



Original scientific paper

Parental Preferences and Non-Spatial Factors Influencing Home-to-school Distance in Urban India: Insights From Visakhapatnam

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ABSTRACT

The school in the neighbourhood unit has been a significant and irreplaceable element in promoting active school commutes, and physical activity needs for children. However, urban areas in India are currently witnessing long school commutes. This study explores parental preferences for school selection in an urban Indian context, focusing on non-spatial attributes of schools associated with home-to-school distance. A questionnaire-based cross-sectional survey was conducted in Visakhapatnam, Andhra Pradesh, with a sample size of 409 families. Data were collected under four parameters: family demographics, socio-economics, neighbourhood environment, and non-spatial attributes of the schools. Pearson's chi-square (χ^2) test of independence was adopted to identify the association between the dependent and predictor variables. Further, a multinomial logistic regression model was employed to predict the odds in home-to-school distance. These methods were chosen for their ability to provide robust and reliable results. The findings, which indicate that child age, number of school-going children, annual household income, school's board of affiliation, and education level significantly predict home-to-school distance, have practical implications. They suggest that policy interventions aimed at reducing school commute times should consider these non-spatial factors. Enhancing local school attributes could encourage shorter commutes, promoting healthier lifestyles for children. This understanding can guide the development of policies and interventions that effectively reduce school commute times.

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Highlights:

- The school's non-spatial attributes are contextually specific. This study is the first attempt to investigate the role of non-spatial factors affecting home-to-school distance in India.
- The non-spatial attributes of school environments significantly influence parents' preferences in school selection.
- Statistical methods χ^2 test of independence and MNL Regression analysis provide robust results in preferential choice studies.

Contribution to the field statement:

This study expands theoretical perspectives on the neighbourhood school concept by incorporating non-spatial attributes of schools and socio-economic factors in parents' school selection preferences, emphasizing the need for integrated urban planning and community engagement to ensure equitable education access in developing urban areas.

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1. Introduction

1.1 Background and Context

Distance of the school plays a significant role in progressing a child's physical and cognitive development and overall well-being (Faulkner et al., 2009; Macdonald et al., 2019). Starting in the early 2000s neighbourhood concept, the element of the school in the neighbourhood unit has played an instrumental role in fostering urban planning and neighbourhood unit sustainability in many developed and developing nations (Glazer, 1959; Lawhon, 2014). Over the period, the consistent efforts and educational reforms in providing access to education in India have facilitated a school provision in almost all neighbourhoods within a walkable distance of 1km (Tucker Shailey, 2012). However, the dynamic nature of urbanisation, available school choices, affordable transportation conveniences, and ever-changing preferences encourage parents to choose various schools and shift away from local schools for their children's education. In urban areas, this has exacerbated challenges in the transportation infrastructure, with studies indicating that nearly 30% of road traffic congestion is caused by school trips during school operating hours (Srinivasan, 2010; W. Sun et al., 2021). This situation is particularly concerning for children, who are a highly vulnerable age group. Longer school commutes expose them to increased risk of road traffic accidents (Singh, 2017), air pollution, obesity, and cardiovascular diseases (Sabin et al., 2005). Additionally, these extended commutes result in a significant loss of active time for physical activity, which is crucial for children's overall health and well-being.

1.2 Literature Study

The literature in this paper consists of two major aspects. It begins with a brief overview of understanding Indian school education and concludes with a review of parental school preferences.

1.2.1 Understanding the Indian School Education

The Ministry of Education under the Ministry of Human Resource Development (MHRD), Government of India, is India's apex body of school education. It controls the funding, framing of policies, and execution, and it ensures uniformity at national and regional levels for education improvement and overall development (Krishna & Naidu, 2005). According to (Parruck Chanda & Ghosh, 2014), School education in India can broadly be segmented by three key factors: level of education, ownership, and board of affiliation. Level of education is further categorised into four phases: lower primary (class 1-5), upper primary/elementary (class 6-8), secondary (class 9-10), and higher secondary (class 11-12) (see figure 1) for clear understanding about the type of school and level of education. School ownership is categorised into three types: public, semi-public and private. Government-operated schools are called government/municipal public schools and offer formal schooling. Semi-public schools are aided by the government and managed by the private, whereas private schools are funded and managed by the private. Most urban neighbourhood schools are municipal schools affiliated with a respective state board of education. Besides the state board, two other prominent school boards are in India: the Central Board of Secondary Education (CBSE) and the Council for the Indian School Certificate Examinations (ICSE). The CBSE and ICSE share a very minimal number among the total school share (nearly 28,000 schools out of a total of 1.5 million), yet they are prevalent across the country. The curriculum, teaching/learning methods, infrastructure facilities, and site areas of these boards are different.

1.2.2 Parents Preferences

Proponents contend that parents are the key decision-makers in school selection and their children's commuting mode (Alsuiadi, 2015; Burgess et al., 2015; Joshi, 2014; Schneider & Buckley, 2002). A recent study by (Joshi, 2014) in Nepal says location, quality of education, and financial consideration are the utmost factors parents rank when selecting a school for their children. Similarly, many U.S. studies identified the convenient location as the primary parental preference in choosing a school for ease of dropping and picking up their children (Hastings et al., 2005). A study by (Schneider & Buckley, 2002) based on an internet search of parental preference about schooling in Washington, DC, found that location



is the second most common keyword in school selection concerning distance from home and access to public transportation. Location preferences vary based on parents' socio-economic background, built environment attributes and political governance (Joshi, 2014).

