



ESCORTED OR INDEPENDENT? WHY CHILDREN TRAVEL TO SCHOOL THE WAY THEY DO IN METROPOLITAN PALEMBANG, INDONESIA

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ABSTRACT

This study examines the determinants of independent school travel among children in Metropolitan Palembang, Indonesia, a city facing increasing motorization and urban expansion. Using a quantitative cross-sectional design, primary data were collected through structured questionnaires from 415 parents of school-aged children. A binary logistic regression model was applied to analyze the effects of socio-demographic and spatial factors, including children's age and gender, household income, school type, and distance between home and school. The findings show that older children and those living closer to school are more likely to travel independently, while girls and children from higher-income households tend to be escorted. School type was not a significant factor. Overall, the results highlight the influence of developmental, social, and spatial factors on parental decisions and offer insights for promoting child-friendly and sustainable urban transport in developing countries.

Keywords : *Children's Independent Mobility; School Travel Behavior; Parental Escort Decision; Household Income; Age-Related Mobility*

INTRODUCTION

Children's independent mobility (CIM)—defined as the freedom of children to travel in their surroundings without adult supervision—has emerged as a critical dimension of sustainable urban mobility and child development. In many urban contexts, CIM is strongly associated with physical activity, spatial cognition, and psychosocial well-being, while simultaneously contributing to broader environmental goals through reduced reliance on private motorized transport (N. M. Ibrahim et al., 2024). However, across both developed and developing countries, a consistent decline in children's independent travel has been documented, coinciding with increasing rates of parental escorting and car dependency (Zannat et al., 2023). This shift reflects growing urban challenges such as traffic congestion, safety concerns, and spatial separation between residential and educational facilities. In cities undergoing rapid urbanization—like Palembang, Indonesia—these dynamics are compounded by infrastructural limitations and uneven spatial development. Such conditions restrict children's opportunities to navigate urban spaces autonomously and heighten parental dependence on motorized travel, thereby diminishing the social and environmental benefits associated with independent school travel (Nyström et al., 2023).

Despite widespread recognition of CIM's developmental and societal importance,

existing literature reveals significant academic and empirical gaps regarding its determinants in developing urban settings. The majority of prior research has focused on high-income or Western cities, where urban infrastructure, safety standards, and cultural norms differ substantially from those of rapidly growing cities in the Global South (Bhuyan & Zhang, 2019). Studies in contexts such as Canada and the United Kingdom have extensively explored parental perceptions, land-use patterns, and neighborhood safety as predictors of CIM (Carver et al., 2014), yet analogous empirical evidence remains sparse for Southeast Asia. Moreover, comparative analyses between developed and developing cities reveal divergent influences of socioeconomic and spatial variables on parental escort decisions (Zannat et al., 2023). Within Indonesia, particularly in metropolitan areas like Palembang, rapid motorization, limited pedestrian infrastructure, and socio-economic disparities intensify the risks and constraints perceived by parents, yet no systematic empirical investigation has been conducted to quantify these effects. Addressing this knowledge gap is essential to advancing urban transport planning that prioritizes safety, equity, and children's autonomy (Shafik et al., 2021).

The theoretical foundation of this study draws from behavioral and environmental frameworks of children's independent mobility and parental decision-making. The socio-ecological model posits that individual behavior is shaped by the interaction between personal, social, and environmental factors, which together determine the extent of children's freedom to move independently (Ghekiere et al., 2017a). Parental perceptions of safety, trust, and competence are influenced by both micro-level factors (e.g., child's age, gender, and household income) and macro-level determinants (e.g., neighborhood design, traffic volume, and school distance) (Christian et al., 2015). The concept of parental escorting behavior reflects a cognitive trade-off between convenience, perceived risk, and the value of independence granted to children (Westman et al., 2017). These theoretical perspectives are supported by empirical findings showing that age, gender, household socioeconomic status, and spatial accessibility exert significant effects on CIM outcomes (Rutberg et al., 2025). Together, these frameworks provide a comprehensive lens through which to examine how multiple socio-demographic and spatial dimensions shape parental escort decisions in a developing metropolitan context.

