element is substantially linked to the others. The study advises the Oyo State (Ibadan zone) administration to advance the development and promotion of alternative modes of transport within the state. For a work trip in the study, this would reduce traffic congestion and provide passengers with alternatives to the study's efficient modes of transportation; the authority should better use and coordinate these modes to ensure greater efficiency in service delivery.

2.2.1 Modal Choices in Lagos

Figure 2.2: Unregulated Yellow Bus Transportation Systems

Source: Lagos Metropolitan Area Transport Authority (LAMATA), 2025

Figure 2.3: Unregulated Yellow Bus Transportation Systems

Source: LAMATA, 2025

Figure 2.4: Blue Rail Transportation System

Source: LAMATA, 2025

Figure 2.5: Blue Rail Transportation System

Source: LAMATA, 2025

Figure 2.6: Red Rail Transportation System

Source: LAMATA, 2025

Figure 2.7: Red Rail Transportation System

Source: LAMATA, 2025

Figure 2.8: Bus Rapid Transit (BRT) Transportation System

Source: LAMATA, 2025

Figure 2.9: Bus Rapid Transit (BRT) Transportation System

Source: LAMATA, 2025

Figure 2.10: Lagos Ferry Transportation System

Source: LAMATA, 2025

Figure 2.11: Lagos Ferry Transportation System

Source: LAMATA, 2025

Figure 2.12: Last-mile transportation system

Source: LAMATA, 2025

2.3 Theoretical Framework

2.3.1 Prospect theory

Daniel Kahneman and Amos Tversky first proposed prospect theory in 1979. It is a behavioural economic theory that examines how individuals make risky and uncertain decisions. It calls into question standard economic theories that assume individuals act rationally to maximize utility. Prospect theory describes how humans make decisions when faced with unknown outcomes. Its key benefit is that it explains why humans frequently make decisions that differ from the best option. The idea claims that each choice involves two steps. First, an editing step is performed to streamline the options under consideration. This technique may include deleting improbable occurrences (or treating highly probable events as certain) and removing characteristics that several events share to focus on their distinctions. In the second step, the possibilities are assessed based on the subjective value assigned to each outcome, and a decision is made. Prospect theory's explanatory strength stems from the likelihood and value assigned to each possibility, particularly when people are inclined to make suboptimal choices.

III. Methodology

The quantitative research methodology of this study made the use of population sampling methodologies necessary. Commuters and drivers working in Lagos State's Oshodi neighbourhood, which was the research site, made up the study population. The population of Oshodi–Isolo Local Government Area is predicted to be 931,300. We used a finite population correction (FPC) to find a suitable sample frame. A statistical adjustment called the FPC is applied when taking samples from a known and limited population. In light of this modification, the estimated sample size for the study was 384.8, rounded to 385 participants. Because of the respondents' availability, accessibility, and closeness to the researcher, a convenience sample strategy was used. Data gathering involved both direct field observation and the distribution of questionnaires. Detailed field notes outlining the salient characteristics of transportation hubs and their environs were used to capture observational data. A Global Positioning System (GPS) device was used to gather the geographic coordinates of pertinent areas in order to facilitate spatial analysis and map creation.

A reconnaissance survey was carried out before the main survey to acquaint the researcher with the subject region and to locate important commercial bus terminals and transportation routes. This step involved gathering the GPS coordinates of important locations, which were then utilised to create maps that aided in the interpretation of the data. In addition to direct observation of transportation-related activities within the research region, respondents were given standardised questionnaires to complete in order to gather primary data. By creating structured questionnaires based on the goals of the study and the conclusions drawn from the literature analysis, instrument validity was guaranteed. The instrument's ability to collect the variables pertinent to the study challenge was guaranteed by this method. To evaluate the validity and reliability of the questionnaire, a subset of the intended audience was used for pre-testing. Before the instrument was fully administered, the pre-test feedback helped to improve it and fix any issues that were found.

