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Research article

Changes in travel frequency and residential relocation following the removal of fuel subsidies in Ibadan North, Nigeria

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Abstract: The removal of fuel subsidies in Nigeria has triggered widespread changes in transportation affordability, with serious implications for where urban residents choose to live. In this study, we examined how households in Ibadan-North, a local government area in Oyo State, are adjusting their residential decisions in response to increased transportation costs. Drawing on data from 400 respondents across twelve communities, we explored the relationship between transport-related financial strain and shifts in housing preference. Our findings showed that households are reducing the frequency of travel for work, education, and social activities, leading to a growing preference for homes located near essential services. While income and occupation significantly influenced household responses, other demographic factors showed little variation. The study highlights the role of transport vulnerability in shaping urban spatial patterns and calls attention to the need for planning strategies that can buffer low- and middle-income populations from the pressures of fuel policy reform.

Keywords: fuel subsidy removal; transport vulnerability; residential mobility; urban housing choice; human ecology

1. Introduction

A subsidy is a form of government intervention that lowers the cost of goods or services for consumers, often with the aim of making essential commodities more accessible and affordable [1]. In Nigeria, fuel subsidies were introduced to cushion the public against global oil price volatility and to support economic development [2]. The subsidy program, however, became a subject of intense public debate due to its financial burden on the government, poor targeting, and widespread corruption [3].

In response, the Nigerian government announced the complete removal of fuel subsidies in May 2023, arguing that the policy had become fiscally unsustainable and that its discontinuation would free up resources for more productive sectors of the economy [3].

The removal of fuel subsidies has significant implications for household welfare and urban spatial structure. Fuel price hikes influence transportation costs, thereby shaping household decisions regarding where to live and work. As mobility costs rise, households, particularly those in lower-income brackets, may be forced to reevaluate their residential preferences, prioritizing proximity to employment centers, schools, and basic services [4,5]. Several studies have shown that transport affordability and fuel price shocks are critical determinants of residential location choices, especially in urban contexts where daily commuting is a necessity [6,7]. The increased cost of fuel can lead to residential displacement, intensify socio-spatial inequalities, and exacerbate housing market pressures [8–10].

Scholars have greatly examined the determinants of residential location choices (RLC), highlighting a combination of economic, social, and spatial factors. Accessibility to jobs and transportation, housing affordability, environmental quality, and neighborhood amenities are frequently cited determinants [11–13]. Households typically make trade-offs between housing costs and commuting times, balancing economic constraints with lifestyle preferences [14,15]. The monocentric city model explains that households with higher incomes can afford to live in suburban areas and commute long distances, while lower-income groups reside closer to city centers to minimize travel costs [16,17]. However, researchers challenge this model, emphasizing that contemporary cities exhibit polycentric structures where access to multiple sub-centers and transit networks significantly influences residential decisions [18,19].

The role of socio-demographic characteristics in shaping RLC is also well established. Factors such as household income, age, education, household size, gender, and marital status affect preferences and constraints [20–23]. For instance, younger individuals and smaller households may prioritize affordability and social connectivity, while larger households with children may seek neighborhoods with access to educational and recreational facilities [20,22]. Social networks and cultural affinities further guide household decisions, particularly in contexts with strong ethnic or communal affiliations [24].

Housing affordability remains a persistent challenge in Nigerian cities, and it often overrides other location preferences [25–27]. As urban populations expand and land prices increase, many low- and middle-income households are pushed to the periphery, where land is cheaper but services and infrastructure are lacking. This phenomenon results in longer commutes and increased dependency on fuel-based transport systems, thus heightening the impact of fuel price changes on household budgets [25].

The Human Ecology Theory offers a useful framework for analyzing residential location dynamics, especially in response to policy-induced shocks like fuel subsidy removal. The theory posits that residential patterns are shaped by the interaction between population characteristics, environmental resources, and technological constraints [28–30]. Within this framework, location choice is influenced not only by economic rationality but also by broader social and institutional structures [31,32]. For instance, land use policies, public transportation systems, and real estate market dynamics all mediate how households respond to environmental and economic changes [33].

In the Nigerian context, empirical studies reveal that residential decisions are shaped by structural factors (e.g., housing market conditions and infrastructure) and individual attributes (e.g., income level

and lifestyle preferences) [34,35]. While some researchers have examined how transport accessibility and housing quality influence residential choices [36,37], others have explored the interplay between social status, neighborhood characteristics, and mobility patterns [38]. However, very few researchers have focused on the effects of fuel subsidy removal on residential location behavior, despite the policy's profound implications for urban sustainability, equity, and planning.

