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Transport affordability in Dutse: Willingness and ability to pay for public transportation

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ABSTRACT

This study assessed the affordability of public transportation in Dutse, Jigawa State, Nigeria, by examining commuters' willingness and ability to pay (WTP/ATP) across selected socio-demographic groups. A quantitative research design was adopted, using structured questionnaires administered to 400 respondents randomly selected from five wards within Dutse Local Government Area. Data were analysed using descriptive statistics, including frequencies and percentages, with affordability examined by gender, age, educational attainment, occupation, and disability status. The findings show that the ₦151–₦200 ($0.11 - $0.15) fare band was the most selected, accounting for 37.25% of respondents, while 58.5% indicated willingness and ability to pay ₦101 ($0.07) or more per one-way trip. Affordability varied across socio-demographic groups, with women, respondents with primary education, unemployed persons, and some older age groups generally showing lower fare capacity. Only 2.50% of respondents reported zero willingness or ability to pay, suggesting that the principal affordability challenge is the fare level rather than outright unwillingness to use public transport. The study concludes that a fare ceiling around ₦200 ($0.15) may support broad ridership, while differentiated and targeted fare measures could improve equitable access to public transportation in Dutse.

Keywords: Transport Affordability; Willingness to Pay; Ability to Pay; Dutse; Nigeria

Introduction

One of the reasons for a 15-minute city is that most daily necessities and services – home, work, shopping, education, healthcare and leisure – can be easily reached by a 15-minute walk, bike ride, or public transit ride from any point in the city because of transport affordability (Pozoukidou & Chatziyiannaki, 2021). But that is not always the case across the globe. Fan & Huang (2011) define transport affordability from a general point of view and from a context-specific angle. Generally, transport affordability is "the financial burden households bear in purchasing transportation services" (Fan & Huang, 2011; p.3) while the proposed context specific definition defines transportation affordability as a household's capacity to pay transportation costs (monetary and time-based) without incurring financial difficulties and time pressures (Fan & Huang, 2011). However, Litman (2024) defines

transport as affordable when households spend 15% of household budgets to transportation or no more than 45% to housing and transport combined.

Fan & Huang (2011) proposed the context specific definition founded on transport affordability analysis that differentiates population groups based upon their socio-demographics, the local built environment, and the policy environment. This is further elaborated by Van Heerden et al. (2022) where they concluded that transport affordability needs the combined analysis of city planners and decision makers to base policy decisions on. The analysis and decision should be based on household income levels of different regions, opportunity for standard housing and combination of a well-connected transport network.

Transport affordability across the world varies yet have something in common – the ever-increasing demand for mass mobility resulting from rapid population growth and extended urbanisation leading to calls for the provision of good quality, affordable urban public transport services. In Addis Ababa, Ethiopia, Mohammed & Senadheera (2022) concluded that the dual affordability metric of observed and potential affordability can provide an effective basis to improve the affordability of public transport in the city by adopting measures that are customised according to regional characteristics at the sub-city level, similar to Van Heerden et al (2022) conclusion. In Santiago, Chile, while testing how different public transport policy scenarios score in terms of fairness for a specific population group, Vecchio et al. (2024) found out that subsidised fares for public transport services are more beneficial to expand the accessibility of older people, especially those with lower incomes, while the expansion of the Metro network benefits mainly middle- and high-income older people.

In Europe, Dorantes & Murauskaite-Bull (2023) societal changes (Covid-19 pandemic, socio-technical changes in the urban transport sector, climate change, and just transition) have highlighted the possibility to transform the transport system to be sustainable, fair, just, intergenerational and intragenerational friendly and inclusive. This can be done through replacing trips by utilising contemporary ICT/digital services, prioritising active transportation and public transport due to rising private transport costs, and integrating urban development and housing policies. However, Qiao & Yeh (2023) studied the integration of socio-technical changes in the urban transport sector and utilising ICT/digital services in Chengdu, China. They found that ride-hailing is competing with and complementing public transit, but for different purposes and target populations. That is, low- and medium-income households use public transport for affordability but utilise ride-hailing for its flexible travel alternative.

Previous studies have highlighted the need for a socially inclusive, bottom-top and lateral decision on urban transportation. Sanusi et al. (2013) concluded that Jigawa State needs an inclusive decision-making process across all sectors for a just transition. Geels (2012) concludes that climate change and cuts in CO_2 emissions require transitions to new kinds of transport systems necessitating a multi-dimensional and multilevel interactions between industry, technology, markets, policy, culture and society to achieve a just transition in the transport system. These conclusions provided the direction that Ahijo et al. (2026) concludes that urban transportation in Dutse (and other similar cities) should be driven be data that is

unique to the urban area and should be multisectorally integrated and inclusive of multiple social groups in line with the developmental goals of the city in question.