Cronbach's alpha values, which range from 0.70 to 0.90 according to reliability study, showed that the measuring items' internal consistency was acceptable to high. As per established standards, an alpha value of 0.70 or above is deemed adequate for assessing the dependability of survey tools. The data was analysed using both descriptive and inferential statistical methods. Minitab 16, Microsoft Excel 2019, and the Statistical Package for the Social Sciences (SPSS) version 23 were used to code and analyse survey data. The travel characteristics of commuters in various regions were compiled using descriptive statistics, such as frequency distributions and graphical representations. The study hypotheses were tested through the use of logistic regression in inferential analysis. In order to evaluate the likelihood of particular modal choice outcomes and to model the link between several independent factors and a categorical dependent variable, logistic regression was employed.

Additionally, the creation of themed maps using GPS data improved spatial analysis. Conjoint analysis was used to better investigate commuter preferences and sensitivity to characteristics of the mode of transportation. A reliable statistical method for evaluating preference structures and trade-offs between characteristics impacting decision-making is conjoint analysis. It has been widely used in a variety of industries, including consumer products, services, and travel behaviour research, and it allows transportation studies to identify the relative relevance of factors influencing modal choice decisions.

IV. Research Findings

A combination of descriptive statistics, Exploratory Data Analysis (EDA), reliability and validity assessments, factor analysis, conjoint analysis, and multinomial logistic regression was employed to achieve the research objectives. A total of 637 responses were initially retrieved from the field survey. After a thorough screening process, 630 questionnaires were deemed complete and suitable for statistical analysis. The respondents comprised both male and female commuters drawn from various age groups, occupational categories, and socioeconomic backgrounds within the metropolitan transport system.

4.1 Socio–Demographic Characteristics of Respondents

Table 4.1 presents the socio–demographic characteristics of the respondents, including their residential status, gender, age group, highest educational qualification, marital status, occupation, monthly income, vehicle ownership status, and type of vehicle owned.

Table 4.1: Socio–demographic characteristics of respondents (n = 630)

Variable	Frequency	Percent
Division of residence		
Ikeja	225	35.7
Badagry	186	29.5

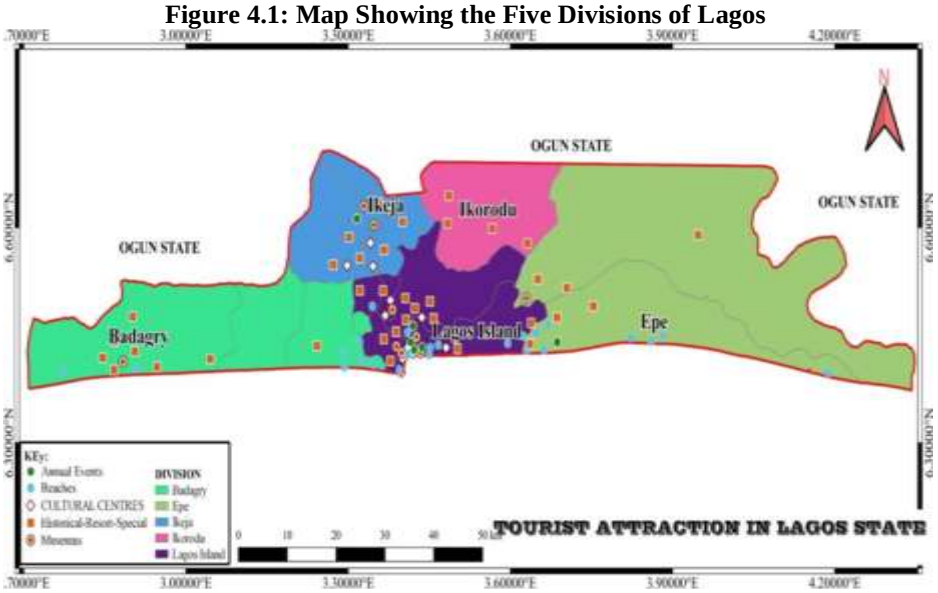
Ikorodu	198	31.4
Lagos Island	21	3.3
Total	**630**	**100**
Gender		
Male	423	67.1
Female	207	32.9
Total	**630**	**100**
Age group (years)		
Below 20	3	0.5
21–29	27	4.3
30–39	14	18.1
40–50	67	42.4
Above 50	19	34.8
Total	**630**	**100**
Highest qualification		
Secondary School Certificate	12	1.9
National Diploma	42	6.7
University Degree or HND	201	31.9
Postgraduate	375	59.5
Total	**630**	**100**
Marital status		
Single	78	12.4
Married	531	84.3
Widowed/Widower	21	3.3
Total	**630**	**100**
Occupation		
Unemployed	18	2.9
Self–employed	108	17.1
The private sector employed	114	18.1
Civil servant	362	57.6
Retired	27	4.3
Total	**630**	**100**
Monthly income (Naira)		
Below 100,000	75	11.9
101,000–300,000	345	54.8
301,000–500,000	138	21.9
Above 500,000	72	11.4
Total	**630**	**100**
Vehicle ownership		
Owns vehicle	375	59.5
Does not own	255	40.5