Here, we address a significant gap. While the impact of fuel subsidy removal has been studied globally, there is a need to assess its effects on residential choices. We aim to unravel the intricate relationships between fuel subsidy removal and residential location choices of urban dwellers in Ibadan-North LGA, by examining the effects of fuel subsidy removal on resident location, analyzing geographical variations across socio-demographic groups, and assessing spatial interaction patterns. Our objectives are to examine the influence of fuel subsidy removal on resident location and analyze geographical variations in the effects of fuel subsidy removal across socio-demographic groups. We test three hypotheses: 1) There is a significant difference in the effect of fuel subsidy removal on resident location change; 2) There is a significant spatial variation in the effect of fuel subsidy removal across different socio-demographic groups in the study area and 3) There is a significant variation in the spatial interaction pattern of respondents before and after the fuel subsidy removal. Our findings can inform policy makers on the potential outcomes of fuel subsidy removal and the need for proactive strategies to mitigate its effects. The findings can contribute to the literature on the impact of fuel subsidy removal on residential location choices.

1.1. Study area

Ibadan North is one of the eleven Local Government Areas (LGAs) that make up the Ibadan metropolitan region, in the southwestern part of Nigeria (Figure 1). Ibadan, the capital of Oyo State, is recognized as the third most populous city in Nigeria, after Lagos and Kano, with an estimated population of approximately 2.6 million as of 2021 [36]. This large and diverse population makes Ibadan a critical urban center for studying socio-economic dynamics, including the impact of national policies such as fuel subsidy removal. The city lies strategically along the major transportation corridors linking the coastal areas to the inland regions, making it a vital economic and administrative node. Historically, Ibadan served as the administrative headquarters of the former Western Region during the colonial period, and remnants of its historic defense walls are visible today.

Socio-economically, Ibadan reflects a broad spectrum of urban livelihoods, ranging from high-income neighborhoods and formal employment sectors to informal markets and densely populated residential areas. The city's population is predominantly Yoruba, but also includes minority ethnic groups such as Igbo, Hausa, Edo, and Ibibio, reflecting Nigeria's wider cultural diversity. Major economic activities include trade, civil service, education, transportation, and small-scale manufacturing. The University of Ibadan and The Polytechnic Ibadan are key institutions within the city, contributing significantly to its status as an educational and intellectual hub.