Based on these theoretical and empirical considerations, this study aims to examine how socio-demographic and spatial factors—including children's age, gender, household income, school type, and school-home distance—influence children's independent mobility to school in Metropolitan Palembang. By applying a binary logistic regression approach, the study tests the hypothesis that older children, boys, those from lower-income households, and those living closer to school are more likely to travel independently than their counterparts. This analytical design allows for a rigorous quantitative assessment of how interrelated household and spatial factors affect the likelihood of children being escorted versus traveling alone, thereby providing a statistically grounded understanding of parental mobility decisions (Zannat et al., 2023).

This research makes a novel contribution to the growing body of literature on children's school travel behavior by providing context-specific empirical evidence from an understudied Southeast Asian metropolitan setting. While prior studies have concentrated on Western and East Asian cities, this investigation extends the discourse to a developing

country where urbanization, spatial inequality, and cultural norms interact uniquely to shape children's mobility patterns. The findings are expected to inform urban planning and transport policy, particularly in developing cities where promoting safe, sustainable, and equitable school travel is increasingly vital for public health and social development (Larsson et al., 2023; Mammen et al., 2012). By examining children's independent mobility through both socio-demographic and spatial lenses, this study contributes to advancing child-centered mobility policies in Indonesia and provides a methodological framework applicable to other rapidly urbanizing cities in the Global South.

LITERATURE REVIEW

The theoretical foundation of research on children's independent mobility (CIM) is anchored in the socio-ecological framework, which posits that children's mobility behaviors are shaped by multilevel interactions between individual, familial, and environmental systems. This model conceptualizes children's travel autonomy not merely as a behavioral outcome but as a reflection of structural, social, and perceptual determinants embedded within urban life. At the individual level, attributes such as age, gender, and perceived competence determine children's readiness for independent mobility, while household-level variables such as parental socioeconomic status, risk perception, and time constraints mediate escort decisions (Ayllón et al., 2019). Environmental characteristics—including road safety, distance to school, and urban form—operate at the community level to either enable or restrict autonomy. The socio-ecological model's holistic structure aligns closely with the goals of this study, which examines how socio-demographic and spatial determinants jointly influence parental escort decisions in a rapidly urbanizing Southeast Asian city. The framework also emphasizes the interdependence between micro-level decisions and macro-level planning, positioning CIM as a key indicator of urban livability and social inclusivity (Christian et al., 2015).

Empirical studies across different global contexts provide robust evidence that socio-demographic and spatial factors exert significant influences on children's mobility behaviors. For instance, recent quantitative analyses from Bangladesh identified parental income, access to private vehicles, and school distance as dominant predictors of escorting practices in dense urban environments (Zannat et al., 2023). In Canada, household language use, child age, and neighborhood safety perceptions emerged as key variables determining whether children walk independently or are escorted (Mammen et al., 2012). Similarly, research in France revealed strong gender disparities in escorting responsibilities within dual-earner families, reflecting persistent gendered divisions of caregiving and mobility labor (Motte-Baumvol et al., 2017). Studies in Spain and Chile further demonstrated that reduced car availability and shorter commuting distances are associated with greater rates of children's independent travel to school (Rodríguez-Rodríguez et al., 2021). In addition, work conducted in Egypt and South Africa highlighted the influence of perceived neighborhood safety and infrastructural quality as key contextual barriers to children's independent movement, underscoring the role of urban design in shaping CIM patterns in developing countries (Rachel et al., 2022; Shafik et al., 2021).

Despite this growing body of evidence, significant gaps persist in the existing literature.

The first is a contextual gap, as most empirical studies have been conducted in high-income or upper-middle-income regions with advanced urban infrastructures, while comparable analyses in rapidly urbanizing Asian cities remain rare (Zannat et al., 2023). The second is a methodological gap, as studies in developing contexts have predominantly employed descriptive or correlational designs rather than multivariate modeling that captures interdependent influences of socio-demographic and spatial factors. A theoretical gap also exists: while autonomy and environmental safety theories have been applied, few studies integrate them into a unified socio-ecological analytical framework to explain escort decisions comprehensively (Han et al., 2022). Finally, a temporal gap is evident, as post-pandemic behavioral shifts in school travel have not been fully captured in Southeast Asian settings, where traffic density and parental risk perceptions have intensified. Together, these limitations underscore the necessity of conducting context-specific, quantitatively rigorous analyses that link family, child, and spatial variables within developing metropolitan environments such as Palembang.

