Safety Practices of Nursery School Travel: Preliminary Results from Ilioupoli

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Abstract

The aim of this research is to identify the mechanisms, which link the socio–economic status of the family (not the area), with the level of traffic safety of preschool children. The study is piloted in the suburb of Ilioupoli, Athens, Greece.

A structured questionnaire exploring the traffic safety of preschool children during their everyday commute to the nursery school, the child-parent interaction and the parent's behaviour and knowledge towards traffic safety, was completed for 286 children by 247 volunteer parents, having at least one child attending a municipality nursery school.

Results show that children travel to the nursery school, mainly as car occupants accompanied by their mother. 18% of the respondents always use a child restraint system (CRS). Most children, who always use car seats while travelling by car, have highly educated mothers (88%). 27% of respondents specify that they always wear seatbelt, when accompanying their child by car.

Keywords: *traffic safety, preschool children, socio–economic status, child restraint systems (CRS)*

Περίληψη

Ο σκοπός της έρευνας είναι να προσδιορισθούν οι μηχανισμοί, οι οποίοι συνδέουν το κοινωνικό-οικονομικό επίπεδο της οικογένειας (όχι της περιοχής), με το επίπεδο της οδικής ασφάλειας των παιδιών προσχολικής ηλικίας. Η μεθοδολογία που αναπτύχθηκε εφαρμόστηκε πιλοτικά στην περιοχή της Ηλιούπολης, Αττικής.

Ένα δομημένο ερωτηματολόγιο, το οποίο διερευνά την ασφάλεια της κυκλοφορίας των παιδιών προσχολικής ηλικίας, κατά την καθημερινή τους μετακίνηση προς τον παιδικό σταθμό, την αλληλεπίδραση παιδιού-γονέα και τη συμπεριφορά και τη γνώση του γονέα σε σχέση με τα θέματα οδικής ασφάλειας, συμπληρώθηκε από 247 εθελοντές γονείς, των οποίων ένα τουλάχιστον παιδί (συνολικά 286 παιδιά) φιλοξενείται σε δημοτικό παιδικό σταθμό.

Τα αποτελέσματα δείχνουν ότι τα παιδιά πηγαίνουν στον παιδικό σταθμό, κυρίως ως επιβάτες αυτοκινήτων συνοδευόμενα από τη μητέρα τους. 18% των ερωτηθέντων χρησιμοποιούν πάντα σύστημα συγκράτησης για παιδιά (CRS). Τα περισσότερα παιδιά, τα οποία χρησιμοποιούν πάντα τα σύστημα συγκράτησης αυτοκίνητου, έχουν μητέρες με υψηλό μορφωτικό επίπεδο (88%). 27% των ερωτηθέντων δηλώνουν ότι ο συνοδός φοράει πάντα ζώνη ασφαλείας, όταν συνοδεύει το παιδί με το αυτοκίνητο.

Λέξεις κλειδιά: *οδική ασφάλεια, παιδιά προσχολικής ηλικίας, κοινωνικο-οικονομικό επίπεδο, συστήματα συγκράτησης παιδιών*

1. INTRODUCTION

Road safety is a global health problem, affecting all ages and regions. Greece is consistently among the worst performing countries in Europe. Regarding transport related injury deaths in children and adolescents aged 0-19 years in the WHO European region, Greece comes second in averaged standardized rates per 100.000 for 2003-2005, with similar performance for most recent years (WHO, 2008). The highest mortality rates are found in ages 10–14 years, where

road traffic crashes are the leading cause of death, while the lowest are in those aged 0–4. The increased mortality in boys at the age of 10–14 years is noteworthy (Dedoukou, 2014).

In Greece there is a national seatbelt law, which applies to front and rear seat occupants and a national child restrain law. The maximum speed limit in urban roads is 50km/h; local authorities can set lower limits, but there are no policies to promote walking or cycling or policies to separate road users to protect vulnerable road users (WHO 2013). According to an observational study carried out by NTUA in 2009 (Yannis, 2009) child restraint use in Greece is 57%, with no significant difference inside or outside urban areas. Besides, around 1 out of 4 drivers do not use seat belts, with females having higher seat belt use rates. Only 19% of rear seat passengers use seat belt inside urban areas, and 28% outside urban areas. Furthermore, most Greek drivers seem to be unaware of the important role of seat belts in minimizing the incidence and severity of accidents (Kontogiannis, Kossiavelou and Marmaras, 2002).

Consecutive lack of consideration of other road users, including vulnerable road users, is a general characteristic of the Greek population. Drivers tend to behave repeatedly with social disregard and sometimes perform it automatically (Kontogiannis, Kossiavelou and Marmaras, 2002). Such behaviours include drivers failing to communicate their intentions to other road users and violation of pedestrian crossings.