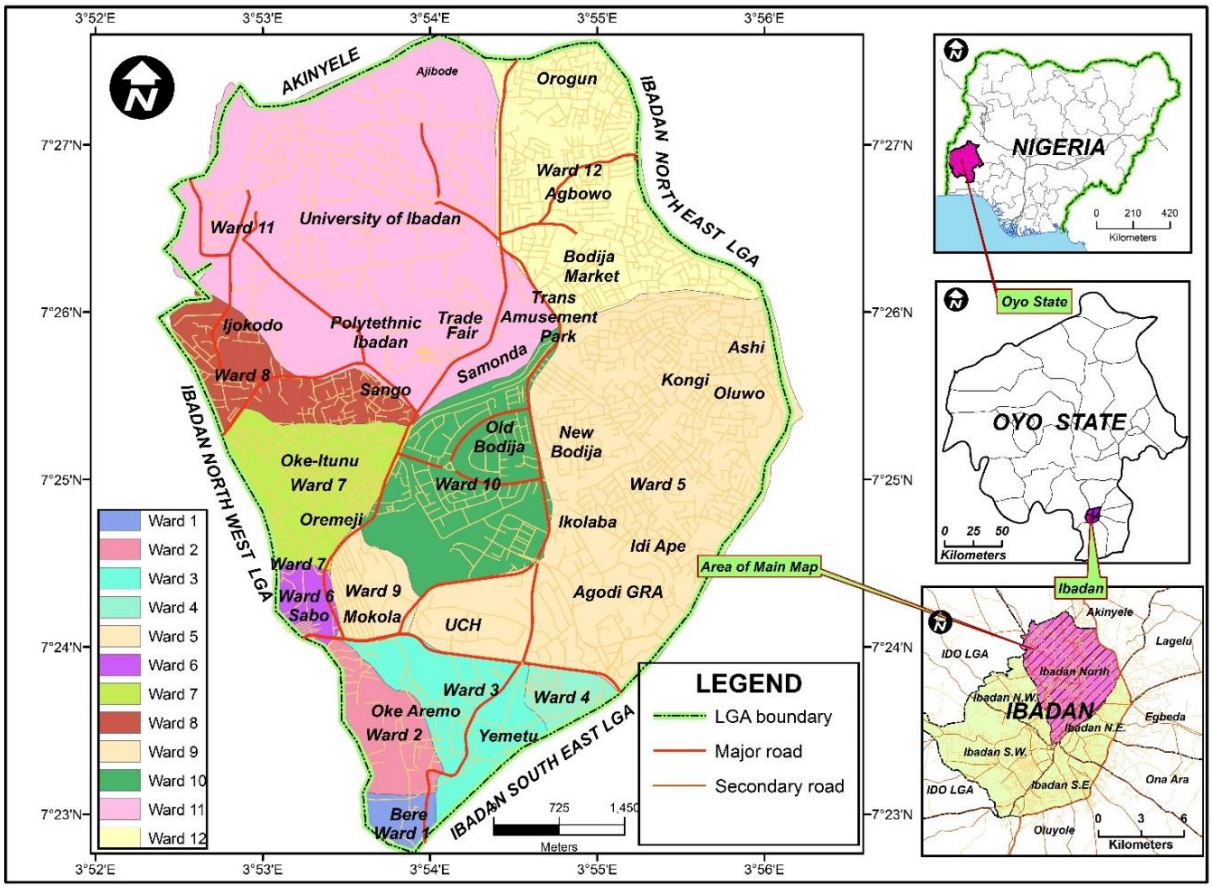

Figure 1. Geospatial representation of Ibadan metropolitan area with emphasis on the primary study area (Ibadan North local government areas showing wards/communities).

2. Methods and data sources

2.1. Data collection and sampling techniques

2.1.1. Data sources and participants

We targeted four key population groups residing in Ibadan-North Local Government Area: Government employees, school teachers, university students, and informal sector traders (primarily market women). These groups were selected based on their differing mobility needs, economic exposure, and potential vulnerability to transport-related policy changes. Data were collected using both primary and secondary sources. Primary data were obtained through a structured questionnaire administered to residents across selected communities. The questionnaire was designed to capture a range of variables relevant to the study and was organized into four sections:

- Section A gathered demographic information, including area of residence, age group, educational attainment, occupation, household income, and ethnic background.
- Section B focused on respondents' perceptions of fuel subsidy removal, its immediate impacts, and the factors influencing their residential decisions.

- Section C examined shifts in housing preference, changes in property values, commuting costs, travel frequency, and overall economic activity in response to the subsidy removal.
- Section D (if applicable) addressed additional contextual information or open-ended responses related to personal adaptation strategies or community-level changes.

Details of the questionnaire are available in the supplementary material (Section 2.1.1). Secondary data were drawn from existing literature on fuel subsidy reform and demographic statistics provided by the National Population Commission (NPC) of Nigeria.

2.1.2. Study area and sample size determination

Twelve communities within Ibadan-North Local Government Area (LGA) were purposively selected for this study: Mokola, Sango, Secretariat, Samonda, University of Ibadan, Ibadan Polytechnic, Coca-Cola, Bere, Ijokodo, Oke-Itunu, Agbowo, and Bodija. These communities reflect a broad socio-spatial diversity, encompassing residential, educational, and commercial zones, thereby offering a heterogeneous population suitable for investigating the impact of fuel subsidy removal on household residential decisions. To determine the study population, demographic data from the 1991 national census were projected to 2023 using an annual urban growth rate of 3.2%, derived from the National Population Commission (NPC, 2006) and relevant urban demographic literature. The projection followed the demographic formula (Eq 1):

$$P_1 = P_0 (1 + r/100)^n, \quad (1)$$

where P_1 is the projected population, P_0 the base-year population, r the growth rate, and n the number of years. Based on this approach, the projected population of Ibadan-North LGA in 2023 was estimated at approximately 742,000. With an average household size of five persons (NPC, 2006), the total number of households was projected to be around 148,400.

The sample size was derived using the standard Yamane formula for large populations (Eq 2):

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

where n is the sample size, N is the total population, and e is the acceptable margin of error (set at 0.05). Applying this yielded a statistically valid sample size of approximately 400 households, which represents about 0.27% of the total projected population. To ensure spatial and demographic representativeness, the sample was proportionally distributed across the twelve communities based on their estimated household sizes. For instance, Bodija, being one of the most populous and demographically diverse communities, was allocated 50 respondents. Mokola and Sango received 45 and 40 respectively, while Samonda, Secretariat, and University of Ibadan were each assigned between 30 and 35 respondents. Smaller communities such as Ijokodo, Oke-Itunu, and Bere were allocated between 15 and 20 respondents. This stratified proportional sampling approach ensured comprehensive coverage and enhanced the generalizability of the study findings across the urban landscape of Ibadan-North. Table 1 shows the summary of the demographic and land use characteristics of selected communities in Ibadan North LGA.

Table 1. Demographic and land use characteristics of selected communities in Ibadan North LGA.