The Ability to Pay (ATP) and Willingness to Pay (WTP) measure two different sides of how passengers interact with transit fares (Wulansari et al. 2017). The ability to pay is an objective, financial measure of what a person or household can afford based on their income and a reasonable budget allocation for transportation while willingness to pay is a subjective, psychological measure of the maximum price a user is prepared to pay for a specific trip, shaped by service quality, personal utility, and perceived value (Sarwandy et al. 2019). That is, ATP is what a user can afford (financial constraint) determined by monthly/daily income and household transportation budget percentage while WTP is what a user chooses or prefers to spend (psychological threshold) determined by service speed, comfort, reliability, time saved, and personal utility. ATP can be measured by calculating household budget surveys and income percentages while WTP can be measured subjectively via contingent valuation, interviews, or stated-preference surveys.

In Nigeria, as in other developing countries, transportation is characterised by traffic, poorly maintained transit infrastructure, limited access to public transportation in communities, and weak intermodal integration affecting home-to-work connections (Aderibigbe et al. 2024). These factors affect transport affordability with the resultant effect on citizen well-being and reduced quality of life. Furthermore, in Abuja, Suleiman & Dahida (2026) mention that affordability constraints persist for low-income users, which can be remedied by equity-sensitive fare reforms that are socially equitable and economically viable. Provision of an equitable transport system is challenging in Abuja, Kaduna, and Lagos as found by Karinatei & Fesmi (2026). Abuja has limited transport services causing high transport costs, Kaduna shows lower affordability than Abuja while Lagos has higher service availability but the highest transport cost. Income inequality, spatial planning gaps, and inconsistent transport regulation are some of the challenges for an equitable transport system in Nigerian cities.

The primary aim of the paper is to assess the affordability of public transportation in Dutse, Jigawa State, Nigeria, by examining commuters' willingness to pay (WTP) and ability to pay (ATP) for transport services. The commuter analysis will be based on different social groups (gender, age group, level of education, occupation, and disability status) within the commuter populace. The specific objectives of the study are:

i. To examine the willingness and ability of commuters to pay for public transportation in Dutse, Jigawa State, Nigeria, and determine the prevailing fare affordability thresholds, and
ii. To assess variations in commuters' willingness and ability to pay for public transportation across selected socio-demographic groups, including gender, age, educational attainment, occupation, and disability status.

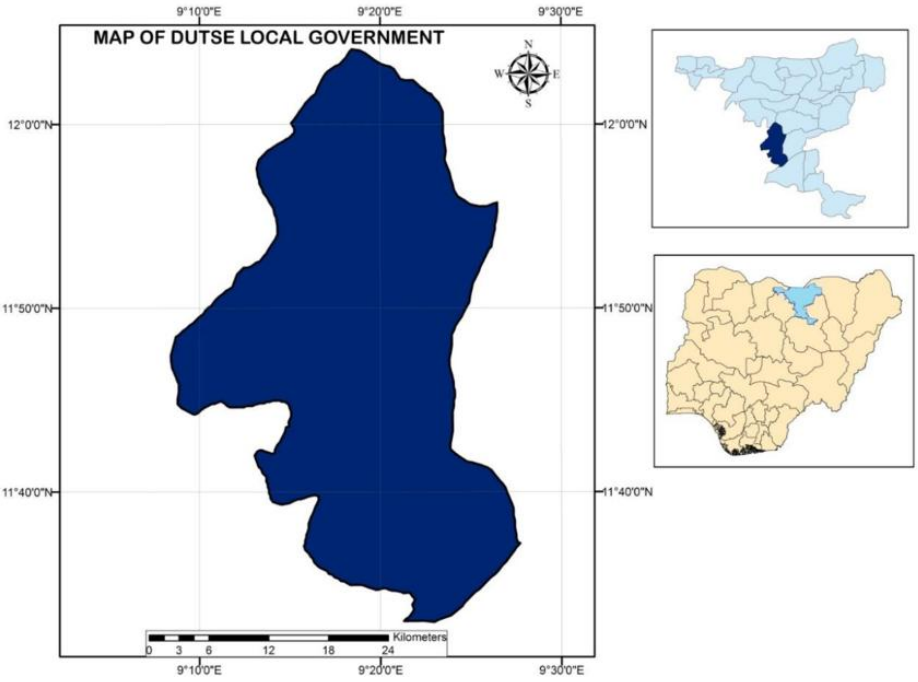
The study seeks to answer the following research questions:

a. What are the willingness and ability of commuters to pay for public transportation in Dutse, and what fare levels constitute acceptable affordability thresholds?

b. To what extent do commuters' willingness and ability to pay for public transportation vary across different socio-demographic groups, particularly gender, age, educational attainment, occupation, and disability status?

Methodology

The research was conducted in Dutse, the capital of Jigawa State, Nigeria. It is primarily accessible via road transport, and its transport infrastructure is dominated by motorcycles and tricycles. According to the population census of Nigeria in 2006, Dutse LGA has a population of 251, 135, and the number of wards in the LGA are 11 (Independent National Electoral Commission, 2019). Dutse is a city in northwestern Nigeria, it is the capital city of Jigawa State, and it is located between latitude 11°45' 22.5° N and longitude 9°20', 20.26° E.



Map Dutse Local Government Area (Source: Kura et al. 2023)

Population estimation

This study adopts quantitative method of research. The data were collected using structured questionnaires, where respondents were provided options to choose from as their answers in the questionnaire. The questionnaire captured demographic information and transport behaviours.