School quality is a complex variable and challenging to describe and quantify. Parents consider higher academic attainments (Burgess et al., 2015), quality of instruction and innovative teaching methods, discipline, school management and results of board examinations (Joshi, 2014), class size, quality of instruction and student-teacher relationship (Alauyadi, 2015) are major attributes of the school quality. (Woessmann, L. 2000) Defines such factors based on the resources and management of the school, which are the two fundamental elements that shape the school's functioning. Based on the above two elements, (Klees, 2010) categorised a school's mechanism into four types, i.e., funded and managed by the public, funded and managed by private, funded by public and managed by private, and funded by private and managed by public. Further, (Woessmann, 2000) study finds that the operation of schools with public funding and public management is associated with lower outcomes, but public funding and private management are associated with better student outcomes and are most efficient. However, private funding and management schools result in higher student outcomes. Parents also consider reputation as another attribute of the school's quality, and school achievements further define its reputation.

Dissatisfaction over failing public schools has motivated parents to choose private schools in many places (Beavis, 2004; Kingdon, 2007; Mousumi & Kusakabe, 2022; A. Singh, 2015; Woodhead et al., 2013). Conversely, globalisation in developing countries has resulted in citizens accessing and affording private schools that teach English, a globally important language (Joshi, 2014), rather than public schools that predominantly teach local or regional languages. Parents who choose private schools in non-native English-speaking countries value English medium instruction, quality of English teaching and teachers' professional expertise (Joshi, 2014). Few studies (Iram Naila et al., 2008; Woodhead et al., 2013) reported that household factors might influence school selection criteria, like the number of children in the family, birth order, and gender of the siblings, have a substantial impact on school selection, particularly in marginal economic families.

1.3 Research Gap

Globally, a vast number of studies exist on children's school commute modes concerning home-to-school distance. Such studies are based on children's age, gender, demographic, socio-economic, neighbourhood environment, social and cultural setting, urban form, distance, walkability, safety, school location, transit access, traffic danger, car ownership, season, and other explanatory factors. These studies focus on the various commute modes and their association with children's health and the built environment (Broberg & Sarjala, 2015; Chica-Olmo et al., 2018; Chillón et al., 2015; Crane & Crepeau, 1998; McDonald, 2007; Mitra, 2013; Sidharthan et al., 2011; Y. Sun et al., 2015). A few studies have attempted to investigate parental preferential factors when selecting a school for their children, mainly considering the distance of the school from home.

1.4 Objectives

Motivated by the above discussion, this research aims to determine the role of a school's non-spatial attributes that influence the parents' preferences in school selection concerning home-to-school distance in urban areas. This study is based on the primary data gathered from a representative sample of parents (of children aged 5-14 years) in Visakhapatnam, India. Further, this study provides insights into school commute typologies of children and home-to-school distance concerning varied socio-demographic settings and further attempts to understand the parent's preferences on school selection criteria based on household characteristics, SES, and school's non-spatial and built-environment factors.

1.5 Significance and Structure of the Paper

This study highlights the critical role of non-spatial attributes in parental school selection and its impact on home-to-school distance in urban India. By understanding these preferences, policymakers can design interventions to reduce school commute times, alleviate traffic congestion, and promote healthier lifestyles for children. The findings provide a basis for enhancing local school attributes and inform the development of more effective urban education policies.