This study distinguishes itself by addressing these multi-dimensional gaps through the application of a binary logistic regression model to examine the determinants of CIM in a rapidly urbanizing Indonesian city. Unlike prior research limited to descriptive or qualitative findings, this study employs inferential modeling to quantify the relative influence of household income, children's age and gender, school type, and school-home distance on independent travel decisions. By situating its analytical framework within the socio-ecological paradigm, the study not only extends theoretical understanding but also provides empirical clarity on the unique configurations of socio-demographic and spatial constraints in developing contexts. Its focus on Palembang contributes novel empirical insights into how patterns of urban form, social stratification, and risk perception converge to shape children's mobility outcomes, providing a critical foundation for evidence-based transportation and urban planning policies (Zannat et al., 2023).

In the broader field of transportation behavior and urban mobility research, dominant approaches to studying CIM have increasingly adopted mixed-method frameworks combining behavioral modeling with qualitative inquiry. Recent studies have employed hybrid choice models and agent-based simulations to capture complex parental decision-making mechanisms, highlighting psychological and social influence factors alongside traditional spatial variables (Jing et al., 2018). The integration of technology-enabled data, such as GPS tracking and parental mobility sensors, has improved measurement accuracy for territorial range and route safety (Vlaar et al., 2019). Meanwhile, emerging literature has begun to explore parental intentions to use automated vehicles (AVs) as future escort modes, suggesting that technology adoption could further reshape traditional escorting practices (Mao et al., 2022). Despite methodological innovations, there remains a lack of integration between sociological and spatial analyses in developing countries—especially where urban density, cultural norms, and socioeconomic disparities intersect to constrain children's mobility autonomy (Hauslbauer et al., 2024).

Synthesizing these bodies of knowledge reveals that CIM research has evolved from descriptive and safety-oriented studies to more integrative, behaviorally grounded analyses of parental decision-making. The consistent emphasis on interrelationships between socio-demographic, psychological, and environmental variables highlights the complexity of

escorting behavior as a function of both individual and systemic determinants. This evolution reflects a shift toward framing children's mobility as a developmental and spatial justice issue, situated within broader debates on urban accessibility, gender equality, and sustainability. By adopting a socio-ecological lens and applying empirical modeling to a developing city context, the present study situates itself within this contemporary trajectory of research and establishes a coherent foundation for the subsequent methodological exposition.

METHODS

This study adopts a quantitative, cross-sectional research design to empirically analyze the determinants of children's independent mobility (CIM) to school in Metropolitan Palembang, Indonesia. The explanatory approach aligns with positivist traditions in transport behavior research, aiming to statistically identify relationships between socio-demographic and spatial factors and parental escort decisions. Quantitative survey designs are particularly effective for capturing patterned behaviors and perceptions within large populations and have been widely applied in studies examining urban mobility, active school travel, and household transport choices (Larouche et al., 2024). The use of a cross-sectional framework enables observation of school travel patterns at a specific time, allowing for systematic comparison across socio-demographic groups without longitudinal constraints.

Research Strategy

The research strategy is explanatory and inferential, designed to test hypotheses regarding how age, gender, household income, school type, and school-home distance affect the likelihood of children traveling independently. Quantitative explanatory studies in transportation research often utilize logistic regression modeling to predict categorical outcomes based on multiple explanatory variables (Yang & Li, 2023). The present study applies this approach to determine how individual and spatial attributes jointly influence escort behavior, providing a rigorous statistical foundation for understanding CIM in an urban Indonesian context. This methodological orientation is consistent with previous mobility studies in Southeast Asia that have sought to quantify behavioral correlates of transport choice (Meesit et al., 2023).

Data Source and Type

Primary data serve as the foundation of this research. Data were collected from parents of school-aged children (6–18 years old) in Metropolitan Palembang between July and September 2022. This approach ensures that responses accurately capture household decision-making dynamics related to children's travel. The reliance on primary survey data strengthens internal validity, allowing for the construction of context-specific variables such as escorting frequency, school distance, and mode of transport. Similar parent-reported datasets have been successfully used in studies on children's travel autonomy and active school transportation, confirming the reliability of parental assessments in mobility research (Breslin et al., 2023).