To estimate the population of Dutse LGA in 2026 using its known population in the 2006 population census (251,135) and an annual population growth rate of 2.91% for Jigawa State (2006 census), the Exponential Population Growth Formula (Geometric Growth Method) was used to do the estimate.

Population projection formula is $P_t = P_0 (1 + r)^n$

Where:

P_t = Projected population in the target year (2026)

P_0 = Initial population (2006 population)

r = Annual population growth rate expressed as a decimal.

n = Number of years between the base year and projected year.

2006 population = 251,135, annual growth rate = 2.91%, target year = 2026, baseline year = 2006, number of years = 20 years.

- Convert the growth rate into a decimal: r = 2.91 ÷ 100 = 0.0291
- Determine the number of years: n = 2026 – 2006 = 20 years
- Substitute the values into the formula: $P_{2026} = 251,135 (1 + 0.0291)^{20}$
- Simplify: $P_{2026} = 251,135 (1.0291)^{20}$

P_{2026} = 251,135 X 1.7788 = 446,719.

Therefore, based on an initial population of 251,135 in 2006 and an annual growth rate of 2.91%, the estimated population in 2026 is approximately 446,719 people. Thus, the average population of each Ward in Dutse LGA is:

446,719 ÷ 11 wards = 40,610.81.

Dutse city is within 5 Wards of Dutse LGA. The wards that are within the city limits are: Kachi, Limawa, Jigawa Tsada, Kudai, and Madobi Wards. Hence, the total population size of the study is:

40,610.81 X 5 wards = 203,054.05

Using the Taro Yamane formula (Ikehi *et al*., 2019) with a 95% confidence level, and a 5% margin of error, the sample size is:

$n = N/1 + N(e)^2$

Where,

N= 203,054.05, e (error margin) = 0.05, $n = 203,054.05/ 1 + 203,054.05 (0.05)^2$

= 203,054.05/ 1+ 203,054.05 (0.0025)

= 203,054.05/ 507.63

= 400.00.

n = 400.00; therefore, the sample size is 400.

Thus, 400 questionnaires were distributed to 400 respondents across the 5 wards of Dutse Local Government Area using random sampling. This sample figure represents all population. The questionnaire distribution was undertaken by administering to people at their homes, on transit (foot, motorcycle, tricycle), at major transit stops, and public places.

Data analysis

The data were analysed using SPSS, producing descriptive statistics such as frequencies and percentages. The analysis focused on transport affordability by gender, age groups, level of education, occupation, and disability status. Tables and charts were used to present the findings.

Results and discussion

Fare affordability is a central determinant of whether public transportation can serve as a viable mobility option for a population (Mohammed & Senadheera, 2022), particularly in a growing urban centre such as Dutse. This section presents an analysis of respondents stated willingness and ability to pay (WTP) for a one-way trip on public transportation, drawn from a household/commuter survey of 400 respondents. Respondents were asked to indicate the highest amount they would be able to pay per one-way trip, with response options grouped into six fare bands: ₦0 (unwilling/unable to pay), ₦1–₦50 ($0.00076 - $0.038), ₦51–₦100 ($0.039 - $0.076), ₦101–₦150 ($0.076 - $0.110), ₦151–₦200 ($0.110 - $0.150) – at ₦1 = $0.00076 on 14/10/2026, Central Bank of Nigeria rates – and Not Applicable (respondents who do not use public transportation). The results are disaggregated by gender, age group, level of education, occupation, and disability status to identify how affordability perceptions vary across socio-demographic groups, an approach consistent with standard contingent-valuation practice in transport economics.

Overall willingness and ability to pay

Table 1 and Figure 1 present the aggregate distribution of stated WTP across all 400 respondents. The modal response was the ₦151–₦200 fare band, selected by 37.25% of respondents (n = 149), followed by ₦101–₦150 (21.25%, n = 85) and ₦51–₦100 (15.50%, n = 62). Cumulatively, 58.5% of respondents indicated a willingness to pay ₦101 or more per trip, suggesting that a majority of the sampled population can accommodate fares in the upper half of the range tested. At the lower end, only 2.50% of respondents (n = 10) reported being unwilling or unable to pay any amount, while 9.25% indicated the question was not applicable to them (i.e., non-users of public transportation). The comparatively small proportion expressing zero willingness to pay is a positive signal for fare-recovery planning, though the concentration of responses in the ₦151–₦200 band also indicates a practical affordability ceiling: fares set appreciably above ₦200 would fall outside the stated capacity of the majority of respondents and risk excluding a meaningful share of current and potential users.

Abdullah et al. (2022) and Džupka et al (2024) pointed out that travellers are willing to pay more for their fares if it is convenient for them. However, Abdullah et al. (ibid.) mentioned that females can pay more than males due to their negative experience using public transport, while Džupka et al. (ibid.) states that the location of travellers, household size, age, mode of transport, and previous experiences with public transportation significantly impact travellers' willingness to pay.

