Influence of the Socio-Economic Factors on Children’s School Travel

Roya Shokoohi*, Noor Rosly Hanif & Melasutra Dali
Faculty of Built Environment, University of Malaya, Kuala Lumpur, 50603, Malaysia

Abstract

Walking to school is a healthy and cheap mode of travel yet most of the children do not start their day with this activity. The cross-sectional survey uses a sample of parents of children (9-12 years old) from public primary schools in Tehran, to examine if socio-economic factors moderate the relationship between parental perception of traffic safety and children travel to school. Results from Multinomial Logistic Models show that, the numbers of cars in a household and household income are the two main moderators. The findings also show parental perceptions of traffic safety vary across different socio-economic status areas.

Keywords: Socio-economic factors; traffic safety; children’s travel behavior; walking to school; income groups

1. Introduction

Children like adults need transportation, particularly for their travel to school. Many of us remember a time when walking to school was a part of our everyday physical activity. However, in recent decade, for many parents, it is really difficult to allow their children to walk to and from school on their own. As such children are more dependent on adults to provide transportation for them. Concurrently, for many parents driving their children or walking with them to and from school every day may not be feasible. Therefore, walking autonomously to and from school is an opportunity to shift a portion of motorized trips to active
travel trips if accessibility, safety and the social benefits of this experience is addressed. Moreover, walking to school is the cheapest travel mode and can decrease the number of household daily trips. Although walking with parents provides a healthy, non-polluting and economical travel mode for both parents and children, it does not give an opportunity to children to explore the environment. Chauffeuring children limits their opportunity to learn how to function safely in an urban environment (Mitchell et al., 2007). As such, children should be encouraged to be active citizens, moving around the city spaces, occupying them, walking on the streets and forcing the city to adapt to their needs. Considering children as frequent pedestrians means changing the living conditions in the city, starting with the street layout and traffic regulations, and also covering community life to improve the perception of safety (Cooper et al., 2003).

1.1. Problem statement

The majority of research about active modes of travel for children to go to and from school conducted in developed countries. However, factors which impact children’s active transportation may vary according to the context of the study (Pont et al., 2009). Therefore, researchers from developing nations need to adapt the findings of previous studies in advanced countries. Moreover, limited researches have focused on exploring the differences between modes of children transportation across income groups (McDonald, 2008).

Tehran is the most populated city in Iran; with a population of 7,872,280 and an area of 754 square meters (Tehran’s Master Plan, 2006). Tehran is divided into 22 administrative regions that have been divided into three socio-economic areas (Tehran Master Plan, 2006; Shokoohi et al., 2011). School travels accounts for 10.5% of daily trips in Tehran and over 50% of these trips are made by private cars. Since year 2002, the Tehran city government has invested a lot of money to improve the infrastructure of neighbourhoods to encourage walking. The research by Department of Traffic and Transportation (2006) also revealed that the long distance between home and school and lack of traffic safety are the main barriers to children walking to school autonomously. Moreover, pedestrian injuries involving car accidents are a serious problem in Iran (Rasouli et al., 2008). More than 40% of those who are injured in car accidents are pedestrians while 15.1% of them are below 10 years old (Atash, 2007). Studies have repeatedly shown that increase in car speeds might be the cause of the severe injuries in accidents, especially for children (Miller et al., 2004). While in some countries (e.g. Denmark, UK, etc.) there is a policy to have speed limit zone (e.g. less than 30 km/hr) around primary schools, there is no speed limit around the schools in Tehran; and only the presence of speed bumps force drivers to slow down. Therefore, increasing traffic safety is the most important concern for all urban planners and transportation policymakers in Tehran. They assume that the lack of traffic safety is the major barrier to children’s walking to and from school. Making safe the immediate environment around the primary schools for children to walk; and decreasing the distance between home and school is the direct reaction to reply to this hypothesis.

