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The role of socio-economic and environmental characteristics in school-commuting behavior: A comparative study of Jewish and Arab children in Israel

Wafa Elias [a,*], Rachel Katoshevski-Cavari [b,1]

[a] Department of Civil Engineering, SCE—Sami Shamoon College of Engineering, Beer Sheva 84100, Israel
[b] Urban Planner, POB 4045, Omer, Israel

ARTICLE INFO

ABSTRACT

School travel contributes to most of today's envisaged transport problems. However the literature dealing with school travel is limited. Hence, a study of school-travel patterns can generate many important insights that may impact transport-system policy and management. This paper focuses on school-commuting patterns and related perceptions of schoolchildren's parents among the Jewish and Arab populations of Israel. The study aims at understanding the commuting behavior of these children, ages 9–15. It examines the relationship between gender and socio-economic characteristics in the commuting behavior of Jewish and Arab schoolchildren. The basic hypothesis is that there are differences in school commuting patterns because of various differences between these two groups.

The study is based on a questionnaire administered to 1755 students from various cities and villages in Israel and their parents. Descriptive statistic and multinomial logit model were used to study the differences in travel behavior within two population groups.

The results show differences in school-travel patterns between Jewish and Arab schoolchildren. Age, gender, car availability, and parents work status were found to impact their travel behavior, including walking time to school. The differences appear in morning commuting behavior, commuting mode used by boys and by girls, and their preferred mode. For both population groups, the older the child and the fewer private automobiles in the household, the more likely it is that they will walk to school as opposed to being driven by car. Arab children with employed mothers were more likely to be driven to school than to commute by school bus or on foot, whereas no significant impact was found among the Jewish children having working mothers. In addition, the results indicated also that there are differences in parental behavioral patterns and perceptions concerning their children's mode of arriving to school, aspects that should be taken into account when dealing with planning policies which aim to increase children walking. The results of the study provide insights into policies and campaigns that may help to promote walking and bicycling and generate the development of healthier and greener travel behaviour.

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1. Introduction

Although the travel behavior of children is known to be an important component in household travelling patterns (Lin and Chang, 2010, for example), and school travel to constitute the primary transport activity among children, it is only over the past few decades that interest has grown in studying this phenomenon and other related aspects, such as the connection between the travel behavior/activities of children and the travel of the household's adults (Zwerts et al., 2010, for example). This growing interest in child travel has occurred in parallel with significant changes in child travel behavior, where the private vehicle has become the predominant mode for transporting children to school, even for distances of less than one mile (Black et al., 2001; McMillan, 2005, 2007).

Complementing these findings about increased car travel among children are various studies that indicate a decrease in children's walking and bicycling to school in recent years (Bradshaw, 2001; Lin and Chang, 2010; Fyhri et al., 2011; Nicitopoulos et al., 2011). Schlossberg et al. (2006) pointed out that from the mid-1970s to the beginning of this century, the percentage of elementary and secondary school students who cycle or walk to school dropped from 49% to 14% in the United States. Children's school-travel mode was also found to be connected to the mother's working hours, which also had changed

* Corresponding author. Tel.: +972 49888003.
  E-mail addresses: wafate@walla.com (W. Elias),
krachel@bgu.ac.il (R. Katoshevski-Cavari).
  [1] Tel.: +972 506205309.

over the years, so that the commuting pattern of mothers is currently significantly associated with the extent of children's walking and bicycling to school (McDonald, 2008). This change in children's travel behavior, coupled with the huge increase in the number of school students over the past few decades, presents a growing transportation problem; and school commuting has become a significant generator of localized congestion at morning (especially) and afternoon peaks. Thus, for example, parents driving their children to school comprise approximately 20% of all UK car trips during weekday morning rush-hours (Black et al., 2001).

It is believed (Bhat et al., 2010; Copperman and Bhat, 2007a, 2007b; Hillman et al., 1990; Pont et al., 2009; Rhoulac, 2005; and Valentine and McKendrick, 1997, to cite just a few) that part of this decline in the extent of walking to school is related to an overall decrease in children's independent spatial mobility as a result of parents' perception and changing ideas about when it is safe to permit a child to walk to school unaccompanied. Parental concerns about traffic, as emphasized by Giles-Corti et al. (2011), are key factors in the decision about whether or not to allow their children to use active modes to travel to school. In addition to perspectives (the parents' and those of others) concerning the neighborhood, geographical aspects of the city were found to play a major role in children's travel patterns. That is, accumulated studies have determined a long list of physical and perceptual aspects of the environment as factors that determine children's travel patterns. These factors include distances, building density, mixed land use, block size, land-use barriers, pedestrian-friendly design of the urban environment, bike lanes, neighborhood safety, traffic safety, household transportation options, caregiver attitudes, a child's attitude, social/cultural norms, ethnic characteristics, gender, and socio-demographics. To mention just a few of these studies: Franzini et al. (2010), Ewing et al. (2004), He (2011), McMillan (2005, 2007), Muller et al. (2008), O'Brien et al. (2000), Schlossberg et al. (2006), Steinbach et al. (2011), Wilson et al. (2010), Yarlagadda and Srinivasan (2008).