Ward/Community	Main land use type	Population density	Community characteristics	Average age range	Income range	Key features and notes
Agbowo	Residential–Educational	High	Mixed-use buildings, student housing, hostels, bungalows	18–35 years	Lower-middle income (₦50,000–₦100,000/$33–$67 per month)	Proximity to University of Ibadan; dense rental market due to student population
Bodija	Residential–Commercial	Medium–High	Detached houses, flats, gated estates, some commercial plazas	25–45 years	Middle income and above (₦100,000–₦300,000+/$67–$200+ per month)	One of Ibadan's planned estates; known for market activity and relatively better infrastructure
Sango	Commercial–Educational	High	Mixed-use; shops below, residences above; compact housing	20–40 years	Lower-middle income (₦50,000–₦100,000/$33–$67 per month)	Major transit corridor; connects UI and other districts; busy traffic zone
Orogun	Residential	Medium	Low-rise family homes, newer developments	25–40 years	Lower-middle income (₦50,000–₦100,000/$33–$67 per month)	Emerging residential area near UI with ongoing urban development
Samonda	Mixed-Use	Medium	Commercial buildings, student hostels, low-rise apartments	20–40 years	Lower-middle income (₦50,000–₦100,000/$33–$67 per month)	Commercial growth corridor; close to research institutions
Ojoo	Commercial–Transport Hub	High	Informal housing, markets, bus terminals, warehouses	18–35 years	Low–lower-middle income (₦30,000–₦80,000/$20–$53 per month)	Major transport hub with high activity level; link to intercity movement
UI Campus Area	Institutional–Residential	Medium	Staff quarters, hostels, educational buildings	18–30 years	Student population; staff range from low to upper-middle income (₦30,000–₦250,000/$20–$167 per month)	University environment with stable infrastructure; mostly non-migrating student population
Mokola	Residential–Commercial	High	Dense housing, old-style buildings, converted residential units	25–45 years	Lower-middle income (₦50,000–₦100,000/$33–$67 per month)	Historically mixed area with old housing stock and increased commercialization

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Ward/Community	Main land use type	Population density	Community characteristics	Average age range	Income range	Key features and notes
Dugbe (part)	Commercial	Very High	High-rise offices, older commercial buildings	30–50 years	Middle to upper income (₦150,000–₦400,000+/$100–$267+ per month)	Commercial core of Ibadan; not primarily residential, but may include workers' residences
Oke-Itunu	Residential	Medium	Low-rise houses, some dilapidation, dense layout	25–45 years	Lower-middle income (₦50,000–₦100,000/$33–$67 per month)	Older residential area undergoing informal upgrades

Note: Income ranges are based on self-reported household estimates and local economic classifications. Currency conversions use an approximate exchange rate of ₦1,500 = $1 USD (as of June 2025). Categories are defined as follows:

- Low income: ₦30,000–₦50,000/month ($20–$33)
- Lower-middle income: ₦50,000–₦100,000/month ($33–$67)
- Middle income: ₦100,000–₦300,000/month ($67–$200)
- Upper income: ₦300,000+/month ($200+)

The respondents were selected based on their occupational, economic, and social relevance to the research objectives. The research team purposively targeted four major socio-economic categories: Government workers, teachers, students, and market women. These groups were selected due to their differential exposure to fuel cost variability and their active roles in daily urban life. For instance, government employees and teachers typically commute over long distances, market women rely heavily on fuel for transporting goods, and students represent a highly mobile demographic within the educational hubs of the LGA. Both male and female respondents aged 18 and above were included, with no restriction based on income level, to ensure inclusivity and to capture a wide range of household-level responses to the policy change.

2.2. Data analysis

Data collected from the survey were analyzed using a combination of descriptive and inferential statistical techniques to identify patterns and assess relationships between variables. Descriptive statistics were used to summarize key demographic and behavioral characteristics of respondents. Inferential analysis was conducted to test specific hypotheses related to changes in travel behavior and residential location choices following fuel subsidy removal. The

Chi-square (χ^2) test was employed to assess the association between categorical variables, particularly to determine whether observed differences across socio-demographic groups were statistically significant. The test compared observed and expected frequencies to evaluate independence between variables within contingency tables.

In addition, a one-sample t-test was used to compare the mean frequency of trips before and after subsidy removal against a reference value. This test helped assess whether the observed change in travel behavior was statistically significant. The p-values for both statistical tests were computed to determine the level of significance, with a threshold of $p < 0.05$ considered indicative of meaningful differences. All analyses were conducted with attention to standard assumptions and using appropriate degrees of freedom to ensure the validity of the results.