2. Literature review

Since last two decades, a large body of literature has examined factors which are correlating walking to and from school. They found that concerns about safety in the neighbourhood; land use, air pollution, and more recently increasing rates of obesity in the population are the influential factors (Sehatzadeh et al., 2011). Concepts, such as Smart Growth, have developed hypotheses to change the travel patterns by improving the built environment. The hypotheses suggest that, increasing the block length, street width, and the lack of pavements in a neighbourhood have led to a decrease in the rate of walking.
Built environment has also impact on travel time and distance that has always been the preliminary impediment for children in their walking to and from school. In last two decades, due to changes in land use, the distance between schools and home has increased in local areas (McMillan, 2007). Consequently, children are more likely to use motorized modes of travel to go to and from school (being driven by parents or using school bus). Additionally, statistics show that although walking to school has recently decreased; the injuries of children pedestrians have increased (Ulfarsson & Shankar, 2008). Some parents are in a rush to get to work in the morning or other appointments in time and most of them do not pay enough attention to pedestrian children. As a result, the closest streets to schools are often the most dangerous places for those children who walk to school (Ahlport et al., 2008). Other studies have indicated that child casualties largely occur during the commencement and dismissal times of the schools (Dissanayake et al., 2009). The concern of parents about the safety of their children (i.e. traffic, road conditions and lack of supervision), often result in them not to allow their children to walk to and from school on their own. The most famous programme about children’s trip to school, Safe Routes to School (SR2S), is aimed at making the school journey safer and healthier for children. This programme attempts to improve the built environment to increase the number of children who are walking to and from school as well as educating children on traffic safety (Boarnet et al., 2005).

2.1. Aim of study

This study explores the association between parental perception of traffic safety in the neighbourhood with the likelihood of a child’s walking to and from school. It further attempts to find out if socio-economic variables (number of cars in a household and the average of monthly household income) change the relationship between parental perceptions of traffic safety and modes of children travel to and from school.

3. Methodology

A cross-sectional survey of parents was used to examine data from 18 school sites in Tehran across three different socio-economic areas. Qualitative and quantitative data (open-ended and structured questions in questionnaire) were collected at the same time and all data was transformed into numbers. Qualitative and quantitative data were integrated at analyse phase, to be able to compare the results (Creswell, 2003). All data was analyzed by using the statistical program, SPSS-version 17 for Windows.

Cross-tabulation was used to identify if there is any relationship between independent and dependent variables. Only variables that were significant in cross-tabulation test were included in Multinomial Regression Models; however, those variables which were not significant but theoretically had some relationship with children’s trip to school were also included. Finally, independent variables regressed on dependent variables while the socio-economic variables were in interaction terms; to examine whether they change the relationship between them. The following framework (see Fig. 1) shows the relationship between different variables in this study. The arrows with dot lines show the indirect relationships and solid arrows show the direct relationships, (x) also show the interaction between variables.
3.1. Limitations

One limitation of this study includes its cross-sectional design, which makes it impossible to draw causal inferences from the data. However, according to the objective of this study, it is not considered as a weakness. Additionally, all respondents involved in the present study were from urban areas (Tehran). Therefore, future research should consider exploring the constraints on children walking to and from school in rural areas, which may be different from urban areas (Dalton et al., 2011; Gallimore, et al., 2011). A fundamental constraint on doing this study was the lack of a clear approach towards issues regarding children’s travel to school and traffic in Tehran. The government has some strategies to improve traffic safety around primary schools in Tehran but parents are not involved in the process of development. Consequently, people do not feel that their real needs are addressed. The strength of this study is parents were involved in the study and it examined the traffic safety factors on the modes of transportation for children to go to and from school separately.

3.2. Research sample sites

The study focused on public primary schools in Tehran, because of their neighborhood orientation and the fact that the majority of primary schools in Tehran are public. Moreover, transportation policy makers target at primary-aged children to improve traffic conditions and make school trips safer for children. School catchment areas were stratified into rich, middle and low socio-economic statuses; see Fig 2(a). A multi-stage cluster sampling of schools was used, based on a complete list of public primary schools across different areas; see Fig 2(b) (de Vaus, 2002). Three districts were excluded from the sampling...
because the population of students was small in these areas. The third one was not under supervision of the Department of Education and Training of Tehran (District Number 20, 21, 22). In Iran there is no co-educational school; therefore, two schools were selected from each district, one male and one female, to be fair in gender terms.

