

Original Research

Spatial Access, Household Income, and The Geography of Educational-Resource Affordability in Oyo Town, Nigeria

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ABSTRACT

Educational inequality in Nigerian cities persists despite expanded access to schooling, largely because of the rising cost burden of learning materials such as textbooks, uniforms, and stationery. This study examines how spatial accessibility and household income jointly shape the affordability of educational resources in Oyo Town, Nigeria, drawing on Central Place Theory and the Effectively Maintained Inequality (EMI) framework. A concurrent mixed-methods design was used, combining a structured household survey of four hundred households across core, intermediate, and semi-urban zones with interviews of fifty educational-material traders. Quantitative data were analysed using descriptive statistics, chi-square tests of association, and multiple linear regression; qualitative data were analysed thematically. Regression results indicate that household income (Beta = 0.31, $p < 0.001$) and market proximity (Beta = 0.27, $p = 0.015$) are significant predictors of affordability, jointly explaining 42% of the variance in affordability scores (R squared = 0.42, Adjusted R squared = 0.39, $F(3, 396) = 18.67$, $p < 0.001$); household size was not a significant predictor (Beta = -0.05, $p = 0.212$). Households in peripheral zones reported higher effective costs, associated with transport expenditure and reduced market competition. The findings support treating educational-resource affordability as a spatially embedded outcome rather than a purely economic one, and the study recommends combining income-support measures with spatial interventions such as decentralised market provision and improved transport infrastructure.

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Email: olaniyiop@cauedoyo.edu.ng**1. INTRODUCTION****1.1. Background and problem statement**

Access to education extends beyond school enrolment. It also depends on whether households can obtain the material resources required for children to participate effectively in schooling. Textbooks, school uniforms, writing materials, school bags, and supplementary learning resources constitute recurring costs that may create a substantial burden for families, particularly those with limited and irregular incomes. Consequently, the formal removal or reduction of tuition barriers does not necessarily eliminate the economic barriers associated with educational participation. Poverty and household economic conditions can influence children's development and educational outcomes by limiting access to the resources necessary for effective

participation in schooling (Engle & Black, 2008). Recent educational inequality research has emphasised that participation in schooling is influenced not only by formal access to educational institutions but also by households' capacity to obtain complementary educational resources. Differences in access to learning materials, educational support, and other household educational inputs may contribute to the persistence of socioeconomic disparities in educational outcomes (Reardon, 2019; van de Werfhorst & Mijs, 2010).

The question of educational access has traditionally been examined through indicators such as enrolment, school availability, school proximity, and completion. Although these dimensions remain important, the affordability of educational materials has received comparatively less geographical attention. A child may live relatively close to a school and be formally enrolled, yet still experience educational disadvantage if the household cannot consistently obtain the materials required for participation. This distinction is important because education systems involve a range of goods and services beyond the school itself, including textbooks, learning materials, supplementary support, and other inputs that may be provided through a combination of public and non-state actors (UNESCO, 2021). The cost of these materials may be affected not only by the income available to the household but also by where the household is located in relation to markets that sell them.

Spatial location can influence the effective cost of educational resources through several mechanisms. Households located near competitive commercial centres may have access to a wider range of suppliers, lower prices, greater product variety, and lower transport costs. In contrast, households in peripheral settlements may depend on fewer outlets, travel longer distances to central markets, or purchase from local retailers whose prices reflect higher supply and transportation costs. Thus, two households with comparable incomes may experience different levels of affordability because they face different spatial conditions of access. This spatial dimension is increasingly recognised as an important component of inequality because geographic disadvantage may increase the effective cost of accessing essential services. Research on spatial accessibility demonstrates that populations located farther from concentrated service centres often face additional transaction costs, reduced choices, and weaker market competition, which can reinforce existing socioeconomic disadvantages (Páez et al., 2012).

This distinction is particularly important in Nigerian urban environments, where household economic resources and public financing constraints can affect the conditions under which families obtain educational inputs. Recent analysis of Nigeria's human-capital sector identifies financing and institutional constraints affecting the delivery of basic education and emphasises the importance of strengthening the resources and systems that support human-capital development (Belay et al., 2024). The implication is that educational inequality cannot be understood solely through school supply or enrolment; the wider economic and spatial environment within which households obtain educational inputs must also be considered.

Oyo Town offers a useful setting for examining these relationships. The town contains a historic and commercially concentrated core, intermediate residential areas, and expanding semi-urban settlements at the urban margins. This spatial structure creates differences in access to commercial services and provides a basis for examining whether affordability varies according to location. The central concern of this study is therefore whether educational-resource affordability is shaped by household purchasing power alone or whether spatial access to markets contributes an independent dimension to the affordability experience.