3. **Results**

3.1. Characteristics of study participants

The participant pool reflected a broad range of demographic and economic backgrounds, providing a detailed view into how urban households in a growing African city respond to rising transport costs. Data were collected from residents of twelve neighborhoods within Ibadan-North, a local government area in southwestern Nigeria. These areas included a mix of residential, educational, and commercial zones, such as university campuses, traditional markets, and mixed-use settlements. The highest respondent concentrations were from Agbowo, Bodija, and Sango, areas known for their proximity to major institutions and transit corridors. Respondents were primarily young adults, with the majority falling within the 18–35 age range. Gender distribution was nearly equal, with a slight female majority. Most participants were either employed or self-employed, while students comprised a smaller share. Educational levels ranged widely, with many respondents holding at least a secondary school diploma or university degree. Household income varied, though most respondents reported earnings within the lower-middle income bracket, equivalent to approximately ₦50,000–₦100,000 monthly (roughly $60–$120 USD). Ethnically, the sample was predominantly Yoruba, reflecting the composition of the region. Figure 2 presents the distribution of respondents by (a) age group, (b) gender, (c) ethnic affiliation, (d) educational level, (e) income range, (f) occupation type, and (g) household size. The demographic patterns reflected a young, educated, and economically active population with varied housing and travel behaviors influenced by subsidy removal.

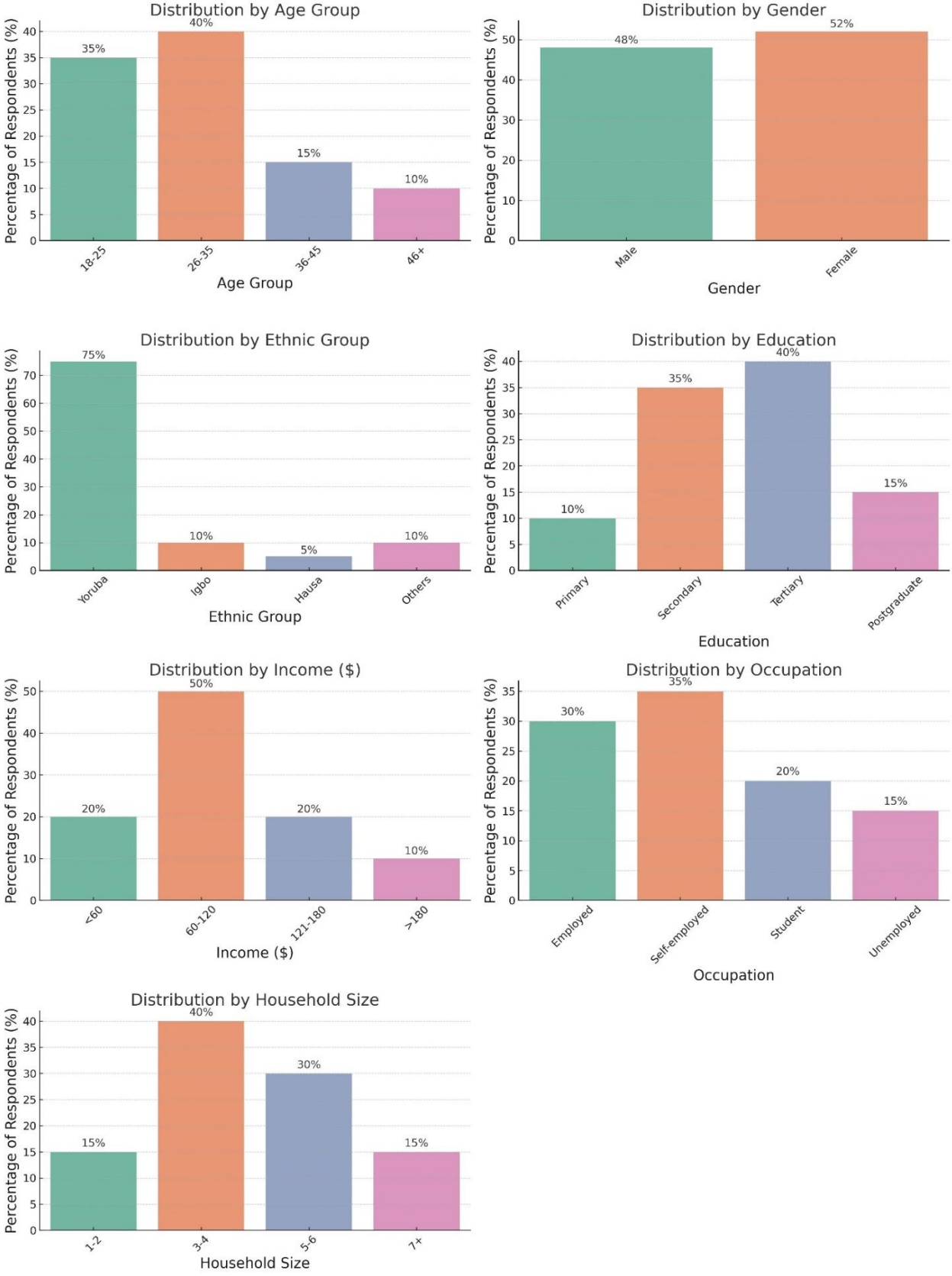

Figure 2. Socio-demographic characteristics of respondents in Ibadan North LGA.