Table 1: *Overall Distribution of Willingness and Ability to Pay per One-Way Trip*

Fare Band	Frequency	Percentage (%)
₦0	10	2.50
₦1–₦50	57	14.25
₦51–₦100	62	15.50
₦101–₦150	85	21.25
₦151–₦200	149	37.25
Not Applicable	37	9.25
Total	**400**	**100.00**

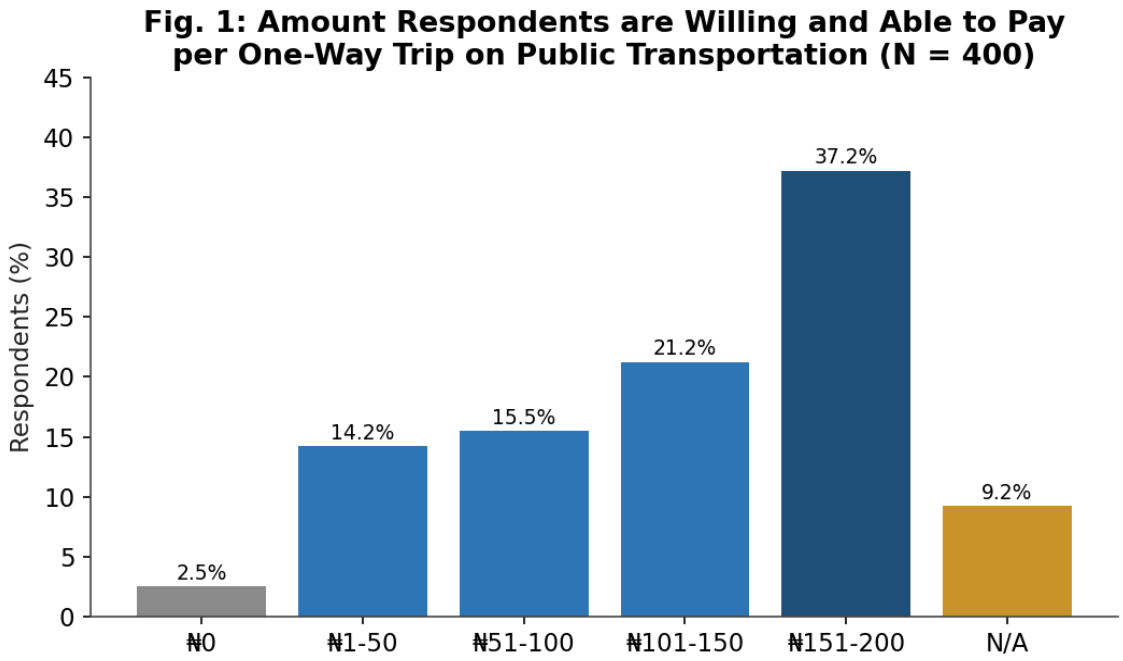


Figure 1: *Amount Respondents are Willing and Able to Pay per One-Way Trip (N = 400)*

Willingness and ability to pay by gender

Disaggregating by gender reveals a distinct affordability gradient (Figure 2). Male respondents (n = 258) were both more numerous and more concentrated at the top of the fare scale: 40.69% indicated willingness to pay ₦151–₦200, compared with 30.98% of female respondents (n = 142). Conversely, female respondents were disproportionately concentrated in the lower-middle fare bands, with 22.53% selecting ₦1–₦50 against only 9.68% of males in the same band. A smaller share of women reported zero willingness to pay (1.40%) than men (3.10%), indicating that non-payment is not itself a strongly gendered outcome; rather, the gender difference lies in the ceiling of what respondents can afford once they are willing to pay something at all. This pattern is consistent with broader evidence that women in similar urban contexts often have lower and less flexible disposable income for transport as concluded by Abdullah et al. (2022). This has implications for fare-setting and subsidy targeting if equitable access is a policy objective.