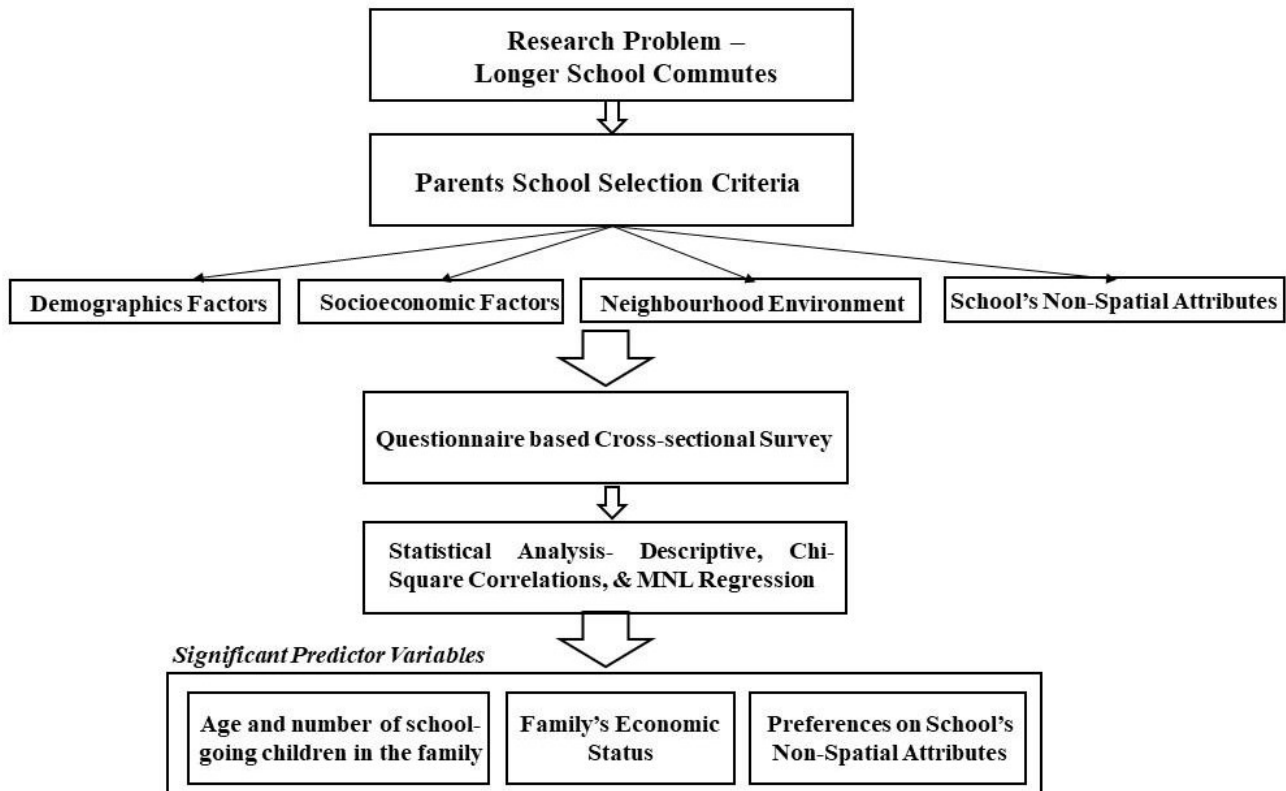


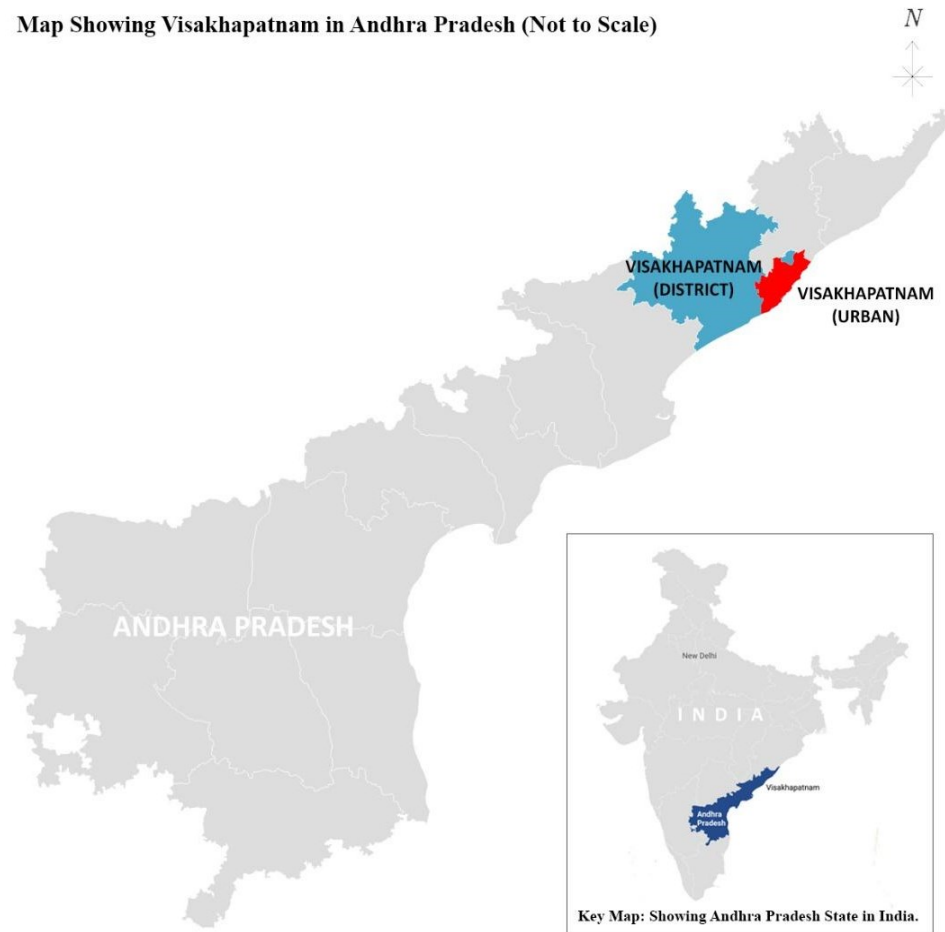
Figure 1. Structure of the Study (Developed by the Authors).

2. Materials and Methods

2.1 Study Setting

A questionnaire-based cross-sectional survey was conducted in Visakhapatnam (GVMC –Greater Visakhapatnam Municipal Corporation), a metropolitan city (with a population of more than 1 million people) in Andhra Pradesh, India (see Figure 2). Visakhapatnam is the first largest city and a proposed executive capital city of the newly bifurcated state of Andhra Pradesh. The city has a population of 1.7 million, a core urban area of 122 km² and a total metropolitan area of 539.95 km²; the city is administratively organised into six zones and 72 wards. Further, the city consists of major ports, industries, and educational institutions in the state, attracting many migrants from the neighbouring regions.

Map Showing Visakhapatnam in Andhra Pradesh (Not to Scale)



Map: Reedy Rohinikumar | IIT Roorkee | 2022 . Map data: © OSM . Created with Datawrapper . Edited in PSD

Figure 2. Map representing the location of Visakhapatnam city in Andhra Pradesh, India.