3.2. Effects of fuel subsidy removal on resident housing location

In Ibadan-North, Nigeria, the withdrawal of fuel subsidies has led to measurable shifts in household travel patterns and residential preferences. As transportation costs rose sharply, many urban residents began to limit non-essential trips, which in turn influenced their decisions about where to live. Respondents reported cutting back on travel for work, education, and social activities, an adjustment that reflects broader behavioral responses to mobility constraints in low- to middle-income settings. The data showed a clear reduction in work-related travel: Prior to subsidy removal, 73% of respondents reported frequent commuting for employment, compared to just 67.8% after the policy change, with most switching to occasional travel. A similar trend appeared in school-related travel, with 99.8% indicating less frequent trips. These changes have amplified the appeal of housing located closer to employment centers, educational institutions, and essential services.

The effects extended beyond work and school. Reduced visits to recreational venues, markets, and social gatherings were widely reported, signaling a shift in how households prioritize proximity in choosing where to live. Respondents expressed a growing preference for neighborhoods with walkable access to amenities and reliable public transportation. These preferences also suggested a rising demand for pedestrian-friendly housing and infrastructure that supports low-cost, low-mobility lifestyles in response to fuel-driven cost pressures. An analysis of the relationship between household financial status and residential relocation, using Chi-Square tests (Pearson $x^2 = 0.243$, $df = 4$, $p = 0.993$), showed that relocation is not significantly driven by income ($p = 0.993$). This suggests that, in the immediate aftermath of fuel subsidy removal, income level alone did not significantly influence the likelihood of residents changing their place of residence. Figure 3 shows (a) work-related travel frequency and (b) reduction in non-essential travel.

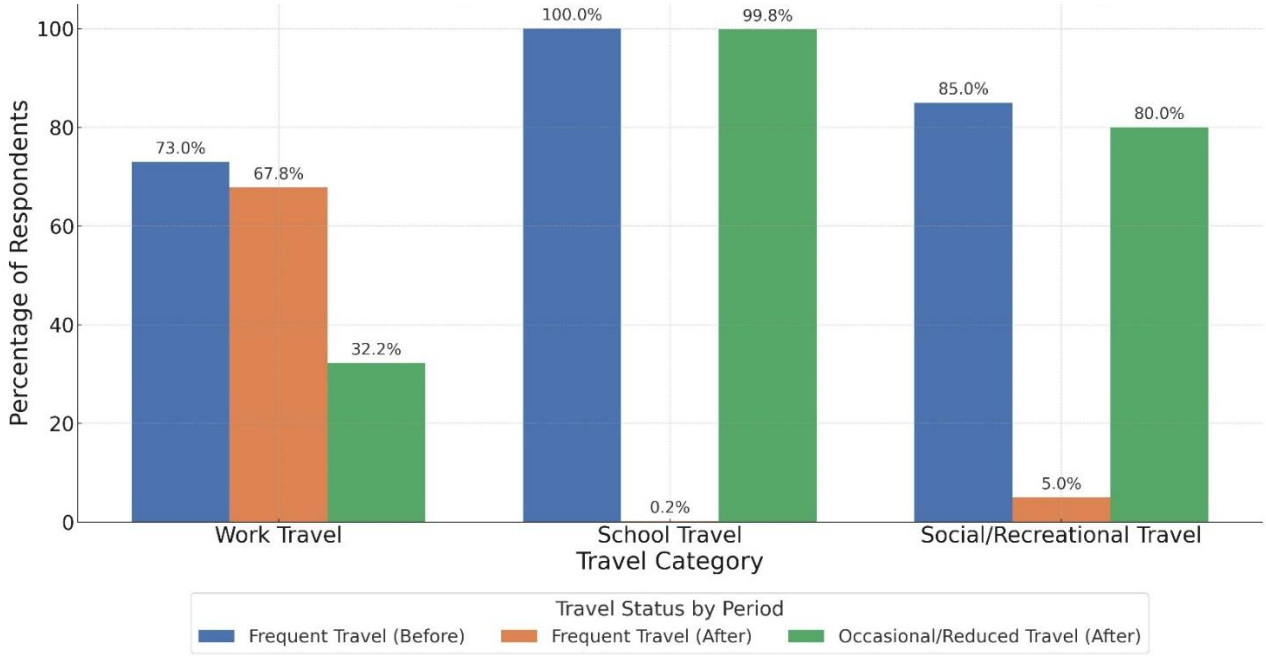

Figure 3. Effects of fuel subsidy removal on resident housing location and mobility in Ibadan-North, Nigeria.