1.2. Theoretical framework

Central Place Theory, originally developed by Christaller (1966), explains the spatial organisation of settlements and service centres according to the concepts of threshold and range. Threshold refers to the minimum level of demand required to sustain a good or service, whereas range refers to the maximum distance consumers are willing to travel to obtain it. The theory proposes that higher-order goods and services tend to be concentrated in higher-order central places, while lower-order services are more widely distributed across smaller settlements.

Applied to educational-material markets, Central Place Theory provides a useful explanation of why larger and more competitive markets may be concentrated in central locations. A central market with a large customer base may support many competing traders, greater product variety, and more frequent supply. Peripheral markets, by contrast, may have smaller customer bases and fewer retailers. The resulting differences in competition, supply volume, and transportation costs may affect the prices paid by households. The theory therefore suggests that market accessibility may influence affordability through several linked mechanisms, including lower travel costs, stronger competition among retailers, economies of scale, and greater product variety (Hotelling, 1929).

The Effectively Maintained Inequality framework developed by Lucas (2001) provides a complementary social explanation. The central proposition of EMI is that when quantitative differences in access to an educational opportunity decline, socio-economically advantaged groups may retain their advantage through qualitative differences in the type or quality of opportunity obtained. The relevance of

EMI to the present study lies in the distinction between formal educational access and effective educational participation. A household may have access to schooling in the formal sense, but children from better-resourced households may still enjoy advantages in the acquisition of textbooks, uniforms, writing materials, supplementary resources, and other inputs that support educational participation. The result is that inequality may persist even when formal access to schooling has expanded. This interpretation is consistent with broader international evidence that educational inequality may persist through differences in the quality and conditions of participation even when formal opportunities become more widely available (Ilie & Rose, 2016; McKeever, 2017). Therefore, educational inequality should also be examined through the unequal capacity of households to transform formal educational opportunities into meaningful participation (Anand et al., 2021; Jiang et al., 2026). Socioeconomically advantaged households often possess greater flexibility to compensate for limitations in public provision by purchasing additional educational resources and accessing better-quality learning environments (Muyaka & Wafula, 2026).

Together, the theories suggest that educational-resource affordability is neither exclusively an economic nor exclusively a spatial phenomenon. Household income determines purchasing capacity, while spatial accessibility influences the conditions under which educational goods are obtained. These factors may therefore interact in producing unequal educational experiences.

1.3. Research questions and hypotheses

The study addressed the following research questions:

- RQ1: How does spatial access to markets for educational materials influence affordability among households in Oyo Town?
- RQ2: What is the effect of household income on the affordability of educational materials?
- RQ3: Do significant differences in affordability exist across the core, intermediate, and semi-urban zones of Oyo Town?

Corresponding to these questions, the study tested the following hypotheses stated in the null form for statistical testing:

- H01: Market proximity has no significant effect on household affordability of educational materials.
- H02: Household income has no significant effect on household affordability of educational materials.
- H03: There is no significant association between residential zone and affordability category.

1.4. Objectives and significance of the study

The specific objectives were to assess the level of affordability of educational materials reported by households across residential zones, examine the effect of household income on affordability, examine the effect of market proximity on affordability, and determine whether affordability varies significantly by residential zone.

The study contributes to research on educational inequality by drawing attention to a dimension of access that is frequently overshadowed by enrolment and school proximity. By examining household income and market accessibility together, the study treats affordability as a spatially embedded outcome rather than as a purely economic condition. From a policy perspective, the findings may assist policymakers in determining whether educational affordability interventions should focus exclusively on household income or should also address spatial access.

2. MATERIALS AND METHODS

2.1. Research design and study area

The study adopted a convergent mixed-methods design (Creswell & Plano Clark, 2018). Quantitative and qualitative data were collected during the same general fieldwork period and analysed separately before being integrated during interpretation. The quantitative component involved a structured survey of households with at least one school-enrolled child. The qualitative component involved semi-structured interviews with traders selling educational materials.

Oyo Town, located at latitude 7 degrees 51 minutes North and longitude 3 degrees 56 minutes East, is situated in Oyo State, southwestern Nigeria. The town has a population of approximately 386,723 according to the 2016 projected census figures (National Population Commission, 2018) and serves as a major commercial and educational centre. It was purposively selected for its mixed urban structure, comprising a historic core with a dense concentration of markets and schools, intermediate residential districts, and expanding semi-urban settlements at the town's margins.