Total	**630**	**100**
Type of vehicle owned.		
Motorbike	15	2.4
Tricycle	81	12.9
Car	516	81.9
Bus	3	0.5
Truck/Trailer	15	2.4
Total	**630**	**100**

Source: Researcher output, 2025

The results indicate that respondents are predominantly residents of Ikeja, Ikorodu, and Badagry, consistent with the study area's spatial focus. The sample is male-dominated and composed mainly of middle-aged, economically active individuals with high levels of educational attainment. Although a majority own vehicles, the continued reliance on public transport underscores the structural importance of collective transport systems in metropolitan Lagos.

Figure 4.1: Map Showing the Five Divisions of Lagos



Source: Researcher Output, 2025

4.2 Transportation Patterns and Modal Choice

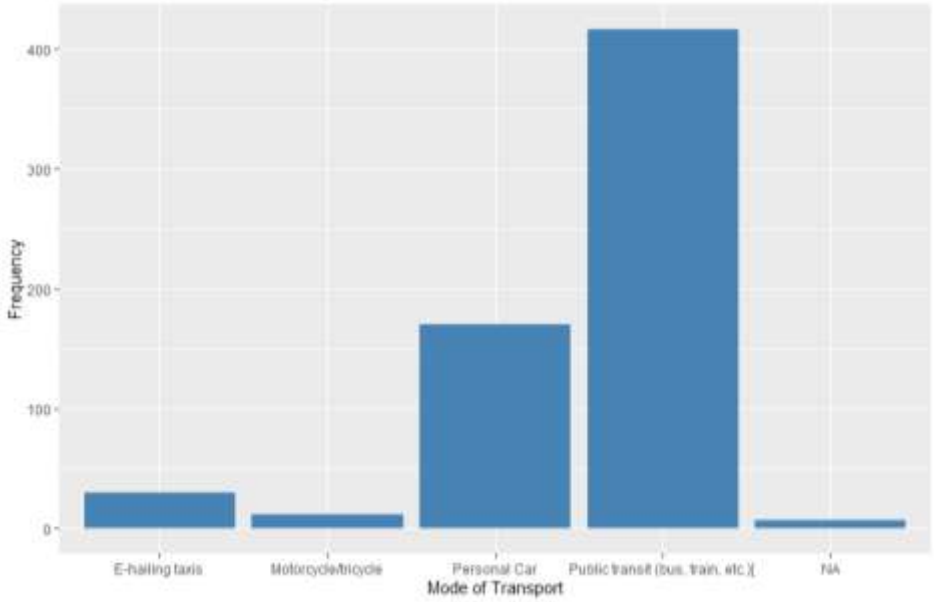
To examine commuters' transportation patterns and modal choices in Metropolitan Lagos, Nigeria, frequency distributions, bar charts, and the chi-square test of association were used. Table 4.2 presents the frequency and proportional distribution of commuters' modal choice in Metropolitan Lagos, while Figure 4.2 provides a graphical illustration. The results clearly show that Public Transit (bus, rail, BRT, etc.) is the dominant mode of transportation among respondents.