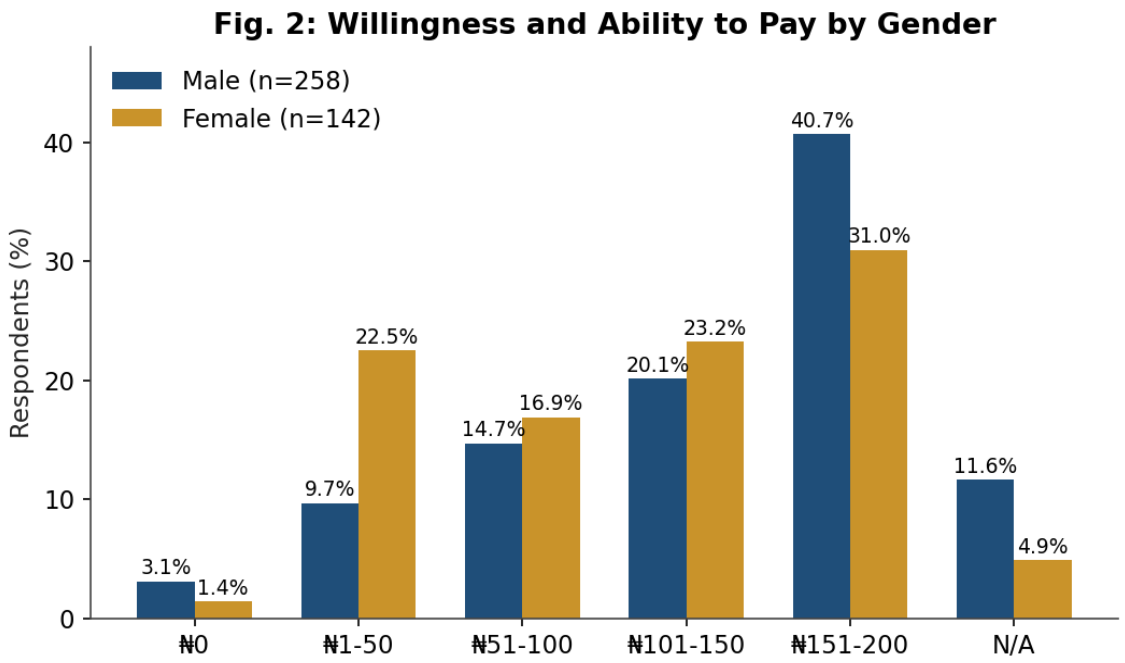


Figure 2: *Willingness and Ability to Pay by Gender*

Willingness and ability to pay by age group

The age-disaggregated results (Figure 3) show a generally positive, though non-linear, relationship between age and willingness to pay the top fare band. The share selecting ₦151–₦200 rises from 32.50% among 15–19-year-olds to a peak of 55.55% among respondents aged 70 and above, with intermediate peaks among the 40–44 (45.83%), 45–49 (50.00%), 60–64 (46.15%), and 65–69 (50.00%) groups. This broadly reflects the expectation that older respondents, who are more likely to be established in employment or otherwise have more stable incomes, can accommodate higher fares. However, the relationship is not monotonic: the 50–54 age group is a notable outlier, with only 25.00% selecting the top band (tied with ₦1–₦50) and the highest proportion of any age group reporting zero willingness to pay (16.66%). A similarly elevated zero-WTP share appears among the 55–59 group (12.50%) and, to a lesser extent, the 65–69 group (8.33%). Because these age bands have relatively small sample sizes (n = 6–13), these figures should be interpreted with some caution, but they nonetheless suggest that affordability does not increase uniformly with age and that a subset of older respondents – potentially those approaching or in retirement before pension income stabilises – face particular fare constraints. By contrast, the youngest respondents (15–19, 20–24, 25–29) reported low but non-negligible zero-WTP shares (1.25–3.65%), consistent with a population that is predominantly student-aged and income-constrained but still transport-dependent.

This study found out that older respondents, who are more likely to be established in employment or otherwise have more stable incomes, can accommodate higher fares while some older respondents are not willing to pay. However, subsidised fares for public transport services are more beneficial to expand the accessibility of older people especially those with lower incomes (Vecchio et al, 2024). Yet, Umme et al. (2023) found out that income influences the willingness to pay of travellers not age. Additionally, Džupka et al (2024) studied the use of Demand-responsive transport (DRT) – *Uber, Bolt*, etc. – and concluded that

young full-time employed individuals are most likely to use DRT frequently while older adults who are retired and whose children have left home are likely to be infrequent users. This can increase public transport use by drawing new customers to public transport services (and increasing the number of travellers willing to pay) or decrease it.

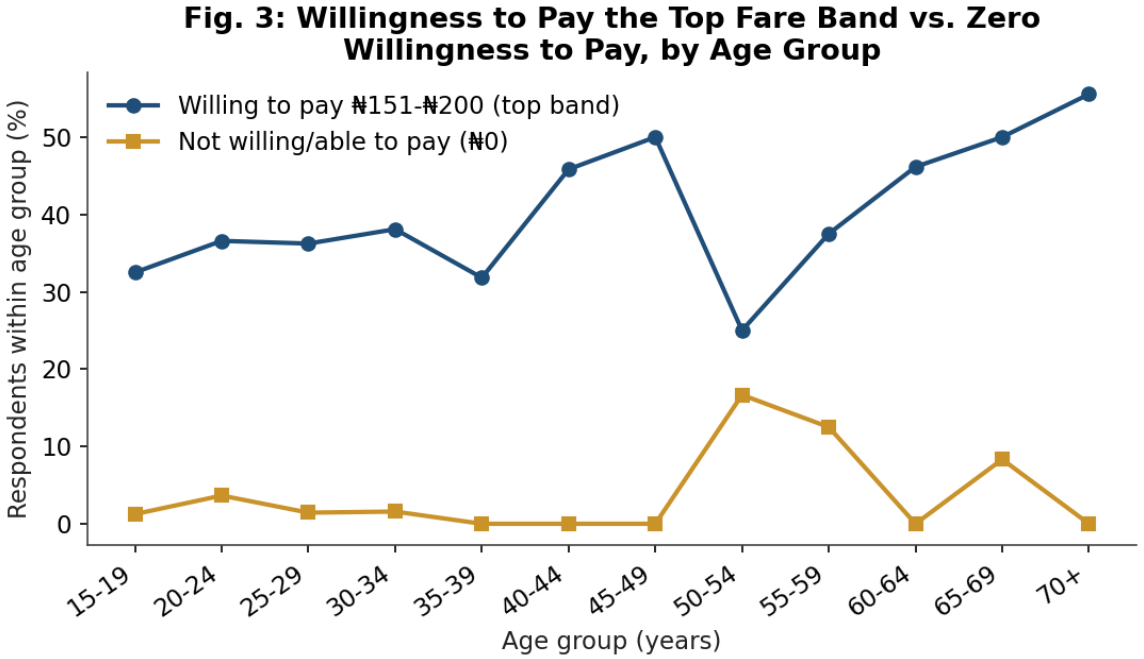


Figure 3: *Willingness to Pay the Top Fare Band vs. Zero Willingness to Pay, by Age Group*