2.2 Participants

The targeted respondents were the parents of elementary school pupils (5-14 years old). Two sampling methods were used to collect the data and received 247 samples from a non-probabilistic snowball sampling technique (circulating questionnaire link/QR code through SMS and WhatsApp) and 220 samples from a simple random sampling (Circulating questionnaire form at the neighbourhood parks) during April 2021 to August 2021. Out of 467 observations, 409 valid responses are retained for the analysis. The purpose of the study was communicated, and informed consent was obtained from the participants.

2.3 Materials, Equipment, Procedures and Protocols

Indicators identified from previous studies to formulate the questionnaire and discussed with subject experts, i.e., school teachers and school-going children's parents, to contextualize the instrument. The questionnaire involves demographic, socio-economic, neighbourhood environment, and spatial and non-spatial parameters of schools. Microsoft Forms (an online survey tool) is used to prepare a questionnaire form for distribution to the targeted respondents. Each question in the questionnaire form was asked in two languages, English and Telugu (a regional language in the study context), for the convenience of the participant. The author has sufficient knowledge of both languages. Hence, the translation of the questionnaire reflects the same meaning in both languages. The data types collected are nominal, ordinal, and interval/ratio with a structured closed-ended and open-ended questionnaire. In this paper, only a selected closed-ended questionnaire is taken into consideration.



2.4 Data Analysis

Descriptive statistics were used to represent the characteristics of the overall sample in frequencies and percentages. Variables like home-to-school distance, commute mode, and school availability in the neighbourhood have been cross-tabulated with frequencies. It has provided information about the proportion of children studying within the neighbourhood and commuting outside with varied distances and commute modes. The Chi-square test is a distribution-free non-parametric test; when the Level of measurement of variables is nominal/ordinal, the sample size of the study groups is unequal, and the distribution is non-normal, this test gives robust results and detailed information about the interdependency of the variables (Mchugh, 2013). The variables in our study satisfy the (Mchugh, 2013) chi-square test criteria and do not require preliminary tests to check the normality. Hence, further analysis was conducted in non-parametric tests using Pearson's chi-square (χ^2) test of independence to investigate the significant relations between the dependent and independent variables. After obtaining the significant variables, a multinomial logistic regression analysis was conducted using the forward method with the significant variables to predict the odds ratios of the home-to-school distance. All the statistical tests were conducted using IBM® SPSS® Statistics Version 27.

3. Results

3.1 Children studying within the neighbourhood vs outside

As shown in Table 2, out of 409 parents' responses, 362 parents reported school availability within the range of 1km from their home, and the remaining 47 parents reported unavailability or unaware of the school in the 1km vicinity. However, out of 362 parents, only 136 parents (i.e., 59 parents with single children, 69 parents having two children, and 8 parents having three children) reported that their children are studying at the same school, and 193 parents (i.e., 144 parents with single children, 45 parents having two children, and 4 parents having three children) reported that they are sending their children outside the neighbourhood for school. Surprisingly, 33 parents said at least one of their children is at the neighbourhood school, and the rest are studying outside the neighbourhood.

Table 1: Characteristics of the sample.

Characteristics of the sample			Characteristics of the sample		
Variable	Frequency	Percentage	Variable	Frequency	Percentage
Number of Respondents	409	100%	Board of Child School		
Gender of the Child			Local / State govt. board	297	72.60%
Male	230	56.20%	CBSE	82	20.00%
Female	179	43.80%	ICSE	30	7.40%
Level of Education of the Child			Medium of instruction		
Primary	208	50.90%	Regional language	48	11.70%
High School	201	49.10%	English	361	88.30%
Number of Children in the Home			Type of management of the school		
1	232	56.70%	Public	108	26.40%
2	160	39.10%	Semi-public	60	14.70%
3	17	4.20%	Private	241	58.90%
Education of the parent			Level of education of the school		
Did not attend the school	22	5.40%	Up to Primary	83	20.30%
Up to matriculation	46	11.20%	Up to Upper-Primary	70	17.10%
Graduate	194	47.40%	Up to Secondary (High School)	256	62.60%
Above graduation	147	35.90%	Type of education of the school		
Occupation of the Parent			Co-Education	380	92.90%
Both are not working	26	6.40%	Only Girls	20	4.90%
Single parent working	290	70.90%	Only Boys	9	2.20%
Both are working	93	22.70%	Teaching Methods		



Annual income of the family (Indian Rupees)			Traditional	140	34.20%
< 3,00,000	101	24.70%	Modern / Digital	36	8.80%
3,00,001 - 6,00,000	133	34.00%	Combined	233	57.00%
6,00,001 - 12,00,000	123	30.10%			
> 12,00,000	46	11.20%			

Table 2: Children studying within the neighbourhood vs outside.

	Is the school within 1km of your residence available?		If yes, is your child studying at the same school?			
	Yes	No	Yes, all my children study at the same school	Yes, one of my child studying at the same school	No	
Number of School Children in the Family	1	204	28	59 (59)	1(1)	144 (144)
	2	143	17	69 (138)	29 (29)	45 (90)
	3	15	2	8 (24)	3 (3)	4 (12)
	Total	362	47	136 (221)	33 (33)	193 (46)

3.2 Mode of the school commute and home-to-school distance

As shown in Table 3, children travel to school by active modes (walking and bicycling) up to the range of 2km from home; as the distance increases, the mode of commute changes to the motorised vehicle. However, the commute mode may vary according to the child's gender and level of education. The Pearson correlation results indicate a significant relationship between the variables of the child's school commute mode and the distance of the school from home ($\chi^2 = 250.078$, $df = 15$, $p\text{-value} < 0.001$).