3.3. Data collection procedure

Data collection was conducted during January and February in year 2009. Multiple methods of data collection were used to strengthen reliability as well as internal validity (Tashakkori & Teddlie, 2003; Creswell, 2003). The parental survey was designed to extract their perception of barriers to their children if they walk to and from school. Parents’ questionnaires (N=561) were distributed to involved children, in grades 3-5, at the selected schools to take home to their parents for their completion. The parents then returned the completed survey to school via their children on the following day. An overall survey response was 83%, and no follow-up was taken to capture non-respondents.

The survey included both open-ended and close-ended questions in order to clarify the results of the parental survey. In addition, telephone interviews were conducted with parents who did not answer the open-ended questions completely because the researcher did not have direct access to individuals (Creswell, 2007). The questionnaires had different sections including general information, parents’ work travel mode, parents’ feeling and decision about their children’s travel to and from school, parents’ school travel mode and parent’s perception of safety in the immediate school environment.

4. Results and Discussion

There were almost equal numbers of male and female children in the sample to be fair in gender (51.2% female, 48.8% male). Children were also recruited evenly across different grades. However, parents who involved in the study were not selected evenly among income groups due to the uneven distribution of the population of Tehran across different socio-economic areas. Thus, 54.3% of respondents are from low-income, 22.5% are from middle-income, and 23.2% are from high-income.

Travel distance has a significant impact on the choice of travel mode (McMillan, 2007) and is more important for children below 10 years of age. Increasing distance (>500m) is equal to a decrease in walking (Yeung et al., 2008). In this study, long travel distance, which is the main barrier for children to walk to and from school, was not included in analysis, because public schools have to register children who live in a walking distance from school or their parents workplace is located in a short distance from school, therefore the majority lived in a walking distance from school, see Fig. 3 (an area with 500m
radius from the main entrance of the school). As such, home or parents’ work place was considered as a destination for children to go after school; however, only a few students walked to school, especially on their own.

![Pie chart showing travel distance from home to school](image)

Fig. 3. Parents’ report about child’s travel distance from home to school, Sources: Authors

To understand if any factors in the environment impede children’s walking to and from school, we need to know both their current and favourite travel mode to school, see Fig. 4 (a) and (b). Also, we should know the reasons if they cannot meet their desirable school transportation. About 42% of children usually walked to school; however, more than 20% of them were escorted by their parents or elder siblings. Moreover, there were some differences between a child’s modes of transportation to and from school.

Walking was still the predominant travel mode in the afternoon (back home from school). Children were more likely to walk with their friends on their trip back home from school. Few students used public transportation and nobody chose cycling or skating to and from school, so these modes of travel were excluded from further analysis. This may be explained by poorly planned roads for cycling and skating, and climate conditions during school time. It may also be due to the cultural and social norms in Iran regarding cycling and skating on the streets, especially for girls. Being driven by parents had a higher rate among high-income groups, while low-income groups’ students had the highest rate of walking to and from school.

![Bar chart showing transportation modes by income level](image)

![Bar chart showing transportation modes by income level](image)

Fig. 4. (a) first figure, Parents reported about child’s current travel mode to school, (b) Second figure, parents reported about child’s current mode of travel back home. Sources: Author.

Parents were further asked about the most convenient transportation mode to school for their children. The majority of parents reported walking was the best school transportation mode for their children if they could escort them. Only a few of them thought that children walking with their friends, or on their
own to school was a proper school travel mode. Approximately 61% of parents reported traffic moving more than 30 km/hr in the neighbourhood as the main reason why they preferred their children not to walk to and from school autonomously, Table 1 shows all parental perception of traffic safety in the neighbourhoods (TSI).