Willingness and ability to pay by level of education

Educational attainment is also associated with differences in stated fare affordability (Figure 4 and Table 2). With the exception of respondents with only primary school education, every educational category recorded ₦151–₦200 as its modal response, with the highest shares among HND holders (47.82%) and university degree holders (45.91%). Respondents with primary school education instead peaked in the ₦101–₦150 band (34.09%), suggesting a fare ceiling roughly one band lower than for more highly educated groups, plausibly reflecting the lower average incomes typically associated with lower educational attainment. Respondents with no formal education showed a comparatively high concentration in the ₦51–₦100 band (31.03%) alongside their modal ₦151–₦200 response (37.93%), indicating a more bimodal spread of affordability within this group. Zero-WTP shares were generally low across educational categories (0–4.5%) except for OND holders (7.69%); trade certificate, Islamic education, and HND holders recorded no zero-WTP responses at all, although these are among the smaller sub-samples (n = 7–21) and should be read with appropriate caution.

However, travellers' likelihood of willingness to pay differs across the educational levels (Umme et al., 2023) where secondary students (the lowest educational level) are more willing to pay than postgraduate students. This is also supported by Džupka et al. (2024).

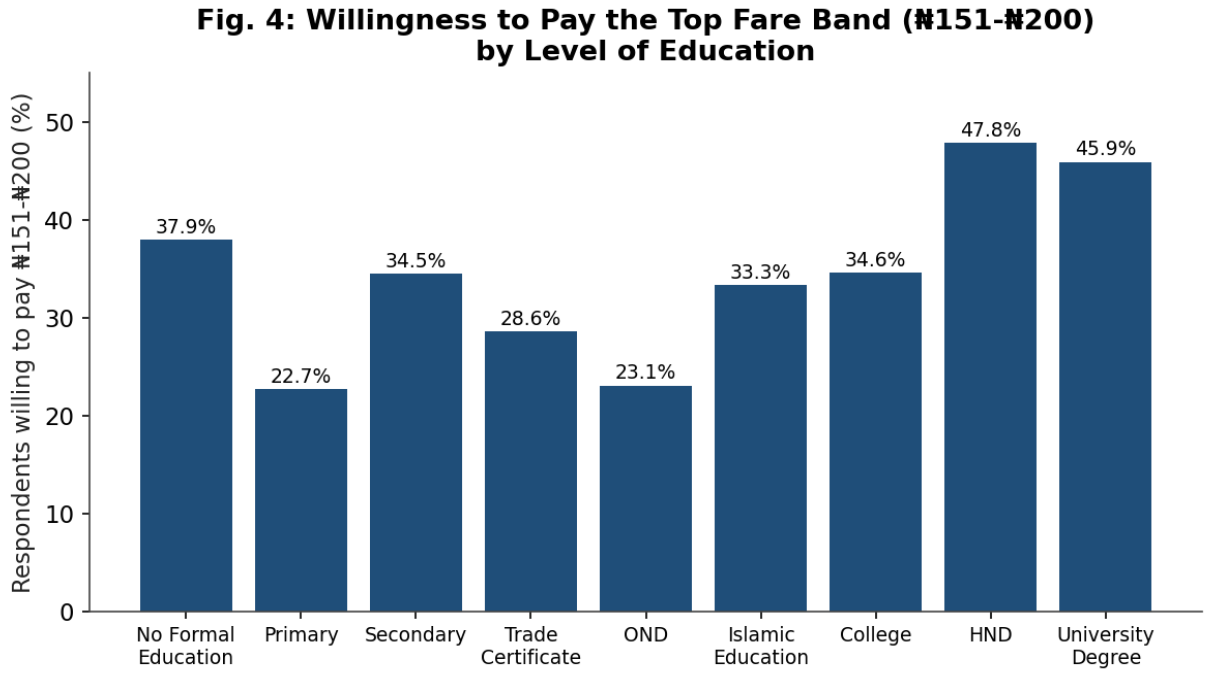


Figure 4: *Willingness to Pay the Top Fare Band (₦151–₦200) by Level of Education*

Willingness and ability to pay by occupation

Occupational status shows a similarly consistent pattern (Figure 5). Every occupational category except the unemployed recorded ₦151–₦200 as its single modal fare band, ranging from 34.09% among students to 46.15% among retirees. Among unemployed respondents, willingness to pay was evenly split between ₦101–₦150 and ₦151–₦200 (30.23% each), indicating a lower affordability ceiling consistent with reduced or absent income. Notably, no unemployed or retired respondent selected the ₦0 band, meaning that within these two groups every respondent expressed some non-zero willingness to pay, even though their overall capacity clusters at lower fare levels than the employed and self-employed groups. Employed respondents recorded the highest top-band share among the economically active categories (41.55%), narrowly ahead of the self-employed (39.49%), while students – the largest occupational group in the sample (n = 132, 33.00% of respondents) – combined a substantial top-band share (34.09%) with the highest zero-WTP proportion among the major occupational groups (2.27%, alongside "Others" at 6.25%), reflecting the more limited and irregular income typical of a student population.