Table 4.2: Distribution of Commuters' Modal Choice in Metropolitan Lagos

Mode of Transport	Frequency	Percentage (%)
E-hailing Taxis	30	4.76
Motorcycle/Tricycle	12	1.90
Personal Car	171	27.14
Public Transit (Bus, Train, etc.)	417	66.19
Total	**630**	**100**

Source: Researcher output, 2025

Figure 4.2: Chart showing modal choice distribution among Commuters in Lagos



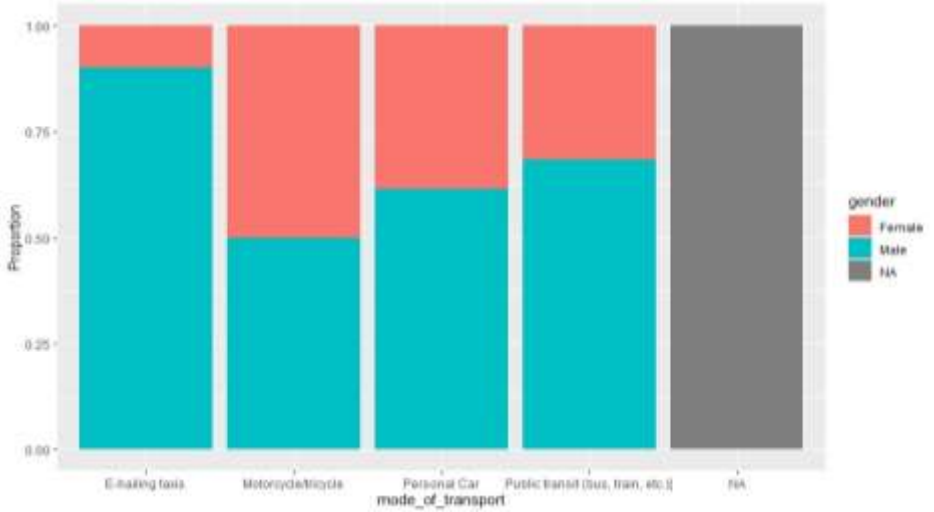
Source: Researcher output, 2025

The results indicate that Public Transit is overwhelmingly the most utilised mode of transportation, accounting for approximately 66% of total responses. This reflects the heavy reliance on mass transit systems, including Bus Rapid Transit (BRT), conventional buses, and rail services, in Metropolitan Lagos. The high patronage of public transit may be attributed to affordability, wider accessibility, and increasingly structured transport reforms implemented by government agencies recently.

Personal car usage ranked second at approximately 27%, suggesting that although private vehicle ownership remains prevalent, rising fuel costs, congestion, parking challenges and maintenance expenses may discourage greater reliance on personal automobiles. This aligns with national economic realities and urban mobility dynamics in Lagos. Only about 4.8% of respondents reported using E-hailing taxis. Despite their perceived comfort and convenience, their relatively higher cost compared to public transit may limit widespread adoption. Motorcycle and tricycle usage was the least reported (1.9%), which may be linked to government restrictions, safety concerns, and regulatory bans on operations in major city corridors. Hence, the findings suggest that Metropolitan Lagos remains mainly dependent on public transport. This has important implications for transport planning, infrastructure expansion, investment in safety, and the prioritisation of security policy. Enhancing the safety, reliability, and efficiency of public transit systems would significantly influence commuter satisfaction and sustainable mobility outcomes in the metropolis.