Data Collection Methods and Instruments

Data were collected using a structured questionnaire survey distributed through schools, with teachers serving as intermediaries between researchers and parents. This delivery method optimized accessibility and response rates, a strategy validated by survey-based mobility studies in other developing cities (Cui et al., 2021). The questionnaire consisted of both categorical and continuous items measuring children's school travel mode (independent vs escorted), age, gender, household income, school type (public/private), and school-home distance. Questions were carefully designed to minimize ambiguity and ensure comparability across respondents. Prior to full deployment, the instrument underwent pilot testing to assess clarity and reliability, following best practices in quantitative survey design (Beacom, 2023). Out of 430 distributed questionnaires, 415 valid responses were received, yielding a response rate of 96.51%, which surpasses the accepted threshold for survey-based social science research.

Data Analysis Techniques

Given the dichotomous nature of the dependent variable (independent vs escorted school travel), the study employs a binary logistic regression model to analyze the probability of children traveling independently as a function of socio-demographic and spatial predictors. This analytical approach is widely regarded as suitable for modeling binary outcomes and identifying the magnitude and direction of relationships among categorical and continuous variables (Darwis et al., 2025). The model specification follows the general logistic regression equation:

$$\ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k$$

Where P represents the probability of independent travel, and $X_1, X_2, \dots, X_k$ represent the independent variables (age, gender, household income, school type, school-home distance). Statistical analyses were conducted using **SPSS version 26**, employing both descriptive and inferential procedures. Descriptive statistics were used to summarize respondent characteristics, while logistic regression estimated odds ratios and significance levels. Model fit was evaluated using likelihood-ratio tests, the Hosmer-Lemeshow statistic, and pseudo R^2 values. Similar analytical frameworks have been successfully applied in urban mobility research to assess active and sustainable transport behaviors (Alver & Odabasi, 2024).

RESULTS AND DISCUSSION

Descriptive Findings

A total of 415 valid responses were analyzed, representing parents of school-aged children (6–18 years) in Metropolitan Palembang. Table 1 presents the descriptive characteristics of the respondents and their children's school travel behavior. Of all respondents, 70.12% reported escorting their children to school, while 29.88% indicated that their children traveled independently. Regarding household income, 41.20% of respondents were classified within the low-income group (IDR 0–3,000,000), 28.67% within the middle-income group (>IDR 3,000,000–6,000,000), and 30.12% within the high-

income group (>IDR 6,000,000). This income distribution indicates a balanced representation of socio-economic diversity across the sample population.

Children's age distribution revealed that 39.52% were in the 6–12-year range, 37.35% were aged 13–15 years, and 23.13% were 16–18 years old. The gender distribution showed a slight predominance of girls (53.49%) compared to boys (46.51%). In terms of school type, 51.33% of children attended private schools, while 48.67% were enrolled in public schools. Analysis of school–home distance indicated that 16.14% of students lived within 500 meters of their school, 14.70% lived between 500 and 1,000 meters, 27.47% between 1,000 and 2,000 meters, 17.11% between 2,000 and 3,000 meters, and 24.58% more than 3,000 meters away. These descriptive findings reflect a diverse sample with substantial variation across demographic, socioeconomic, and spatial factors, providing a strong empirical foundation for inferential analysis.

Table 1. Descriptive Statistics of Children's Background and School Escort Decision

Variable	Category (Code)	Frequency	Percentage
Escort Decision	Escorted	291	70.12
	Independent Mobility	124	29.88
Household Income	Low (IDR 0 – 3000k)	171	41.20
	Middle (>IDR 3000 – 6000k)	119	28.67
	High (>IDR 6000k)	125	30.12
Children Age	6-12 yrs	164	39.52
	13-15 yrs	155	37.35
	16-18 yrs	96	23.13
Children Gender	Boys	193	46.51
	Girls	222	53.49
School Type	Public	202	48.67
	Private	213	51.33
Distance School-Home	<500 m	67	16.14
	>500 – 1000 m	61	14.70
	>1000 – 2000 m	114	27.47
	>2000 – 3000 m	71	17.11
	>3000 m	102	24.58