The unemployed are dependent on public transport for their commute to job search (Calvert et al., 2022). Therefore, they are willing to pay. However, due to their limited ability to pay for transport, the unemployed are more willing to share the commute with 'people they knew' so that they can help themselves if one could not be able to pay for fares. In Bengaluru, India, Ghosh et al. (2023) found that two-wheelers are the dominant vehicles used by working-class males and low- and middle-class income groups are unable to afford public transport. Therefore, the willingness to pay for transport is low in that city.

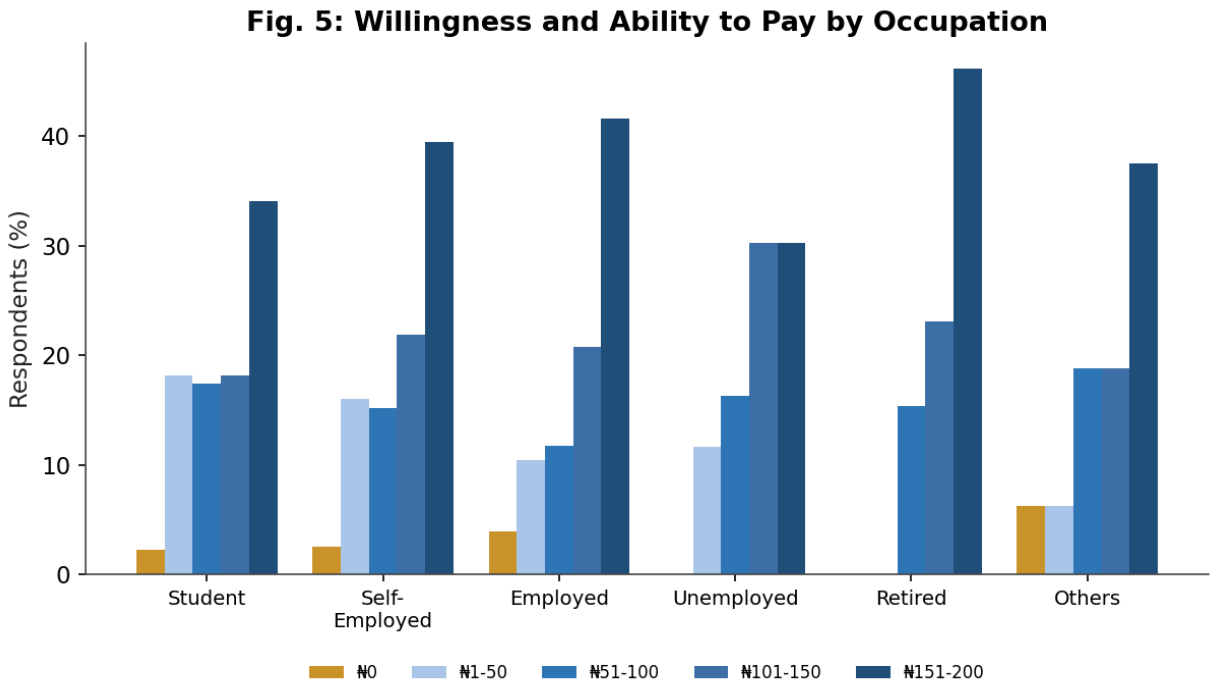


Figure 5: *Willingness and Ability to Pay by Occupation*

Willingness and ability to pay by disability status

Respondents with disabilities constitute a small sub-sample (n = 15, 3.75% of respondents) but show a distinctive response pattern (Figure 6). Willingness to pay among this group was evenly split between the ₦151–₦200 and ₦51–₦100 bands (33.33% each), a flatter distribution than observed for respondents without disabilities, among whom ₦151–₦200 clearly dominates (37.40%). No respondent with a disability reported zero willingness to pay, whereas 2.59% of those without a disability did. While the small sample size limits the strength of any conclusion, the more even spread across fare bands among respondents with disabilities may reflect greater heterogeneity in income and mobility needs within this group and underscores the importance of considering accessibility-linked affordability (e.g., fare concessions, paratransit costs) alongside general fare-setting.