Relationship between Gender and Modal Choice

Figure 4.3: Gender Distribution across Modal Choice in Metropolitan Lagos



Source: Researcher output, 2025

Figure 4.3 presents the proportional distribution of modal choice across gender categories in Metropolitan Lagos. The plot illustrates the extent to which male and female commuters differ in their travel-mode choices. The chart indicates that male commuters dominate most modes of transport, particularly public transit and personal car use. However, female participation remains significantly higher across modes, with notably higher proportions in motorcycle/tricycle and e-hailing taxi use relative to males. This suggests perceived comfort, convenience, and safety considerations influence gender preferences.

4.3 Statistical Test of Association

To statistically assess whether gender and modal choice are independent, Pearson's Chi-square test of association was conducted. The result is shown below:

Pearson Chi-square: $\chi^2(3) = 11.53$, $p = 0.009$

Since the p-value is less than 0.05, the null hypothesis of independence is rejected. This indicates a statistically significant association between gender and modal choice in Metropolitan Lagos. Therefore, gender plays an important role in determining the choice of transport mode among commuters. The result implies that modal choice is not purely random or uniform across genders. Male commuters are more likely to use public transport and personal vehicles. In contrast, females show a slightly greater preference for modes perceived as safer and more controlled, such as e-hailing taxis. This aligns with existing transport literature, which suggests that women are more sensitive to personal security, risk of harassment, travel reliability, and environmental comfort. In contrast, men exhibit greater tolerance for travel risk and congestion.

The chi-square test indicated that the approximation may be inaccurate due to minor expected frequencies in some modal categories. However, the sample remains sufficiently large, and the inference is still reliable. Based on both graphical evidence and inferential testing, it is concluded that gender significantly influences modal choice in Metropolitan Lagos. This finding concludes that commuters in Metropolitan Lagos, Nigeria, do not exhibit specific transportation patterns or modal choices. The primary mode of transport identified is public transport, which is predominantly used by male commuters.

4.4 Determinants of Modal Choices

To identify factors influencing transportation modal choices in Metropolitan Lagos, Nigeria, a multinomial logistic regression model was estimated to assess the determinants of modal selection. Findings indicated that income, age, gender, and perceived safety significantly influenced modal preference. Commuters with higher safety perception were more likely to select organised public transit alternatives. These findings align with theoretical expectations and previous literature, which emphasised the influence of socioeconomic and perceptual determinants on transport decisions.

4.4.1 Multinomial Logistic Regression Results

Table 4.3 presents the model diagnostics, while Tables 4.4 and 4.5 show the estimated coefficients, standard errors, z-statistics, and p-values for the multinomial logistic regression model explaining commuters' modal choice in Metropolitan Lagos.

Table 4.3: Model Fit Statistics for Multinomial Logistic Regression

Statistic	Value
Residual Deviance	1008.682
Akaike Information Criterion (AIC)	1050.682

Source: Researcher output, 2025

Table 4.4: Multinomial Logistic Regression Estimation for Modal Choice

Mode (Relative to Baseline)	Coefficient	Std. Error	p-value
Motorcycle/Tricycle			
Intercept	2.3483	1.9035	0.0231
Gender (Male)	-2.0104	0.853	0.0184
Age	-0.1301	0.4792	0.6541
Income	-1.3008	0.5526	0.0186
Safety – Important	1.3997	0.8364	0.0942
Safety – Indifferent	1.7070	1.0613	0.1077

Safety – Less Important	-10.0853	0.00004	0.0010
Personal Car			
Intercept	3.9498	1.1898	0.0010
Gender (Male)	-1.6956	0.6333	0.0074
Age	-0.1167	0.2599	0.6789
Income	-0.3915	0.1842	0.0335
Safety – Important	0.7497	0.4621	0.1047
Safety – Indifferent	-0.0738	0.7255	0.7900
Safety – Less Important	0.226	0.7102	0.8810
Public Transit			
Intercept	6.1923	1.1484	0.0010
Gender (Male)	-1.3554	0.6230	0.0296
Age	-0.5114	0.2468	0.0383
Income	-0.4297	0.1738	0.0134
Safety – Important	0.1365	0.4444	0.7587
Safety – Indifferent	0.2424	0.6702	0.8900
Safety – Less Important	-0.5459	0.6837	0.7910

Source: Researcher output, 2025

The multinomial logistic regression model was statistically meaningful, as shown by the satisfactory residual deviance and AIC values. Gender was a significant predictor across transport modes, indicating that males were less likely than females to choose motorcycles or tricycles, personal cars, or public transit. Income was also significant across most categories, suggesting that economic status plays a crucial role in determining transport mode. Age significantly influenced the preference for public transit, suggesting that younger commuters may be more flexible in their modal choice.