Table 1: Perceived traffic safety factors in neighbourhoods which impact parental decision making about their children’s modes of travel to and from school

| If your child were to walk to and from school or already does, would they have to any of the following on his/her way to and from school? | Yes |
|---|---|
| Cross a road with more than 4 lanes | 25.4 |
| Cross a road at an intersection that does not have a street signal or a stop sign to stop traffic | 38.9 |
| Cross a road without a painted crosswalk | 43.7 |
| Walk in the road or on the edge of road because there is no pavement | 59.1 |
| Walk along a road that has traffic moving at more than 30 km/hr | 60.7 |

To understand the parental perception of traffic safety and the impact of these factors on a child’s walking to and from school, Multinomial Regression models were used (see Table 2). Children’s modes of travel to and from school were limited to walking with an adult, walking with friends or alone, driven by parents and using a school bus. The traffic safety indexes (TSI) were negatively related to the probability of a child walking to school with friends or alone, relative to other transportation alternatives. This suggests that as the value of the indexes increased, the likelihood of walking independently decreased. This result was in the expected direction, as a higher value on the TSI expresses a very large amount of perceived traffic barriers for children in their walking to school on their own.

Table 2: Multinomial Regression Models to show the relationships between perceived traffic safety factors, socio-economic and socio-demographic factors and children modes of travel to and from school. *Note: the reference category is: walk with friends/alone; variables are significant at p≤0.05

| | Children’s modes of travel to school | Children’s modes of travel back home |
|---|---|---|
| Intercept | 5.984 0.285 | 7.8 0.034 |
| HOUHLD | 0.971 0.279 | -1.208 0.016 |
| [DRIVELEC=1.00] | 2.37 0.019 | 1.152 0.045 |
| [UNDER5=0.00] | 2.511 0.004 | - - |
| [KIDSNU=1.00] | -0.821 0.492 | - - |
| [HOUSINC=1.00] | -0.15 0.919 | -1.469 0.1 |
| [HOUSINC=2.00] | 0.142 0.895 | -1.533 0.027 |
| [MUMOCUP=1.00] | - - | -0.578 0.333 |
| KIDAGE | -0.93 0.106 | -0.637 0.069 |
Children are more likely to walk to school with an adult rather than walking to school autonomously while there is only one person in a household who is holding driving license (DRIVELIC). To examine the probability of children walking to school relative to being driven by parents, number of cars in a household (HOUSHLDCAR) and presence of siblings who are under 5 years old (UNDER5) were significant. In the last model, which compared the probability of walking to school over using a school bus, number of cars in a household was not significant anymore; however, average monthly household income (HOUSINCOM; B = -5.64, p = 0.001 < 0.05) and age of children (KIDAGE; B = -1.174, p = 0.086 < 0.1) impact negatively on choosing modes of travel for children, which was anticipated.
Two factors of traffic safety were significant in above models. The proportion of street segments within ½ kilometre of school with more than four lanes of traffic (TRAFLAN) was negatively related to the likelihood of children walking to school on their own over other transportation modes to school. Narrow streets (TRAFLAN; \( p=0.00<0.05 \)) were negatively associated with the probability of a child walking to school. This means that when the percentage of narrow streets (with less lanes of traffic) increased in a neighbourhood the likelihood of children walking to school decreased. These findings contrast with the results of previous studies (Clifton & Kreamer-Fults, 2007). It can be explained that in narrow streets in Tehran, pavements are totally absent due to insufficient width of the street; however, they still allow vehicles to enter, which make them dangerous for pedestrians and especially for children. At the same time, it was positively associated with children being escorted by their parents (\( p=0.00<0.05 \)) or using motorized modes to school (\( p=0.001<0.05 \)), especially using a school bus (\( p=0.00<0.05 \)). The absence of painted crosswalks within ½ kilometre of school (CROSNOPAV) was negatively associated with the probability of children walking independently over other alternatives.