Inferential Analysis: Binary Logistic Regression

To examine the determinants of children's independent mobility to school, a binary logistic regression model was estimated using children's travel mode (0 = escorted, 1 = independent) as the dependent variable. The independent variables included household income, children's age, gender, school status, and distance between home and school. The results are summarized in Table 2. The model achieved statistical significance (Likelihood Ratio $\chi^2 = 116.16$, $df = 5$, $p < 0.001$), with a Pseudo R^2 (McFadden) value of 0.229, indicating a satisfactory model fit for behavioral prediction studies. The log-likelihood value (−195.00) suggests that the inclusion of explanatory variables significantly improved the model's predictive accuracy compared to a null model.

Children's age was a strong and statistically significant predictor of independent mobility ($\beta = 0.405$, $p < 0.001$). The odds ratio (1.499) indicates that with each additional year of age, the likelihood of independent travel increased by approximately 50%. This result aligns with previous findings suggesting that older children exhibit greater travel autonomy due to enhanced cognitive, navigational, and physical capabilities (N. M. Ibrahim

et al., 2024).

Gender also exerted a statistically significant influence ($\beta = -0.716$, $p = 0.006$), with an odds ratio of 0.489, indicating that girls were less likely than boys to travel independently. This finding corresponds with cross-cultural evidence showing gender-based differences in mobility freedom due to heightened parental safety concerns and gender norms (Rutberg et al., 2025).

Household income was significant ($\beta = -7.38E-08$, $p = 0.016$), although the effect size was minimal due to the monetary unit scale. The negative coefficient suggests that higher household income slightly decreases the probability of independent travel. This relationship supports the argument that affluent families, with greater access to motorized transport, are more likely to escort their children for convenience and perceived safety (Zannat et al., 2023).

School status, whether public or private, was not statistically significant ($\beta = 0.259$, $p = 0.318$), indicating that institutional differences did not substantially affect escort behavior. This finding is consistent with other Southeast Asian studies where school type played a limited role in determining children's mobility autonomy (Mammen et al., 2012).

Distance between home and school demonstrated a significant negative relationship with independent mobility ($\beta = -0.331$, $p = 0.001$). The odds ratio (0.718) indicates that children living farther from school were less likely to travel independently. This trend reflects established findings in urban mobility research, where increased distance reduces the feasibility of active or unsupervised travel modes (Christian et al., 2015).

Table 2. The Binary logistic regression results examining the influence of household income, child characteristics, school status, and distance between home and school on children's independent mobility to school.

Variable	Coefficient (β)	Std. Error	Odds Ratio	p-value
Constant	-5.032	0.812	0.007	<0.001***
Household Income	-7.38E-08	3.07E-08	1.000	0.016**
Children Age (years)	0.405	0.055	1.499	<0.001***
Gender (1 = Girl)	-0.716	0.258	0.489	0.006**
School Status (1 = Private)	0.259	0.260	1.296	0.318
Distance School-Home	-0.331	0.099	0.718	0.001***

Significance levels:

* $p < 0.001$, $p < 0.01$, $p < 0.05$

Model Goodness-of-Fit and Statistical Validity

The model's overall fit statistics, summarized in Table 3, demonstrate satisfactory performance. The log-likelihood value of -195.00 and the likelihood ratio chi-square statistic of 116.16 ($df = 5$, $p < 0.001$) confirm that the full model provides a significantly better fit than the null model. The pseudo R^2 (McFadden) value of 0.229 indicates that approximately 22.9% of the variation in children's independent mobility decisions is explained by the included variables, which is consistent with effect sizes typically reported in behavioral mobility studies (Meesit et al., 2023; Qiu & Zhu, 2021).

Table 3. Model Goodness-of-Fit

Statistic	Value
Log-Likelihood	-195.00
Likelihood Ratio χ^2	116.16
Degrees of Freedom	5
Pseudo R ² (McFadden)	0.229
Model Significance	p < 0.001

Predicted Probabilities of Independent Mobility

The estimated probabilities from the logistic model provide further insight into how each predictor variable affects the likelihood of independent mobility. Figure 1 illustrates these relationships using predicted probability curves derived from the regression coefficients.