Safety perception variables revealed mixed significance. The "Less Important" category showed a substantial adverse effect for motorcycles and tricycles, suggesting that passengers who place little value on safety completely avoid these modes. Overall, the results confirm that socio-demographic characteristics and safety perceptions significantly influence modal choice in Metropolitan Lagos.

4.4.2 Conjoint Analysis of Factors Influencing Modal Choice

To deepen the analysis of determinants of modal choice beyond traditional regression modelling, a Choice-Based Conjoint (CBC) analysis was conducted. The technique assumes that commuters evaluate transport alternatives as a bundle of attributes and make trade-offs when selecting their preferred travel mode. Attributes included in the conjoint model were fare, travel time, comfort, and safety an orthogonal fractional factorial design generated hypothetical choice scenarios that respondents evaluated. A rating-based conjoint analysis was estimated using ordinary least squares (OLS) regression to decompose commuters' preferences for hypothetical transport profiles into part-worth utilities. The dependent variable is the rating assigned to each transport profile, while the explanatory variables represent the attribute levels for cost, travel time, safety, security, comfort, and availability.

The estimated regression model is specified as:

$$Rating_i = \beta_0+\beta_1 Cost_i+\beta_2 Time_i+\beta_3 Safety_i+\beta_4 Security_i+\beta_5 Comfort_i+\beta_6 Availability_i+\varepsilon_i \quad (1)$$

Table 4.5: OLS Conjoint Regression Results

Variable	Estimate	Std. Error	t-value	p-value
Intercept	4.667	0.051	91.376	0.001
Cost (Medium)	0.333	0.102	3.263	0.001
Cost (High)	0.000	0.072	0.000	1.000

Time (60 minutes)	−1.000	0.102	−9.790	0.001
Time (90 minutes)	−3.333	0.072	−46.152	0.001
Safety (Medium)	0.000	0.125	0.000	1.000

If $p < 0.05$, then the test is significant.

Table 4.5 presents the estimated coefficients from the conjoint regression model. The model exhibits high explanatory power, with an R2 of 0.907 and an adjusted R2 of 0.906, indicating that more than 90% of the variation in commuters' ratings is explained by the included transport attributes. The overall model is statistically significant ($F = 835$, $p < 0.05$), confirming the joint relevance of the explanatory variables. The estimated intercept of 4.667 represents the baseline rating associated with the reference transport profile. This relatively high baseline suggests that respondents generally evaluated the hypothetical transport options favourably. With respect to transport cost, the coefficient for the medium-cost level is positive and statistically significant ($\beta = 0.333$, $p < 0.05$), indicating that, relative to the reference cost category, moderate pricing is associated with a higher commuter rating.

In contrast, the high-cost level is not statistically significant, implying that higher fares do not yield additional utility when other attributes are controlled for. Travel time emerges as the most influential attribute in the conjoint regression. The coefficient for a 60-minute travel time is negative and highly significant ($\beta = -1.000$, $p < 0.05$). At the same time, the coefficient for a 90-minute travel time is substantially larger in magnitude and also highly significant ($\beta = -3.333$, $p < 0.05$). These results demonstrate a strong and monotonic disutility associated with increasing travel duration, confirming that commuters strongly penalise longer travel times when evaluating transport alternatives.