Table 3: Mode of school commute vs home-to-school distance.

Mode of School Commute	Distance of the child's school from home				Total
	< 1 km	1-2 km	2-5 km	> 5 km	
Walking	45	13	0	0	58
Bicycling	25	2	2	0	29
Rickshaw/Auto	47	45	22	13	127
Dropping/Pick-up by parent or caretaker	11	21	27	6	65
School van/bus	7	13	45	51	116
Public transport	0	0	2	12	14

3.3 Correlation among variables (Refer to Table 4)

3.3.1 Demographic factors vs home-to-school distance

Gender

Our sample of responses represents 43.8% girls and 56.2% boys school admissions. Regarding the distance of the school from home, girls were slightly lower compared to boys in the school admissions, whereas, while distance increased from home to school, boys' numbers slightly increased. However, the difference was not statistically significant ($\chi^2 = 0.646$, $df = 3$, $p\text{-value} = 0.886$). (Easton & Ferrari, 2015) reported that gender moderated with age could significantly affect the commute distance as a girl's age may increase commute distance.

Age / Level of the child's education

Parents of primary school children were more likely to send their children to schools near home (39.4%, 23.6%, 20.2%, and 16.8% in <1km, 1-2km, 2-5km, and above 5km, respectively). Whereas in high-school children, the number of children was significantly increasing in comparison to primary-level children as the distance increased from the home (26.4%, 22.4%, 27.9%, and 23.4%, in <1km, 1-2km, 2-5km, above



5km, respectively). There is a significant difference in the Level of the child's education and the distance of the school from home ($\chi^2 = 10.039$, $df = 3$, $p\text{-value} < 0.05$). The results correlate with (Easton & Ferrari, 2015) findings, where a child's age/level of education is very consistent and significant in association with home-to-school distance.

Number of children in the family

Regarding the number of school-going children in the family, our sample reported 232 (56.7%) families having a single child, 160 (39.1%) families having two children and the rest 17 (4.2%) families having three children. Our results describe that families with two or more children prefer schools within 2km from home, whereas single-child parents' preferences vary regardless of the distance. Our findings report a significant difference in the number of school children in the family and home-to-school distance ($\chi^2 = 21.040$, $df = 6$, $p\text{-value} < 0.05$).

3.3.2 Socio-economic factors vs home-to-school distance

Parent's educational qualification

Of all the 409 observations, 174 (35.9%) respondents are above graduation; among them, 37 parents (25.2%) are sending their children to the school in the neighbourhood, another 105 parents (71.4%), including the above 37 respondents' children are studying at the school within 5km from home, and 42 parents (28.6%) are sending their children to the school above 5km from home. Similarly, 194 (47.4%) respondents are graduates; among them, 72 parents (37.1%) are sending their children to the school in the neighbourhood, 166 parents (85.4%), including the above 72 respondents' children are studying at the school within 5km from home, and 28 parents (14.4%) are sending their children to the school above 5km from home. Likewise, 46 (11.2%) respondents are up to matriculation; among them, 17 parents (37%) are sending their children to the school in the neighbourhood, and the rest 29 parents (63%) are sending their children to the school outside the neighbourhood. Lastly, 22 (5.4%) respondents did not attend schooling; among them, 9 parents (40.9%) are sending their children to the school in the neighbourhood, and the 18 parents (81.8%) children including above 9 are studying within the 5km, and the remaining 4 parents (18.2%) are sending their children above 5km. These results describe a slight relation between an increase in the parent's education level to the Distance of the children's school from home; however, the difference was not statistically significant ($\chi^2 = 14.991$, $df = 9$, $p\text{-value} = 0.091$).

Annual income of the family

Of all the 409 observations, 101 respondents (24.7%) have income below 3,00,000 and send their 45 (44.6%) children to the school in the neighbourhood, 92 (91.1%) children are studying the range of 5km from home, and only 9 (8.9%) children are travelling more than 5km from home for schooling. Similarly, 139 respondents (34%) have an income between 3,00,001-6,00,000 and send their 52 (37.4%) children to the school in the neighbourhood, 115 (82.7%) children are studying the range 5km from home, and 24 (17.3%) children are travelling more than 5km. Likewise, 123 respondents (30.1%) have an income of 6,00,001-12,00,000 and send their 25 (20.3%) children to the school in the neighbourhood, 82 (66.7%) children are studying in the range of 5km from home, and 41 (24.7%) children are travelling more than 5km from home for schooling. And finally, 46 respondents (11.2%) have an income of above 12,00,000; among them, 13 (28.3%) parents send their children to the school in the neighbourhood, 38 (82.6%) are within the range of 5km from home, and the rest 8 (17.4%) of them are travelling more than 5km. Pearson correlation suggests a significant correlation between the annual income of the family and the Distance of the children from home ($\chi^2 = 40.251$, $df = 9$, $p\text{-value} < 0.001$).

Parents occupation

In our sample, 290 (70.9%) respondents reported single parents are working, 93 (22.7%) said both parents are working, and only 26 (6.4%) reported not working anywhere. The correlation between parents' occupation and home-to-school distance did not show any statistical significance ($\chi^2 = 1.290$, $df = 6$, $p\text{-value} = 0.972$).