To examine the probability of children walking back home relative to being driven by parents, mother’s occupation (MUMOCUP; \( p=0.073<0.1 \)) became significant, which was anticipated. However, mothers’ occupation did not impact parental decision making about arranging school bus for their children to go back home or escorting them while walking back home. It was not anticipated, but more than 75% of mothers involved in this study were housewives, which decreases the influence of mothers’ occupation on choosing modes of travel for children to go to and from school. Variables such as children’s age (KIDAGE; \( p=0.069<0.1 \)), average monthly household income (HOUSINCOM; \( p=0.027<0.05 \)), and number of people in a household who hold a driving licence (DRIVELIC; \( p=0.045<0.05 \)) increase the probability of children walking back home with an adult over their autonomous walking. The direction of relationship between the rest of the non-urban form variables and children walking to school was consistent with other literature. The average of the monthly household income (HOUSINCOM) impact the likelihood of children walking back home with an adult and using school bus relative to children walking on their own. However, this factor did not have any effect on probability of a child being driven by parents to go back home over other modes of transportation. The results also show, younger children (KIDAGE) are less likely to go back home on their own or with their friends, that is consistent with other literatures.

Three traffic safety factors from the parental TSI influenced the probability of children walking back home on their own over their walking with an adult. Lack of painted crosswalks (CROSNOPAV; \( p=0.003<0.05 \)), decrease in number of traffic lanes (TRAFLAN; \( p=0.00<0.05 \)), and absence of traffic signs to stop traffic at intersections (NONTRAFSIGN; \( p=0.038<0.05 \)) decreased the probability of children walking back home autonomously over their walking with their parents.

The research findings support the general hypothesis that traffic safety plays a role in decision-making about a child’s mode of transportation to school. This result is consistent with the results of previous studies concerning children being driven by parents or using a school bus (Bringolf-Isler et al., 2008; Beck & Greenspan, 2008; Schofield et al., 2008). This study found that the relationship between perceived traffic safety (parental perception about traffic safety in the neighbourhood) and children walking to school is significant. However, there are other factors that influence on parental decision making about children’s walking to and from school which increases the complexity of the association.

Parents’ self-reported measures of traffic safety such as street width, absence of traffic signs to stop traffic at intersections and lack of painted crosswalks has the greatest impact on how children travelled to school. Parents also indicated that traffic with high speed on local streets and all aforementioned traffic safety factors impact on modes of children’s transportation used in going back home.

The research suggests that the average of household income, household car ownership and infrastructure of the neighbourhood significantly impact on this variation. This can be explained in that
infrastructure investment was not distributed equally across different areas, and that, commonly, low-income areas have been ignored.

This study focused on exploring perceived barriers to children’s walking to and from school; therefore, only traffic safety factors from parent survey, which negatively impacted on the probability of a child walking autonomously to and from school, were compared across income groups. The ANOVA test was used to show the initial difference of barriers across income groups. The result of the ANOVA test showed that parental concerns about their children crossing the roads when there are no painted crosswalks do not vary across different socio-economic status areas, this result shows that the lack of painted cross-walks is a common parental perceived barrier across all income groups. However, parental perceptions of presence of streets with more than 4 lanes of traffic, and presence of intersections without any traffic signs to stop traffic in the neighborhoods vary across different socio-economic status areas. It is explained that infrastructure and street width are different across different income groups, as such parental concerns about traffic safety varies across different socio-economic areas. The results are illustrated in Table 3.

Table 3: ANOVA test: Initial differences between perceived traffic safety factors across income groups

| Perceived traffic safety factors                                      | Sum of Squares | Mean Square | F      | Sig. |
|---------------------------------------------------------------------|----------------|-------------|--------|------|
| Cross a road with more than 4 lanes of traffic                      | Between Groups | 10.88       | 5.44   | 28.18| 0.000|
| Cross a road at an intersection that doesn’t have a street signal or a stop sign to stop traffic | Between Groups | 1.357       | 0.678  | 2.728| 0.066|
| Cross a road without a painted crosswalk                            | Between Groups | 0.568       | 0.284  | 1.142| 0.32 |

ANOVA test confirmed that the difference between infrastructure and street layouts across different socio-economic areas led to different parental concerns about traffic safety in neighbourhoods. However, it is not clear yet if it is the only reason or socio-economic status of households also impacts their concerns about traffic safety and choosing modes of travel for their children to and from school. Previous studies concerning children travel to school, confirmed the two important socio-economic variables that impact parental decision making about their children modes of travel to and from school are the average of household monthly income and number of cars in a household (Kerr et al., 2006; McDonald, 2008).