The safety-related coefficients are either statistically insignificant or not estimable due to singularities. This outcome does not imply that safety is unimportant to commuters. Instead, it indicates that safety attributes may be perceived as baseline or non-compensatory requirements that do not vary sufficiently across the evaluated profiles to generate identifiable marginal effects in the conjoint trade-off structure. Similar reasoning applies to the security, comfort, and availability attributes, whose coefficients were not separately identifiable due to perfect collinearity or reference-category coding.

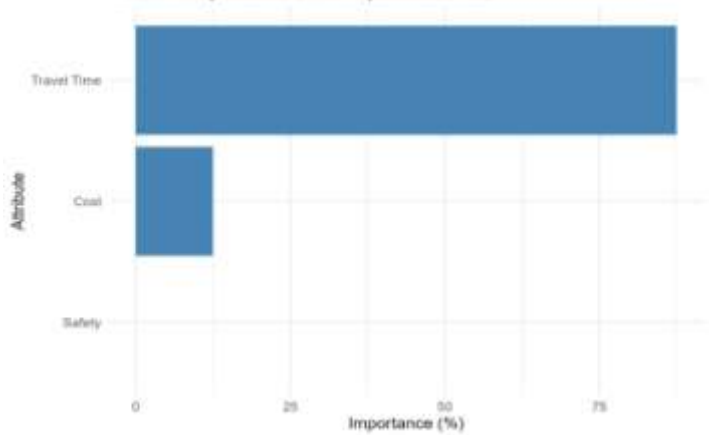
The conjoint regression results reinforce the earlier relative-importance findings by demonstrating that travel time is the dominant driver of commuters' preferences, followed by cost considerations. Safety and security concerns, while substantively important, appear to operate through alternative behavioural mechanisms, such as mode avoidance or threshold-based decision-making, which are better captured by complementary analytical approaches, including logistic regression and structural models.

Table 4.6: Relative importance of transport attributes

Attribute	Importance (%)	Rank
Travel Time	85.0	1
Cost	15.0	2
Safety	0.0	3

Source: Researcher output, 2025

Figure 4.4: Relative Importance of Transport Attributes



Source: Researcher output, 2025

The results, as illustrated in Figure 4.4 above, clearly show that travel time dominates commuters' preference structure, accounting for 85% of the explained variation. Cost plays a secondary role, while safety exhibits negligible marginal importance within the conjoint trade-off framework. This does not diminish the substantive importance of safety; instead, it suggests that safety is perceived as a baseline requirement rather than a compensatory attribute. Results revealed statistically significant part-worth utilities for all attributes, indicating their contribution to commuters' modal choice. Safety recorded the highest positive utility, indicating that commuters strongly prefer modes perceived as secure. Travel time was the second most influential attribute, followed by fare, while comfort had the least influence, though it remained relevant.

Attribute importance analysis indicated that safety accounted for the largest share of decision weight, confirming that perceived security remains the dominant consideration in travel mode selection in Lagos. This validates earlier regression findings and reinforces evidence that security and safety concerns are critical motivational factors in modal choice. Results revealed diverse modes of transport, including Bus Rapid Transit (BRT), rail, ferry, private vehicles, motorcycles, tricycles, and walking. The descriptive distribution showed that road-based transport remains dominant. Cross-tabulation indicated that gender and age significantly influenced modal selection. A chi-square test confirmed a significant association between commuters' socio-demographic characteristics and transportation patterns.

4.4.3 Implications of the Conjoint Regression Findings

The strong adverse effects associated with longer travel times underscore the importance of transport policies that prioritise congestion reduction, network efficiency, and travel reliability in Metropolitan Lagos. Measures such as dedicated lanes, improved traffic signal coordination, and enhanced public transport operations are likely to yield substantial behavioural responses from commuters.

Furthermore, the limited marginal effects of safety and security attributes within the conjoint framework suggest that these factors should be addressed alongside efficiency-enhancing interventions rather than in isolation. Integrating safety improvements with policies that reduce travel time may therefore offer the most effective strategy for influencing commuters' modal choice behaviour. A rating-based conjoint analysis was conducted to examine commuters' trade-offs among key transport attributes. Figure 4.4 presents the relative importance of the attributes derived from the conjoint model, while Table 4.6 provides the corresponding numerical values.