3.3.3 School's non-spatial factors vs home-to-school distance

Board of the school

Of all the 409 observations, 297 parents (72.6%) are sending their children to the Local / State government board schools; among them, 117 (39.4%) parents send their children to the neighbourhood school, 257 (86.5%) children are studying in the range of 5km from home, and only 40 (13.5%) children are travelling more than 5km from home. Similarly, 82 parents (20.1%) are sending their children to CBSE schools; among them, 13 (15.9%) parents send their children to the neighbourhood school, 52 (63.4%) children are studying in the range of 5km from home, and 30 (36.6%) children are travelling more than 5km from home. Finally, 30 parents (7.3%) are sending their children to the ICSE schools; among them, 5 (16.7%) parents send their children to the neighbourhood school, 18 (60%) children are studying in the range of 5km from home, and 12 (40%) children are travelling more than 5km from home. These results show that most children studying in local/state govt board schools travel less than 5km for schooling from their home, whereas children studying at CBSE and ICSE schools travel more than 5km. Although most children study at local schools, there is a significant difference in the distance of the school from home and the board of children's school ($\chi^2 = 39.256$, $df = 6$, $p\text{-value} < 0.001$).

Our statistical model (see table 5) presents the probability of preference for CBSE schools compared to the local board having 1.198, 4.118, and 6.721 times in 1-2km, 2-5km and above 5km categories, respectively, with the base category of home-to-school distance below 1km. Similarly, the probability of preference for ICSE schools compared to the local board having 1.200, 2.370, and 6.669 times in 1-2km, 2-5km and above 5km categories, respectively, with the base category of home-to-school distance below 1km.

Medium of instruction

The majority of the parents choose English as an instruction language rather than a local/regional language; out of 409 observations, 361 (88.3%) parents sending their children to schools of English language instruction, and only 48 (11.7%) parents are sending to the schools of local/regional language instruction. Though the majority prefer English instruction as a major criterion for their children's school, the distance of the school from home and the medium of instruction does not significantly differ ($\chi^2 = 6.789$, $df = 3$, $p\text{-value} = 0.079$).

School management

Nearly two-thirds of the sample represents private schools over public and semi-public together. Public school students decrease as home-to-school distance increases, whereas private school children remain consistent. However, the home-to-school distance over school management is not statistically significant at 95% CI ($\chi^2 = 12.132$, $df = 6$, $p\text{-value} = 0.059$).

Level of education offered by the school

Our sample represents primary school children with 208 members. However, only 83 (40%) were enrolled in schools offering primary education, and the rest, 125 (60%), were enrolled in schools that offer up to elementary and secondary level. Chi-square statistics show the association between home-to-school distance and the level of education offered by the school in school selection ($\chi^2 = 18.043$, $df = 6$, $p\text{-value} < 0.05$). However, the child's education level needs further examination of this significance.

Type of education offered by the school

In the type of schooling, 93% of the sample represents co-education schools, and only 7% represents only girls and only boys schools together. The chi-square statistic is not significant on home-to-school distance and type of school ($\chi^2 = 3.464$, $df = 6$, $p\text{-value} = 0.749$).



Table 4: Correlation among variables.

Variable	Descriptive statistics (frequency)				Pearson Chi-Square analysis		
	Distance of the child's school from home				χ^2	df	Sig.
	< 1 km	1-2 km	2-5 km	> 5 km			
Gender of the Child					0.686	3	0.886
Male	74	51	58	47			
Female	61	43	40	35			
Level of Education of the Child					10.039	3	< 0.05 (0.018)
Primary	82	49	42	35			
High School	53	45	56	47			
Number of Children in the family					21.040	6	< 0.05 (0.002)
1	58	57	70	47			
2	69	32	26	33			
3	8	5	2	2			
Education of the parent					14.991	9	0.091
Did not attend the school	9	3	6	4			
Up to matriculation	17	10	11	8			
Graduate	72	44	50	28			
Above graduation	37	37	31	42			
Occupation of the Parent					1.290	6	0.972
Both are not working	9	6	7	4			
Single parent working	96	68	70	56			
Both are working	30	20	21	22			
Annual income of the family					40.251	9	< 0.001 (0.000)
< 3,00,000	45	27	20	9			
3,00,001 - 6,00,000	52	25	38	24			
6,00,001 - 12,00,000	25	24	33	41			
> 12,00,000	13	18	7	8			
Board of child school					39.256	6	< 0.001 (0.000)
Local / State govt. board	117	72	68	40			
CBSE	13	15	24	30			
ICSE	5	7	6	12			
Medium of instruction					6.789	3	0.079
Regional language	19	16	7	6			
English	116	78	91	76			
Type of management of the school					12.132	6	< 0.05 (0.059)
Public	36	32	21	19			
Semi-public	16	12	12	20			
Private	83	50	65	43			
Education offered by the school					18.043	6	< 0.05 (0.006)
Up to Primary	41	11	13	18			
Up to Upper-Primary	19	22	18	11			
Up to Secondary (High School)	75	61	67	53			
Type of education of the school					3.464	6	0.749
Co-Education	128	85	91	76			
Only Boys	4	7	4	5			
Only Girls	3	2	3	1			
Teaching Methods					3.589	6	0.732
Traditional	52	34	32	22			
Modern / Digital	11	9	8	8			
Combined	72	51	58	52			



3.4 Results of Multinomial Logistic Regression Analysis: (Refer to Table 5)

After identifying the significant predictor variables using Pearson Chi-Square correlation, a multinomial logistic regression model was performed to predict the odds of parental preferences on school selection (dependent variable: the distance of the child's school from home 1 = <1km, 2 = 1-2km, 3 = 2-5km, 4 = above 5km. and independent/predictor variables are the number of school children at home, the child's education level, the family's annual income and the board of education of the child's school). The model was performed using the stepwise method of forward entry.