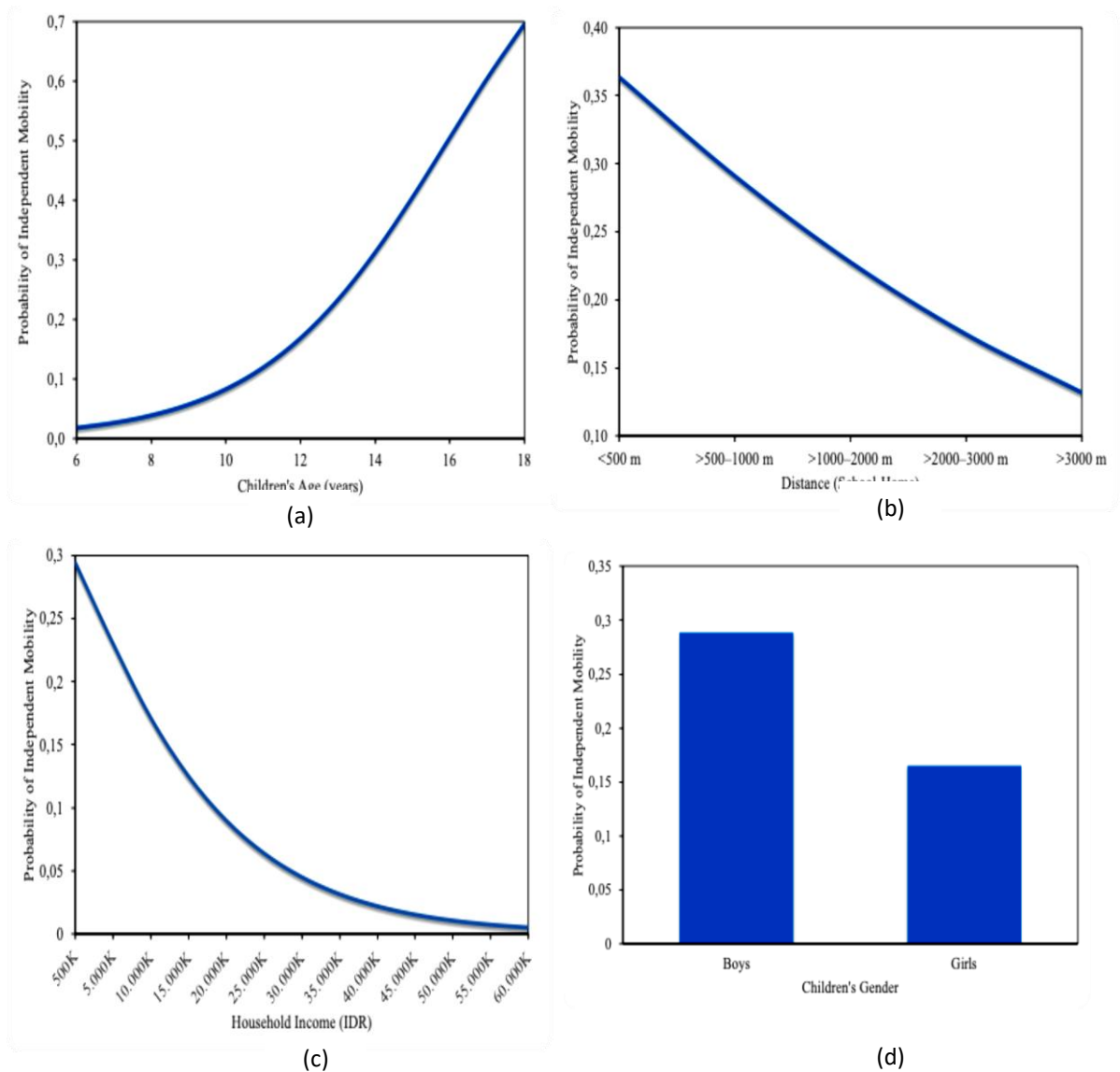


Figure 1. Determinants of children's independent mobility probability:

- (a) increasing probability with age,
- (b) decreasing probability with greater distance from school,
- (c) lower dropout probability with higher household income, and
- (d) comparison of dropout probability by gender (boys vs. girls).