3.2.1. Demographic variations in response to subsidy removal

To evaluate how different population subgroups reacted to the withdrawal of fuel subsidies, Chi-Square tests were conducted across several demographic variables. The results revealed that responses to the policy shift were generally uniform across most socio-demographic categories, with no statistically significant differences found in relation to residential location, age group, gender, educational attainment, and ethnicity. These findings suggested a widespread behavioral response to the increased transport costs, regardless of these background characteristics. However, notable exceptions emerged in two areas: Occupational status and household income level, which revealed significant variation (Table 2). This indicated that the capacity to adapt to new transport and mobility constraints was more strongly influenced by economic and employment conditions than by demographic background.

Table 2. Demographic differences in response to fuel subsidy removal.

Demographic variable	p-value	Statistical significance
Residential location	0.577	Not Significant
Age	0.814	Not Significant
Gender	0.405	Not Significant
Educational attainment	0.991	Not Significant
Ethnicity	0.795	Not Significant
Occupational status	0.004	Significant
Household income level	0.003	Significant

3.2.2. Travel frequency following fuel subsidy removal

The analysis of trip frequency following the withdrawal of fuel subsidies revealed a marked reduction in household mobility. As shown in Figure 4, most respondents reported traveling less often after the policy change. These results reflected a substantial shift in day-to-day movement patterns and suggested that higher transportation costs have led many households to restrict non-essential travel. The findings pointed to a broader trend of reduced spatial interaction, consistent with expectations under conditions of constrained mobility and rising fuel expense patterns often seen in urban areas where access to affordable transport is limited.

To evaluate the impact of fuel subsidy removal on daily travel behavior, a one-sample t-test was conducted comparing the average number of trips taken per household per month before and after the policy change. The results indicated a statistically significant decline in travel frequency. Prior to subsidy removal, the mean monthly number of trips per household was approximately 30 (SD = X), which dropped to just 2 trips per month (SD = Y) following the policy shift. Both test results yielded p-values below 0.001, confirming the significance of this change. These findings demonstrated a sharp contraction in household mobility, suggesting that the rising cost of transportation has significantly influenced routine movement patterns. The scale of reduction points to a behavioral adjustment consistent with constrained travel budgets and shifting access to essential services.