3.4.1 Model Fitting Information

The model fitness was measured using the likelihood ratio (LR) chi-square test, comparing the model's fitness with the complete set of predictors with an intercept-only, or null, model (no predictors). Based on the LR test, the model containing the complete set of predictors represents a significant improvement in fit relative to a null model (LR $\chi^2(21) = 97.796, P < 0.001$). This result proves at least one population slope is non-zero. The Pearson (0.933) and Deviance (0.851) statistics prove that the model is fit since the P-value is > 0.05 . The Pseudo R-square measures are Cox and Snell (0.289), Nagelkerke (0.310) and Mc Fadden (0.128), which implies a moderately strong model referencing to the odds ratio scale in the results (Bo Hu, et.al., 2006). The model accounts for 20% to 33% of the variance and represents relatively decent-sized effects. The likelihood ratio test provides that the independent or predictor variables, number of school children at home, education level of the child, board of education and family's annual income are significant contributors.

3.5 Predictors of the home-to-school distance

Table 5 shows the predicted statistics of the model concerning the base category as the distance of the school from home is less than 1km. In the 1-2 km category, none of the predictor variables is statistically significant at $p < 0.05$. Only the board of education CBSE & ICSE positively correlates with the dependent category. In contrast, the remaining predictor variables negatively correlate to the home-to-school distance. Similarly, in the 2-5 km category, board of education CBSE & ICSE, number of children and Level of child education are statistically significant at $p < 0.05$ except for the family's annual income. Among them, the child's board of education and education level have a positive correlation, and the number of school children has a negative correlation. Finally, in the category above 5km, the board of education CBSE and education level are statistically significant at $p < 0.05$.

Table 5: Results of Multinomial Logistic Regression.

Variables	B	(S.E)	P - Value	Odds	Ra	95% C.I (Exp . B)
						Lower Upper
Distance of the school from home = 1-2km						
Board of Child's School = Local/State Govt	-	-	-	-	-	-
Board of Child's School = CBSE	0.181	0.499	0.717	1.198	0.451	3.185
Board of Child's School = ICSE	0.182	0.697	0.794	1.200	0.306	4.703
Number of School Children	-0.529	0.237	0.025	0.589	0.370	0.937
Education Level of the Child	0.419	0.279	0.134	1.520	0.879	2.628
Annual income of the family = Below 3,00,000	-	-	-	-	-	-
Annual income of the family = 3,00,001 - 6,00,000	-0.311	0.350	0.374	0.733	0.369	1.454
Annual income of the family = 6,00,001 - 12,00,000	0.412	0.399	0.302	1.510	0.691	3.303
Annual income of the family = Above 12,00,000	0.652	0.560	0.244	1.919	0.641	5.745



Distance of the school from home = 2-5km

Board of Children's School = Local/State Govt	-	-	-	-	-	-
Board of Children's School = CBSE	1.415	0.471	0.003	4.118	1.636	10.366
Board of Children's school = ICSE	0.863	0.726	0.235	2.370	0.571	9.828
Number of School Children	-1.046	0.263	0.000	0.351	0.210	0.589
Education Level of the Child	0.813	0.285	0.004	2.254	1.290	3.938
Annual income of the family = Below 3,00,000	-	-	-	-	-	-
Annual income of the family = 3,00,001 - 6,00,000	0.257	0.358	0.473	1.293	0.641	2.610
Annual income of the family = 6,00,001 - 12,00,000	0.584	0.427	0.171	1.793	0.777	4.140
Annual income of the family = Above 12,00,000	-0.958	0.671	0.154	0.384	0.103	1.431

Distance of the school from home = >5km

Board of Children's School = Local/State Govt	-	-	-	-	-	-
Board of Children's School = CBSE	1.905	0.468	0.000	6.721	2.688	16.804
Board of Child's School = ICSE	1.898	0.671	0.005	6.669	1.789	24.859
Number of School Children	-461	0.268	0.086	0.631	0.373	1.067
Education Level of the Child	0.829	0.310	0.008	2.290	1.247	4.205
Annual income of the family = Below 3,00,000	-	-	-	-	-	-
Annual income of the family = 3,00,001 - 6,00,000	0.589	0.452	0.193	1.803	0.743	4.376
Annual income of the family = 6,00,001 - 12,00,000	1.303	0.497	0.009	3.681	1.390	9.746
Annual income of the family = Above 12,00,000	-0.517	0.703	0.462	0.596	0.150	2.364

-: **Bold** figures are significant at $p < 0.05$

4. Discussion Summary

Many researchers used cross-sectional research design and multinomial logistic analysis to model the school commute distances and mode of commute assessment. In this research, we have used the same methods for investigating parental preferences and analysing how demographic, socio-economic, and school non-spatial attributes are instrumental to home-to-school distance in an urban context in India. Our preliminary results found that many parents send their children to schools outside their neighbourhood, though there is a school facility within their neighbourhood. And it has also shown a significant association between home-to-school distance and the mode of school commute. These findings are similar to previous studies in similar Indian urban contexts (Tetali et al., 2016; N. Singh & Vasudevan, 2018).