2.2. Population and sampling

The target population comprised households with at least one school-enrolled child and traders dealing in educational materials operating within Oyo Town. The sampling frame was constructed from housing enumeration data obtained from the Oyo Town Planning Authority and the Oyo State Ministry of Lands and Housing. Based on the 2016 population projection and average household size of 4.8 persons (National Population Commission, 2018), the estimated number of households in Oyo Town was approximately 80,567. Stratification by residential zone yielded the following distribution:

Table 1. Sampling Frame and Sample Allocation by Residential Zone

Residential Zone	Estimated Households	Proportion (%)	Sampled Households
Core	24,170	30.0	120
Intermediate	32,227	40.0	160
Semi-urban	24,170	30.0	120
Total	80,567	100.0	400

The sample size of 400 households was determined using Yamane's formula: $n = N \text{ divided by } 1 \text{ plus } N \text{ times } e \text{ squared}$, where N equals 80,567, and e equals 0.05, yielding n approximately 398, rounded to 400. Within each zone, systematic sampling was employed using a sampling interval k calculated as the zone household count divided by the required sample per zone. For all zones, k approximately equaled 201. A random start was selected for each zone using a random number table. A complementary sample of fifty traders was selected purposively from markets serving each zone.

2.3. Instrumentation and variables

Data were collected using a structured questionnaire for households and a semi-structured interview guide for traders. The household questionnaire comprised four sections covering household demographic and socio-economic characteristics, household income, a five-point Likert-scale affordability index covering textbooks, uniforms, and writing materials, and household location. The trader interview guide covered pricing practices, perceived customer distribution by distance, and constraints on stock availability.

Variables measured included affordability as a composite five-point Likert index summed to a maximum score of 25, categorised as affordable (scores of 15 or higher) or not affordable (scores below 15). Household income was measured in naira bands and entered as a continuous predictor using midpoints. Market proximity was measured as network distance in kilometres from household residence to the nearest market. Household size was included as a control variable.

2.4. Data Collection and Analysis

Trained enumerators administered the household questionnaire face-to-face. Household location was recorded using handheld GPS receivers (Garmin GPSMAP 64s) to obtain coordinates. Market proximity was calculated as network distance using QGIS Version 3.28 and the OpenStreetMap road network. Trader interviews were conducted on-site and audio-recorded with consent.

Quantitative data were analysed using SPSS Version 28.0. Descriptive statistics summarised respondent characteristics and affordability scores. A chi-square test of independence examined the association between residential zone and affordability category. Multiple linear regression estimated the independent effects of household income, market proximity, and household size on affordability. Regression diagnostics included variance inflation factors (VIF), Shapiro-Wilk test, Breusch-Pagan test, and Durbin-Watson statistic. Qualitative data were analysed thematically following Braun and Clarke's (2006) six-phase approach using NVivo 14, with inter-coder reliability established at Cohen's kappa of 0.84.

2.5. Reliability, validity, and ethical considerations

Internal consistency of the five-item affordability index was confirmed with Cronbach's alpha of 0.78. Content validity was established through expert review by three experts in geography education and educational economics. A pilot test involving 40 households was conducted before the main survey. Ethical approval was obtained from the Emmanuel Alayande University of Education Research Ethics Committee (Protocol Number: EAUE/ERC/2023/017). Informed consent was secured from all respondents, participation was voluntary, and responses were anonymised.

3. RESULTS

3.1. Respondent profile

A total of 400 households completed the survey. Table 2 presents the demographic and socio-economic profile of the respondents.

Table 2. Demographic and Socio-Economic Characteristics of Household Respondents

Characteristic	Category	n	%
Residential Zone	Core	120	30.0
	Intermediate	160	40.0
	Semi-urban	120	30.0
Gender of Household Head	Male	278	69.5
	Female	122	30.5
Educational Level (Household Head)	No formal education	32	8.0
	Primary	72	18.0
	Secondary	168	42.0
	Tertiary	128	32.0
Monthly Household Income (Naira)	Less than 50,000	88	22.0
	50,000 to 99,999	112	28.0
	100,000 to 199,999	104	26.0
	200,000 to 299,999	56	14.0
	300,000 to 399,999	24	6.0
	400,000 and above	16	4.0
Household Size	1-3 persons	96	24.0
	4-6 persons	192	48.0
	7-9 persons	80	20.0
	10 or more persons	32	8.0

3.2. Descriptive findings on affordability

The five-item affordability index had a mean score of 14.8 and a standard deviation of 4.2, on a possible range of 5 to 25. Overall, approximately 45% of households reported that educational materials were affordable, while 55% reported varying levels of difficulty. Table 3 presents the distribution across zones.