Among demographic variables (mentioned above) the child's age (Timperio et al., 2004; Alton et al., 2007) and gender (Clifton et al., 2011; Prezza et al., 2001; Kamargianni et al., 2012) have been found to significantly impact children's school-mode choice: older children and boys are more likely to walk or to bicycle to school than are other children. However, ethnicity, which is especially relevant to our study, was found in the United States to be a mediating variable in the link between age and gender, on the one hand, and travel freedom, on the other (Macdonald et al., 2004). Thus Latinas and Asian girls had limited travel freedom, particularly in the ability to travel by themselves on public transit. In a later study, McDonald (2008) concluded that low-income and minority groups, particularly Afro-Americans and Hispanics, used active travel modes to go to school at a much higher rate than did "whites" or higher-income students.

Based on data from sixteen elementary schools in California, McMillan (2007) studied factors that affected the students' caregivers' decisions about transport mode to school. Binomial logit regression models were developed to examine the likelihood of a child's walking/bicycling to school versus travel by private vehicle or a neighborhood carpool. Similar to previous studies, the results showed that the distance from home to school had a significant influence on students' mode choice. However, the attitudes and perceptions of parents regarding the safety and traffic characteristics of the neighborhood were found in that research to have more influence on school-travel mode choice than did built-environment attributes. Jonnalagadda et al. (2001), and Ewing et al. (2004), present two examples of studies that used a multinomial logit model to study the reasons for different mode choices. Some of the elementary findings that are relevant to the present research question show, again, that students with shorter

walk and bike times to and from school are significantly more likely to walk and cycle, respectively, to school; however, the two studies also indicate other aspects that influence the decision concerning a student's travel modes. Students from households with higher incomes and more vehicles per capita are less likely to walk to school than to be driven by car, go on a school bus, or use a bicycle.

As part of the attempts in various cities in Western countries to increase walking in the city and because of the understanding that a parent's perception of the built-up environment is an important component in the overall cause of the decrease in children's walking and cycling to and from school, various policies have concentrated in recent years on educational programs to reverse this decrease and foster active travel. One example is the Safe Route to School (SR2S), which was first implemented in California (McMillan, 2007). This program endeavors to positively impact a child's travel and health by making the school route safer for non-motorized modes through (1) education about road safety, (2) enforcement of traffic laws around schools, and/or (3) engineering of the street environment along the routes to school to control traffic and to enhance pedestrian and bicycling. The SR2S program, by concentrating on creating a safer walking and bicycling environment, is a mechanism for creating an overall safer environment.

In light of the factors described that influence children's school-travel modes, this study aims at understanding the commuting behavior of Jewish and Arab schoolchildren, ages 9–15, in Israel. Although this decreasing self-commuting is also found in Israel (Lipman, 2008), it is important to emphasize that Israeli schoolchildren's self-commuting is high in comparison with that in English-speaking countries (Mackett et al., 2007). The present study examines the relationship between gender and socio-economic characteristics in the commuting behavior of Israeli Arab and Jewish schoolchildren. The basic hypothesis is that various differences between these two groups, such as in socio-economic level, mothers' working patterns, and the built environment, aspects mentioned above as determining mode of travel, account for differences in their school-commuting patterns. A comparison of the two communities, furthermore, provides insights into how socio-economic characteristics, which also reflect the inequity in investment distribution among different groups in the Israeli society, affect the commuting behavior of schoolchildren. This research is among the first to address the relationship between modes of travel to school and a range of factors that might affect mode choice.

The paper is organized as follows: We first describe the Israeli Arab population, the methodology of the research, and the survey. This section is followed by an analysis of the data and a description of the multi-logit model employed in this study. Finally, discussion and conclusions are presented, as are several suggestions based on the results.

2. The Israeli Arab population

The Arab population living in Israel numbered 1.642 million at the end of 2012, constituting 21% of the total Israeli population. By 2030, this population is expected to grow to 2.362 million (24% of the total population). The high rate of growth is mainly due to a relatively high birth rate (Israel Central Bureau of Statistics, 2007). Most of the members of the Israeli Arab population live in separate villages and towns, which generally provide basic amenities (education-schools, medical services [other than hospital-based services], financial services, etc.). There are some mixed cities (that is, with both Jewish and Arab populations), but these were not included in our study.

About 82.6% of the Arab population in Israel is Muslim (including Bedouins); another 9% is Druze; and about 9% is Christian. An Arab