Age effect: The probability of independent travel increased steadily with age—from 1.75% at age 6 to 69.63% at age 18—indicating a strong maturity-related gradient in mobility autonomy. This pattern aligns with international findings where older children exhibit greater spatial competence and parental trust (Larouche et al., 2024).

Distance effect: The likelihood of independent mobility decreased as travel distance increased, ranging from 36.36% for children living within 500 meters of school to 13.20% for those living beyond 3,000 meters. This pattern reinforces prior evidence that shorter distances enhance feasibility and safety perceptions of walking or cycling (Sharmin et al., 2021).

Gender effect: The model predicted a probability of 28.86% for boys compared to 16.55% for girls, confirming that gender-based parental restrictions persist in children's travel behavior (Rodríguez-Rodríguez et al., 2021).

Household income effect: Predicted probabilities showed a steady decline with higher income levels—from 29.4% at IDR 500,000 to less than 1% at IDR 60,000,000—indicating that wealthier families tend to rely more on private motorized transport and escorting arrangements. This inverse relationship between affluence and child mobility autonomy mirrors findings in studies from Bangladesh and Thailand (Meesit et al., 2023; Zannat et al., 2023).

School type effect: The predicted difference between public and private schools was minimal, with probabilities of 27.3% and 32.5%, respectively, corroborating the non-significance found in the regression model. This suggests that institutional type alone does not substantially mediate children's mobility independence when socio-demographic and spatial factors are controlled (Ikeda et al., 2020).

Discussion

The results of this quantitative study reveal that children's independent mobility in Metropolitan Palembang is primarily shaped by age, gender, household income, and school-home distance, while school type exerts minimal influence. These findings align with the study's objective to identify the socio-demographic and spatial determinants of children's school travel autonomy. The significant effect of age underscores the developmental dimension of mobility, wherein older children exhibit greater spatial competence and parental trust, consistent with established theories of child development and autonomy (Larouche et al., 2024). The observed gender disparity, where girls are less likely to travel independently, reinforces the persistence of gendered mobility norms prevalent across urban contexts (Wachter & Holz-Rau, 2022). Household income and commuting distance were both inversely associated with independence, implying that affluence and urban sprawl limit opportunities for self-directed movement.

Interpreted through the social-ecological framework, these findings emphasize that children's mobility decisions emerge from nested systems of influence—individual maturity, family risk perception, and environmental affordances (Ghekiere et al., 2017b). Within this framework, the increasing odds of independence with age reflect growing child agency within parental constraints, while gender-based restrictions correspond to sociocultural norms embedded in household-level decision-making. The negative

relationship between income and independent mobility suggests that car ownership and perceptions of status-driven safety shape parental attitudes. This aligns with the “parental gatekeeping” concept in transport psychology, where parents act as mediators of environmental exposure and mobility permissions (Mah et al., 2017). The absence of school-type effects may be interpreted as a contextual indicator that institutional characteristics in Palembang do not significantly modify parental safety perceptions or commuting patterns once income and distance are controlled.

Comparison with international literature reveals both convergence and contextual divergence. The predictive role of age and distance parallels results from European studies that identified commute length and parental safety evaluations as the most salient determinants of independent school travel (Masoumi et al., 2020) (Masoumi et al., 2020). Similarly, parental risk perceptions and neighborhood safety evaluations have been found to mediate the relationship between socio-economic status and autonomy (Mammen et al., 2012). However, the inverse effect of household income observed in Palembang contrasts with patterns in higher-income settings, where affluence often facilitates access to safer walking environments and thus promotes autonomy (Rodríguez-Rodríguez et al., 2021). This divergence reflects socio-urban inequalities typical of Southeast Asian cities, where private transport is both a necessity and a status symbol, reducing incentives for independent child mobility.