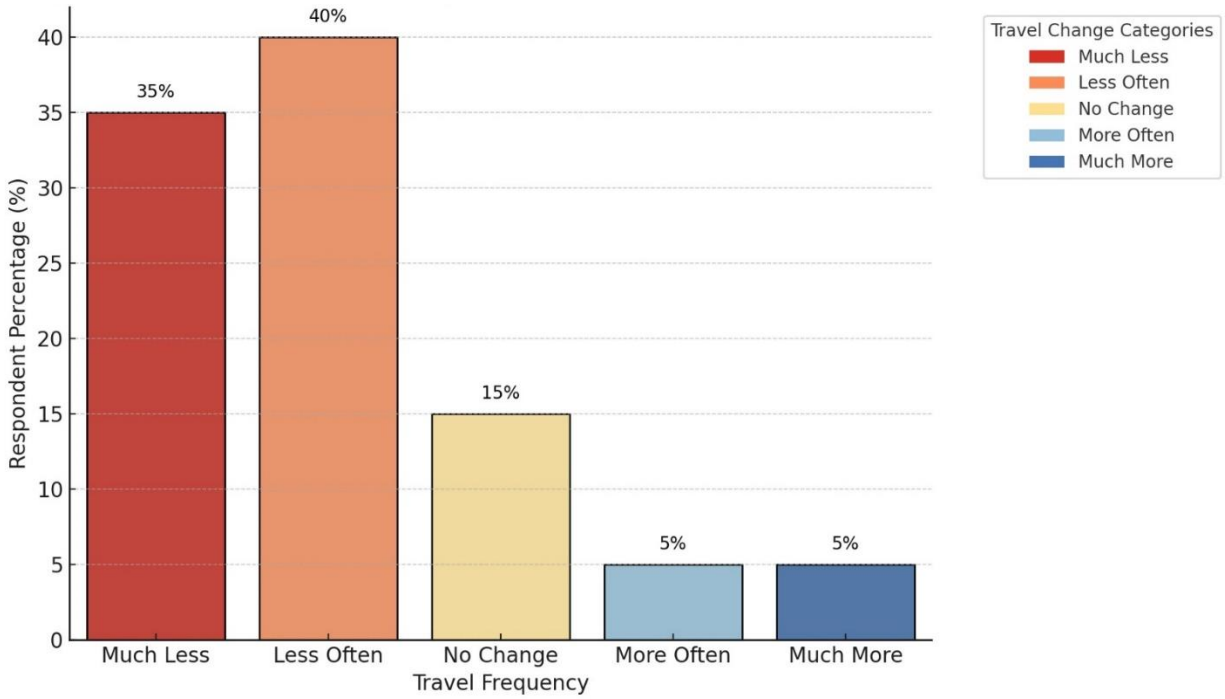

Figure 4. Travel frequency following fuel subsidy removal.

4. Discussion

This study contributes to ongoing global discussions on how fuel pricing reforms influence urban living patterns, with a focus on household behavior in Ibadan-North, Nigeria. The findings illustrate how the removal of fuel subsidies has triggered changes in travel behavior and residential preferences among urban residents. Drawing on a demographically diverse sample from twelve communities, the study reveals consistent shifts in spatial routines that reflect broader pressures on affordability and mobility. A central observation is the reduction in trip frequency following subsidy removal, particularly for work, education, and social activities. These behavioral shifts suggest that increased transportation costs are prompting residents to reevaluate the trade-offs between distance, cost, and access to daily necessities. From a human ecology perspective, this can be understood as a response to environmental stress: As a key urban resource, affordable mobility becomes constrained, households adjust by seeking housing options that minimize travel and increase proximity to essential services.

Although the reduction in work-related trips (from 73% reporting frequent travel to 67.8% reporting only occasional travel) may appear modest, it signals an emerging pattern of constrained mobility. Similar trends were evident in school and leisure travel, with a corresponding rise in demand for housing in areas with accessible infrastructure. These adjustments reflect both economic necessity and strategic decision-making in the face of transport-related vulnerability. Interestingly, we found no statistically significant link between financial status and relocation behavior in the short term ($p = 0.993$). While counterintuitive, this may reflect delayed household response to economic stress or the buffering effect of social networks and local support systems. Over time, financial constraints may influence relocation decisions, but the immediate response appears shaped more by existing commitments and adaptive behaviors than by income alone.

In contrast, occupational status and income level were found to significantly influence how households adjusted to the subsidy removal. This aligns with the theoretical expectation that access to resources, particularly stable income and employment flexibility, determines a household's capacity to adapt to environmental and economic shifts. Other demographic variables, such as gender, education, and ethnicity, did not show significant variation in responses, suggesting a more uniform experience of transport cost pressures across these categories. These findings have important implications for urban planning. The growing preference for housing near workplaces, schools, and transport hubs underscores the need for infrastructure that supports localized access to essential services. In contexts where fuel price reforms are likely to continue, planners and policymakers must anticipate how mobility constraints reshape urban spatial organization. From a human ecology standpoint, successful adaptation requires not only physical infrastructure but also policy frameworks that consider household-level vulnerabilities and resource limitations. Supporting more compact, accessible urban environments may reduce inequality and enhance urban resilience in the face of future economic disruptions.

5. Conclusions

In this study, we examine how the withdrawal of fuel subsidies in Nigeria has influenced residential location decisions and mobility behavior in Ibadan-North, a fast-growing urban district. The findings point to a clear behavioral shift: As transportation costs increased, many households reduced their travel frequency and began prioritizing housing options closer to workplaces, schools, and essential services. These adjustments reflect how economic policy can directly shape spatial decision-making at the household level. While no immediate statistical link was found between financial status and relocation behavior, significant variation across income and occupational groups suggests that fuel pricing reforms do not affect all populations equally. Households with limited financial flexibility or rigid employment structures appear particularly exposed to transport-related pressures. This uneven impact underscores the need for policymakers to consider differentiated vulnerabilities when designing and implementing economic reforms.

The study also draws attention to a growing demand for accessible, well-connected housing in response to rising mobility costs. These findings offer important guidance for urban planners and local governments: Strategies that promote compact, mixed-use development and improve access to public transport may help mitigate the adverse effects of future fuel policy changes. By capturing a localized case of broader urban dynamics, this research contributes to a more nuanced understanding of how economic shifts influence settlement patterns in cities across the Global South.

User of AI tools declaration

The author declares he has not used Artificial Intelligence (AI) tools in the creation of this article.

Conflict of interest

The author declares no conflict of interest.

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