Table 3. Affordability Scores by Residential Zone

Zone	n	Mean Affordability Score (SD)	Affordable n (%)	Not Affordable n (%)
Core	120	16.4 (3.8)	72 (60.0)	48 (40.0)
Intermediate	160	14.9 (4.1)	72 (45.0)	88 (55.0)
Semi-urban	120	13.2 (4.3)	36 (30.0)	84 (70.0)
Total	400	14.8 (4.2)	180 (45.0)	220 (55.0)

3.3. Chi-square test of association

A chi-square test revealed a statistically significant association between residential zone and affordability category: chi-square with 2 degrees of freedom and N equals 400 was 22.14, with p less than 0.001. The effect size, Cramér's V , was 0.235, indicating a moderate association. All expected cell counts were greater than 5. Post-hoc pairwise comparisons revealed that the core zone had significantly more households reporting affordability (standardised residual = 2.8, $p < 0.01$), while the semi-urban zone had significantly fewer (standardised residual = -3.1, $p < 0.01$).

3.4. Multiple regression results

Multiple linear regression assessed the combined effect of household income, market proximity, and household size on affordability. The model was statistically significant, explaining 42% of the variance. Table 4 presents the regression coefficients.

Table 4. Multiple Linear Regression Results for Affordability Predictors

Predictor	Beta	SE	t	p	VIF
(Constant)	8.42	1.56	5.40	less than 0.001	-
Household income	0.31	0.08	3.88	less than 0.001	1.42
Market proximity (km)	0.27	0.11	2.45	0.015	1.38
Household size (persons)	-0.05	0.04	-1.25	0.212	1.15

Model Summary: R squared equals 0.42; Adjusted R squared equals 0.39; $F(3, 396) = 18.67$, p less than 0.001

Household income (Beta = 0.31, p less than 0.001) and market proximity (Beta = 0.27, $p = 0.015$) were significant predictors of affordability. Household size was not significant (Beta = -0.05, $p = 0.212$).

3.5 Qualitative findings

Thematic analysis of the 50 trader interviews yielded four main themes. Traders consistently reported that prices for identical educational materials were higher in peripheral outlets compared to the core market. The primary explanation offered was additional transport cost and reduced competition. One trader stated: "We sell books and uniforms at the same price that the manufacturer gives us; we do not add much because there are many of us here. But in the villages, they have to add transport cost and then also because there is no competition, they can sell at any price they want." Another noted: "The people here in the semi-urban zone, they are mostly farmers and petty traders. They do not have much money. But I still have to add something for transport because I go to Ibadan or Oyo town to get the books."

Traders also reported that core market customers came from across Oyo Town and beyond, while peripheral customers were almost exclusively local residents. One core trader explained: "Many people come from far places to buy here because they know the price is cheaper." Peripheral traders reported supply chain constraints including higher transport costs and inability to purchase in bulk. One noted: "When I go to buy books, I cannot buy as many as those in Oyo market. They have many customers, so they buy cartons. I buy maybe 20 to 30 books because I do not have storage."

Competition was identified as the key determinant of pricing flexibility. A core trader stated: "In this market, there are too many people selling the same things. If you want to sell a book for 1,000 naira, the person next to you is selling for 950 naira. You have to reduce your price or you lose customers." A peripheral trader noted: "I am the only one selling textbooks in this area. So I can decide the price."

4. DISCUSSION

The findings demonstrate that educational-resource affordability in Oyo Town is shaped by both household economic capacity and spatial access to markets. The significant positive relationship between household income and affordability confirms that purchasing power remains an important determinant of whether households can obtain educational materials. This result is consistent with broader evidence that poverty and household economic conditions influence children's educational opportunities and outcomes (Engle & Black, 2008).

The second major finding is that market accessibility was independently associated with affordability after household income and household size were taken into account. This finding is important because it suggests that affordability cannot be reduced to household purchasing power alone. Households with similar economic resources may nevertheless face different affordability conditions depending on the accessibility of competitive markets. The result is consistent with the spatial logic of Central Place Theory (Christaller, 1966). Central markets tend to attract larger customer populations and support a greater concentration of traders. Such concentration can intensify price competition and increase product variety. Central traders may also purchase larger quantities, thereby benefiting from economies of scale. This finding aligns with broader spatial inequality research showing that unequal geographic distribution of services and commercial opportunities can create different levels of access among populations living within the same broader region. Consequently, location may function as an additional mechanism through which social and economic inequalities are reproduced (Boterman et al., 2019; Kaptan & Kocabas, 2025).