Gendered disparities in mobility observed in this study correspond to patterns found in both Western and developing contexts, though their origins differ. In South Asia and parts of the Middle East, cultural norms and safety concerns strongly constrain girls’ spatial movement (Reddy & Pasupuleti, 2024). In Europe, by contrast, gender effects tend to diminish when environmental safety and transport infrastructure quality improve (Masoumi et al., 2020). The Palembang findings indicate that parental perceptions of gender vulnerability remain a powerful determinant of mobility autonomy, reinforcing the need for culturally sensitive interventions that promote equal opportunities for active travel among boys and girls. Furthermore, the strong distance effect highlights how spatial planning decisions—such as school catchment zoning and residential density—directly shape children’s travel independence, echoing calls for urban design strategies that integrate walkability into school placement policies (DeWeese et al., 2013).

The study contributes to the empirical literature by offering context-specific evidence from a developing urban setting where rapid motorization and uneven infrastructure development reshape mobility norms. Its findings extend the social-ecological framework by demonstrating that environmental constraints interact with socio-economic privilege to produce paradoxical outcomes: higher-income families are more risk-averse and less likely to allow autonomy, contrary to Western models of independence. This expands theoretical understanding of “mobility equity” and highlights the intersection of class and parental risk perception in child transport behavior (S. T. Ibrahim et al., 2025). Practically, the results can inform urban mobility policies by encouraging the creation of neighborhood-based safe routes to school programs and parental education campaigns emphasizing the developmental benefits of autonomy.

However, several limitations should be acknowledged. The cross-sectional design restricts causal inference; temporal relationships between predictors and outcomes cannot

be firmly established. The reliance on parent-reported data introduces potential response bias, particularly regarding income and perceptions of safety. Additionally, the absence of spatially explicit measures such as walkability indices or GIS-based exposure data limits the capacity to directly link built-environment features to behavior, as recommended in recent mobility research (Masoumi et al., 2020). Future studies could adopt mixed-methods or longitudinal designs incorporating participatory mapping and sensor-based mobility tracking to better capture the dynamic interplay between environment, perception, and independence.

The implications of these findings extend beyond academic discourse into urban planning and policy development. Interventions aimed at promoting children's independent mobility should address both infrastructural and socio-cultural barriers. Policies must prioritize neighborhood safety improvements, reduce traffic hazards near schools, and foster community trust in shared public spaces. Moreover, initiatives that encourage parental involvement in mobility education could help mitigate overprotective attitudes that constrain autonomy (Larouche et al., 2024). A multidisciplinary approach combining behavioral science, transport engineering, and community engagement would be essential to translate empirical insights into sustainable, equitable mobility practices for children in developing urban regions.

CONCLUSIONS

This study has demonstrated that children's independent mobility to school in Metropolitan Palembang is primarily influenced by socio-demographic and spatial factors—specifically age, gender, household income, and school-home distance—while institutional variables such as school type play a limited role. The results affirm that as children grow older, their likelihood of traveling independently increases significantly, whereas girls remain less likely than boys to experience similar levels of autonomy. Moreover, higher-income households tend to favor escorted travel, and longer distances between home and school substantially reduce the probability of independent mobility. These findings directly address the research objective by revealing the multifaceted interplay between individual, household, and spatial dimensions that shape children's school travel behavior in a rapidly urbanizing context.

Theoretically, this research contributes to the growing body of knowledge on children's mobility by contextualizing established behavioral models within the socio-economic realities of developing metropolitan environments. By integrating parental decision-making theory with spatial-behavioral perspectives, it offers a refined understanding of how autonomy, safety perceptions, and accessibility intersect in shaping children's travel modes. Practically, the study underscores the need for inclusive urban and transport planning that balances child safety with opportunities for independence. It provides empirical evidence to guide policymakers, educators, and urban designers in creating environments that foster safe, equitable, and sustainable school mobility.

Future research should build upon these insights by incorporating longitudinal and mixed-method approaches to capture temporal changes and deeper behavioral dynamics in children's travel decisions. Policymakers should prioritize interventions that enhance

neighborhood safety, promote proximity-based school planning, and challenge cultural norms that limit girls' mobility autonomy. Through such multidimensional efforts, urban centers like Palembang can move toward developing child-friendly mobility systems that not only ensure safety but also nurture independence, confidence, and well-being among the next generation of city dwellers.

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