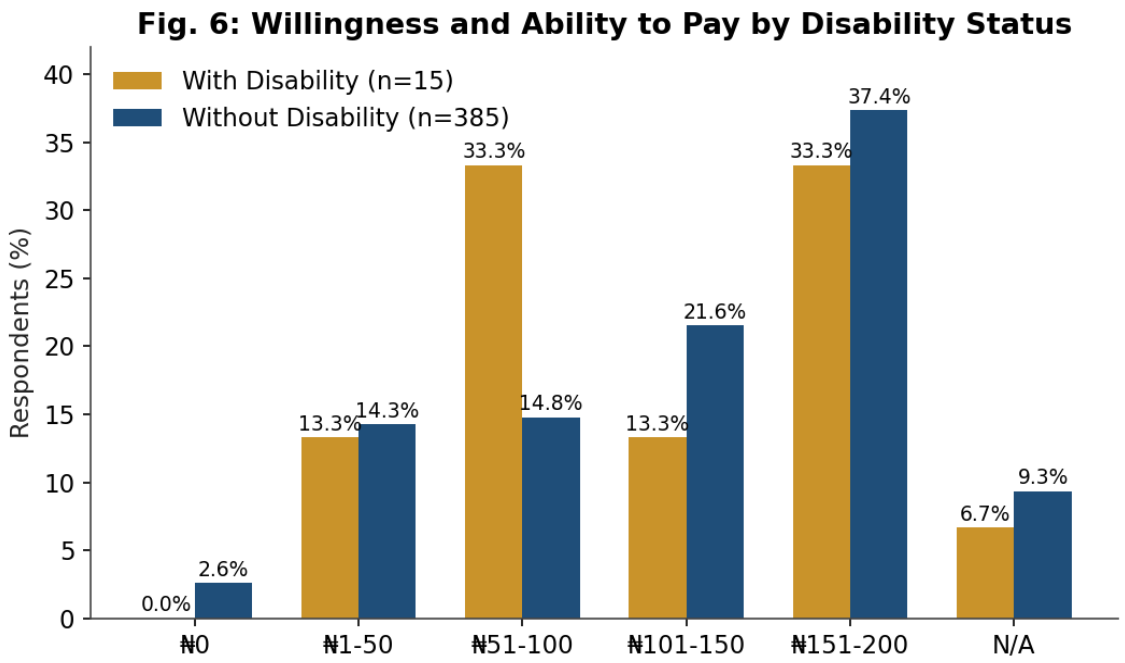


Figure 6: *Willingness and Ability to Pay by Disability Status*

Conclusion

Taken together, these results point to several cross-cutting patterns relevant to transport policy and fare design in Dutse. First, the ₦151–₦200 band emerges as the affordability ceiling for the majority of the sampled population across almost every socio-demographic group examined – gender, most age groups, most educational levels, and most occupational categories – suggesting a reasonably robust upper bound for base fare-setting if the objective is to retain broad ridership. Second, affordability is not uniform: women, respondents with only primary education, the unemployed, and certain older age cohorts (particularly 50–59-year-olds) consistently cluster one fare band lower than their counterparts, indicating that a flat, undifferentiated fare risks disproportionately burdening these groups. Third, the very low incidence of outright zero willingness to pay (2.50% overall) suggests that affordability, as such, is less a barrier to public transportation use in Dutse than the level at which fares are set relative to respondents' income-constrained top limit. That is, the concern is less whether people will pay at all and more how much they can pay before ridership or trip frequency is affected. These findings support consideration of differentiated or tiered fare structures, targeted concessions (e.g., for women, students, the unemployed, and older or disabled residents), and further income-linked analysis to validate the affordability thresholds identified here.

The figures reported in several sub-group tables (e.g., 45–49, 50–54, 55–59, 65–69 age groups; trade certificate and Islamic education categories; and the disability sub-sample) are based on small cell sizes ($n < 20$), which increases the sensitivity of percentages to individual responses and warrants caution in generalising these specific sub-group findings. The analysis is based on stated, rather than revealed, willingness to pay, which may not fully capture actual payment behaviour under real fare conditions. Future work could triangulate these findings with household income data and observed fare payments to strengthen the

affordability thresholds identified. These results establish the overall affordability situation and acceptable fare thresholds of Dutse populace by examining the equity dimension of transport affordability by identifying differences among socio-demographic groups.

Based on the findings, transport authorities and relevant stakeholders in Dutse should consider adopting a differentiated and socially responsive public transport fare structure, with the ₦151–₦200 range serving as a practical reference point for maintaining broad affordability. This price range is recommended based on most respondents are willing and able to pay the amount as confirmed on Table 1 (Overall Distribution of Willingness and Ability to Pay per One-Way Trip), Figure 2 (Willingness and Ability to Pay by Gender), Figure 3 (Willingness and Ability to Pay by Age Group), Figure 4 (Willingness and Ability to Pay by Level of Education), Figure 5 (Willingness and Ability to Pay by Occupation), and Figure 6 (Willingness and Ability to Pay by Disability Status). Targeted fare concessions or subsidies should be considered for groups that demonstrate relatively lower affordability, particularly women, students, unemployed persons, older residents, and persons with disabilities. In addition, future fare-setting decisions should incorporate household income and actual fare-payment data rather than relying solely on stated willingness and ability to pay. Periodic affordability assessments should also be undertaken to account for changes in income, inflation, transport operating costs, and travel patterns, thereby ensuring that public transportation remains accessible, affordable, and socially equitable for residents of Dutse.

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Data availability: *Not applicable*

Use of AI tools (where applicable): *Not applicable*

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