As explained in 4.3.1 (Age / Level of the child's education), parents of primary school children prefer schools near home, whereas high school children in our study travelled long distances for schooling. The results correlate with (Easton & Ferrari, 2015) findings, where a child's age/level of education is very consistent and significant in association with home-to-school distance. Regarding a child's gender role, this variable does not directly affect the home-to-school distance in our findings. (Easton & Ferrari, 2015) reported that gender moderated with age could significantly affect the girl's age as the commute distance may increase. We further analysed the influence of the number of children in the family associated with home-to-school distance. In our findings, the number of school-going children in the family negatively correlates with school distance. Families with two or more children send their children to schools within 2km, whereas single-child families' preferences vary with mixed responses. This finding is close to the earlier study by (Ota & Moffatt, 2006) in rural Andhra Pradesh. It talks about opportunities based on family size and birth order, where the younger child in siblings receive privileges over the firstborn and elder children. Such studies were initial and focused on only schooling opportunities, and did not explore any



relation to home-to-school distance. recent times, increased access and opportunities in school education have given numerous opportunities to parents in urban areas for various school choices.

Parents' perceived specific non-spatial attributes define the quality of the school. Previous studies focused on school management, medium of instruction, smaller class sizes, teaching methods, and academic attainments are found to be significant factors in parental preferences (Alsuiadi, 2015). In addition to the above factors, the board of education is crucial in school selection in the Indian context, mainly the social construct over the impression of school boards. Usually, neighbourhood schools are local/state board schools that consist of basic infrastructure and facilities and offer application-based learning. In contrast, CBSE and ICSE are magnet schools with higher infrastructure standards, equipped with facilities, laboratories, and libraries, and offer application-based and problem-solving pedagogy. Such schools are mainly located in suburban areas, and very few are in core urban neighbourhoods since they require a more extensive site area. Such schools are accessible to financially resourced families with better parent education levels in urban areas.

5. Conclusion

The findings of this research study highlight that parents' preferences are instrumental in the non-spatial attributes of the school environments. This study explains how the role of demographic, socio-economic factors and school's non-spatial attributes influences the parents' preferences in school selection concerning home-to-school distance in urban areas. In this regard, the findings from the case of Visakhapatnam show that significant determinants of home-to-school distance are

- Age and the number of school children in the family (demographic),
- family income (socio-economic), and
- attitude toward the board of education and management of the school (non-spatial attributes of the school).

These findings offered a new dimension to rethink the theoretical perspectives that have defined the traditional neighbourhood concepts of Clarence Artur Perry (Aronovici, C. 1939) and (Mumford, 1949), on the importance of school in neighbourhood unit design whilst investigating from a developing country's position. The fact is that cities are ever-changing with their demographic and socio-economic needs. The infrastructure setups for education resources within the urban areas are also drastically changing for the development causes with a competitive spirit. The availability of land resources and affordability have become the open and often latent drivers in the cities. For instance, this study has shown that demographics, socio-economic factors and attitudes toward the school's board of education (non-spatial attributes of the school) have driven parents' preferences in selecting the schools for their children in the case of Visakhapatnam City.

From a methodological position, this study adopted a cross-sectional research design for collecting data and a multinomial logistic model to predict the factors determining the parents' preferences in selecting the schools for their children with respect to home-to-school distance. However, this study has shown a direction for collating and analysing the data on parents' preferences towards school selection. Such models need to be developed from a multi-disciplinary perspective that can assimilate the spatial distribution of such non-spatial parameters in an integrated manner. Nevertheless, this study showed that ongoing and future school revamping schemes are often limited only to the physical and educational aspects of the schools. Instead, it should be a holistic approach scaling from the school setting, creating a sense of neighbourhood unit, and even planning the city transport network.

This study contributes to the existing literature by expanding the theoretical understanding of neighbourhood design, particularly in the context of developing countries. It challenges traditional theories by incorporating the influence of non-spatial attributes of schools and socio-economic factors on parents' preferences, thereby offering a more holistic view of urban educational infrastructure. It highlights the need for policymakers to consider the Integrated Urban Planning and Development policies that integrate educational infrastructure within neighbourhood planning, ensuring accessible schooling options. Socio-economic Support: Implement programs that address the socioeconomic



disparities influencing school selection, such as subsidies or financial aid for lower-income families. Community Engagement: Foster a collaborative approach involving parents in the educational policies and school management decision-making process.

This study acknowledges several limitations: Contextualization of the findings is specific to Visakhapatnam City and may not be generalizable to other urban areas with different socio-economic contexts. The cross-sectional nature of the study limits the ability to observe changes over time in contrast to longitudinal studies. Moreover, the snowball sampling method and self-reported data from parents may affect the results in potential biases.

In conclusion, this study highlights the critical need for a holistic approach to urban planning and school infrastructure development. Policymakers, urban planners, and educators must collaborate to create neighbourhood-level interventions that provide quality education and foster a sense of community. By addressing the demographic, socio-economic, and non-spatial attributes influencing school selection, we can ensure equitable access to education and contribute to the sustainable development of urban areas.

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Conflicts of Interest

The author(s) declare(s) no conflicts of interest.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author, Ram Sateesh Pasupuleti.

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Not applicable.

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