To examine if the aforementioned variables change the relationship between parental perceptions of traffic safety and children’s walking to and from school, socio-demographic and traffic safety variables regressed on children’s modes of travel to and from school while number of cars in a household and the average of monthly household income were in interaction terms. Absence of traffic signs at intersections did not become significant when those two socio-economic variables were in interaction terms. It confirms number of cars in a household and economical status of a household does not impact parental perceptions of lack of traffic signs at intersections in the neighbourhoods. Parental concerns about traffic safety if their children have to cross those streets with more than four lanes of traffic to walk to and from school were decreased due to the lower average of monthly household income and presence of only one car in a household.

The results were anticipated, because economical status of a household and their access to car increase their transportation options i.e. in rich families they can afford to arrange transportation for their children or chauffer them to and from school, however children from families with low monthly income have to walk to and from school or if it is possible be escorted by an adult. Lack of painted crosswalks became
significant only in the last model with a decrease in magnitude of its impact on probability of using school bus over children’s walking back home while number of cars in a household and the average of monthly household income were in interaction terms (Table 4).

Table 4: Regression with interaction variables to establish the effect of TSI and NSI factors on the probability of children’s walking to school. *Note: the reference category is: walk with friends/alone; variables are significant at $p \leq 0.05$, first column from left, shows the magnitude of impact of traffic safety factors before socio-economic factors were interacting with them.

|                           | Children’s mode of travel to school | Children’s modes of travel back home |
|---------------------------|-------------------------------------|--------------------------------------|
|                           | $x$ CAR $x$ INCOME $B$ $B$ $B$ | $x$ CAR $x$ INCOME $B$ $B$ |
| walking with an adult     | 5.316 1.574 1.114 2.736 0.7 | -11.659 -1.327 -2.457 |
| driven by parents         | 4.156 1.619 1.719 - - | - - |
| school bus                | 10.674 3.187 3.691 12.433 2.338 2.988 |
| [TRAFLAN=.00]             | - - - -11.659 -1.327 -2.457 |
| [CROSNOPAV=.00]           | - - - -11.659 -1.327 -2.457 |

5. Conclusion

This study, adds to the literature by showing that living within walking distance from school (500 m) may not guarantee walking as the children’s mode of transportation to and from school, especially if on their own. This research confirms that traffic safety is definitely a barrier to children’s walking to and from school on their own; therefore, it should be considered by any programme that targets the changing travel patterns.

However, improving the infrastructure in front of the main gate of the schools is not enough to improve the perception of traffic safety in the neighbourhood. This study also provides an analytical framework to examine how traffic safety and cultural norms may relate to children’s travel behaviour. Moreover, Traffic safety factors have an association at different levels across different areas. As such, future research concerning people from different income groups and household travel needs would help in clarifying the transportation needs and preferences of different segments of the population.

Parental concerns about traffic safety factors in a neighbourhood are changed according to their average of monthly income and access to car. Parents with higher average of monthly income have more transportation options to send their children to school; therefore their children are less likely to walk to and from school. However, some socio-demographic factors also impact on parental decision making about their children trip to school. The hypothesized relationship between traffic safety and children walking to and from school will be more comprehensive, by combining the influence of transportation, urban form, traffic safety, neighbourhood safety and health.

Future research should also examine the efficiency of several moderator factors, such as creation of traffic calmed spaces or neighbourhood parks, in changing the travel pattern and influencing health, to use resources efficiently. As was discussed previously, looking at these factors carefully across different groups of population and different socio-economic status areas will also lead to a more fair distribution of resources.
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