V. Summary of Findings

The report provides important new information about Metropolitan Lagos's mode choice behaviour and transportation trends. The results show that public transportation, which includes rail systems, buses, and bus rapid transit (BRT), clearly dominates commuter travel. Together, these modes of transportation account for around 66% of commuter trips. Despite the rising prevalence of private car ownership, this emphasises the structural importance of public transportation in Lagos' urban mobility system. The data also shows that sociodemographic traits have a big impact on modal choice decisions. Age, income, and gender are among the variables that show statistically significant impacts. Male commuters make up a greater share of all commuters, especially when it comes to using private vehicles and public transportation, whereas female commuters show a greater preference for means of transportation that are seen as safer and more regulated, most notably e-hailing cab services.

Perceptions of safety and security turn out to be a deciding element in modal choice, especially when it comes to discouraging the use of tricycles and motorbikes. Regression findings suggest that safety is a threshold condition rather than a negotiable feature, despite the fact that safety qualities have little marginal effect in the conjoint trade-off analysis. This implies that rather than sacrificing safety in favour of other advantages, commuters often avoid means of transportation that are viewed as risky. The most significant factor influencing modal choice is shown to be travel time. Conjoint research shows that commuters' preference structures place around 85% of their relative value on trip time, with longer travel times producing significant negative utility. This study emphasises how sensitive commuters are to traffic jams, delays, and the general effectiveness of the city's transit system.

Modal selection is also influenced by economic factors, which have a secondary but statistically significant impact. While higher fares reduce preference, especially for e-hailing services, moderate fee levels increase the appeal of transportation options. Furthermore, a statistically significant correlation between gender and mode choice is confirmed by the chi-square test, highlighting the significance of integrating gender-sensitive factors into urban transportation planning and policy development.

VI. Recommendations

Based on the study's findings, the following recommendations are proposed:

1. **Enhance Public Transport Efficiency:** The study therefore suggest that transportation authorities should prioritize measures that reduce travel time, such as dedicated bus lanes, improved traffic signal coordination, and optimized route planning, particularly from Oshodi to high-demand corridors that are yet to be covered.
2. **Strengthen Safety and Security Measures:** The government and its agencies should strengthen safety and security interventions, including surveillance systems in buses, improved lighting, and visible security personnel at terminals and along routes, this should be integrated into transport planning to address commuter concerns, especially for vulnerable groups.
3. **Promote Gender-Sensitive Transport Policies:** Urban transport policies should explicitly account for gendered travel behaviour by improving safety, comfort, and reliability, thereby encouraging greater female participation in public transport usage.
4. **Expand and Integrate Multimodal Systems:** Continued investment in rail, ferry, and BRT systems, alongside effective last-mile connectivity, will reduce over-reliance on road transport and enhance system resilience.
5. **Incorporate Behavioural Insights into Planning:** Transport planning models should integrate behavioural frameworks, such as prospect theory and stated-preference methods, to better capture commuters' perceptions, preferences, and risk sensitivities which will help in transportation planning processes.

VII. Conclusion

The study demonstrates that a complex interaction between sociodemographic variables, safety perceptions, and transport system features determines the mode of transportation used in Metropolitan Lagos. Even if public transit is still the cornerstone of urban mobility, passenger behaviour is mostly influenced by perceived safety and journey time efficiency. The need for inclusive and equitable transport policy is further highlighted by observed gender and income-based inequities.

The results indicate that targeted increases in system dependability and efficiency, along with ongoing expenditures in safety improvements, are necessary to achieve sustainable urban transport outcomes in Lagos. All things considered, the city's growing population, economic expansion, and long-term transport development goals depend heavily on the implementation of a coordinated, multimodal, and user-centred transport framework.

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