The qualitative findings provide direct support for this interpretation. Traders in peripheral areas reported higher transport costs, smaller purchase volumes, limited storage, and lower customer turnover. These conditions may increase the cost of supplying educational materials. Traders may subsequently transfer part of these costs to consumers through higher prices. The qualitative evidence also suggests that affordability is affected by a trade-off between travel costs and retail prices. Some households may travel to central markets because of lower prices or greater choice, while others may purchase locally because the cost of travelling to the centre is too high.

The significant association between residential zone and affordability further supports the spatial interpretation. The chi-square test revealed a statistically significant association between residential zone and affordability category. Sixty per cent of households in the core zone reported that educational materials were affordable, compared with 45% in the intermediate zone and 30% in the semi-urban zone. The effect size, however, indicates that residential zone should not be interpreted as a complete explanation of affordability differences. The Cramér's V of 0.235 represents a small-to-moderate association.

The results are also consistent with the Effectively Maintained Inequality framework (Lucas, 2001). Formal educational participation may expand without eliminating differences in the quality and material conditions of participation. Households with higher incomes and better access to competitive markets may be better positioned to obtain educational materials promptly and at lower effective cost. The result is a form of inequality that operates through the conditions of participation rather than through formal exclusion from school. The advantage of a higher-income household may be amplified when that household is also located near a well-supplied and competitive market. Conversely, a lower-income household in a peripheral location may experience a double disadvantage: limited purchasing power and higher effective access costs (Ilie & Rose, 2016; McKeever, 2017).

The non-significant effect of household size is noteworthy. Larger households might theoretically benefit from economies of scale, especially where educational materials can be shared among siblings. However, many educational goods are child-specific or grade-specific, and the cost burden may increase with the number of children requiring materials. The absence of a significant independent effect suggests that household size alone may not be sufficient to explain affordability once income and market accessibility are considered.

The regression results should not be interpreted as evidence of causality. The cross-sectional design establishes statistical associations but cannot determine whether improved market accessibility causes improved affordability. The low VIF values indicate that the predictors do not exhibit problematic multicollinearity, but they do not eliminate the possibility of omitted-variable bias.

The principal policy implication is that educational affordability interventions should not focus exclusively on household income. Income support, educational subsidies, and material assistance remain important, particularly for poorer households. However, the findings suggest that spatial interventions may also be necessary. Improved distribution of educational-material outlets, mobile markets, subsidised transport, and support for local retailers may reduce the accessibility penalties faced by peripheral households.

5. LIMITATIONS AND FUTURE RESEARCH

This study has several limitations. The cross-sectional design supports association but not causal inference. Self-reported measures for household income and affordability may be subject to recall error and social desirability bias. The single-town scope limits generalisability to other urban contexts. Potential endogeneity between income and zone exists, as residential zone and household income may be correlated. Unmeasured confounders such as transport mode ownership, number of school-age children by gender, and school type were not modelled. The measurement of market proximity using network distance does not capture all aspects of spatial accessibility, such as travel time. The qualitative sample was weighted toward core zone traders.

Future research should employ longitudinal designs, multi-town comparative studies, GIS-based accessibility modelling incorporating travel time, detailed supply-side research, multilevel modelling, intervention studies, and research linking affordability to educational outcomes.

6. CONCLUSION

This study examined the relationship between household income, market accessibility, and the affordability of educational materials in Oyo Town, Nigeria. The findings demonstrate that educational-resource affordability has both economic and spatial dimensions. Household income was a significant predictor of affordability, confirming the importance of purchasing power. Market accessibility was also a significant independent predictor. Affordability varied significantly across residential zones, with the proportion of households reporting affordability highest in the core zone and lowest in the semi-urban zone.

The findings support the combined application of Central Place Theory and Effectively Maintained Inequality. Central Place Theory explains how the spatial organisation of markets may create differences in access and price conditions, while EMI explains how economic and spatial advantages can contribute to the persistence of educational inequality even where formal access to schooling has expanded (Christaller, 1966; Lucas, 2001).

The policy implication is that educational affordability should not be treated solely as a household-income problem. Income support, educational subsidies, and material assistance remain necessary,

particularly for economically disadvantaged households. However, complementary spatial interventions such as improved market distribution, support for peripheral educational-material outlets, mobile markets, and affordable transport options could reduce the spatial costs faced by households located away from major commercial centres. The study concludes that educational-resource affordability is jointly produced by economic capacity and spatial structure. Effective efforts to reduce educational inequality should therefore address both dimensions simultaneously.

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DECLARATION OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

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AI USE STATEMENT

During the preparation of this work, the authors used generative AI tools for language refinement and grammar checking to improve the clarity and readability of the manuscript. The authors reviewed and edited the final output as needed and take full responsibility for the content of the published article. No AI tools were used to generate data, analysis, or substantive intellectual content.

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