Many studies aim to define whether changing the built environment can reduce the risk of injury to children. The protective effect of traffic calming infrastructure, in particular speed humps, within a radius of 0.4 km has been demonstrated (Tester et al., 2004). Children, both as cyclists and as pedestrians, appear to benefit from vertical and horizontal deflections (Mountain, Hirst and Maher, 2005). Particular street designs (Brude and Larsson, 2000) and the physical separation of vehicular and pedestrian traffic (Garder, 1989) are considered to have a positive effect in reducing the risk of child pedestrian injury (Retting, Ferguson and McCartt, 2003).

Sideris and Ligett (2005) reported that child pedestrian casualties are always uneven; educational, residential and commercial land use types, as well as road and population densities can be used to predict pedestrian casualty numbers. Also, Dissanayake, Aryaija and Wedagama (2009) aimed to provide some guidance for local authorities in Great Britain, to deliver successful child road safety audits. Their results show that secondary retail and high density residential land use types are associated with all child pedestrian casualties. In addition, educational sites, junction density, primary retail and residential land use types are also associated with child casualties at different time periods of the day and week (Dissanayake, Aryaija and Wedagama, 2009). Effective interventions for the prevention of child occupant travel related injury include car seat restraints (Porter and Zhao, 1998). The use of child restraint system (CRS) for children aged 7 years and under is significantly related to the parent's attitudes, knowledge and behaviours towards road safety in general, such as drinking habits while driving and CRS safety knowledge (Kopel et al., 2013). Other approaches to the problem include altering school attendance times to prevent child pedestrian injuries (Yiannakoulias, Bland and Scott, 2013).

The objective of this study is to identify the mechanisms, which link the socio –economic status (SES) of the family (not the area), with the level of traffic safety of preschool children in Greece. Controlling for the area, in which families reside and travel, we examine the socioeconomic parameters that influence the safety of the children on their everyday travel to nursery school. This study is piloted in Ilioupoli, Athens, Greece and will continue at several selected areas throughout the country.

This paper is structured as follows. The next section gives a detailed background of factors affecting the vulnerability of children as road users. Then the methodology used is described, as well as the questionnaire design and the study area selection. Following this, results are drawn from the collected data. Finally, the findings of the study are discussed, along with suggestions and further study recommendations.

2. BACKGROUND

The primary cause of fatalities among children aged 0–14 years, in Greece, is recorded to be road traffic injuries (Dedoukou, 2014). This is also the case for many other countries around the world. Motor vehicle crashes are the most common cause of injury and death for Australian children aged 1 to 14 years (Australian Traffic Safety Bureau, 2009). In the United States, motor vehicle crashes were the leading cause of unintentional death for children aged 1 to 14 between 2000 and 2006 (Center for Disease Control and Prevention, 2014).

2.1 Parameters affecting child's vulnerability in traffic

2.1.1 Cognitive development

Children's behaviour in road traffic is influenced by their cognitive development. Although each child grows and develops at its own pace, the use of the developmental theory of Jean Piaget (Piaget, 1977), is often considered in an effort to explain their traffic behaviour. According to this theory there are four levels of development:

- *Sensori–motor Level (up to the age of 2).* (Schieber and Thompson, 1996).
- *Pre-operational level (approx. 2-6 years of age).* At this stage, children are egocentric. Their actions are dictated by their perceptions, feelings, expectations and fears.
- *Concrete operational level (approx. 6-12 years of age).* At this stage children can put themselves in the position of others. They also can cope with tangible, but not abstract, concepts (e.g. time or speed).
- *Formal operational level (approx. 12 years of age and over).* Children at this stage are capable of abstract thinking. They are capable of understanding and practising traffic rules.

2.1.2 Physical development

Physical development is a crucial parameter of children's vulnerability in traffic. Their limited height makes them difficult to see, for example when walking between parked cars. They also have limited visual perception, due to their limited height. There are also indications of some limitations to children's peripheral vision (David et al., 1986). Auditory perception of movement is a problem area for young children. The number of correctly identified vehicle sounds increases significantly with age (Pfeffer and Barnecutt, 1996)

2.1.3 Age

In almost every western country, the highest at risk age group for children pedestrians is that of elementary school, i.e. ages between 5 and 9 years (Assailly, 1997). As already mentioned, age is closely linked to development; consequently these two parameters are often considered together. On the other hand, vulnerability might be high, even though a person is almost fully developed. This is the case for adolescents. For this age group, it is mostly psychosocial factors that influence their susceptibility to traffic accidents.

2.1.4 Gender

Boys are more prone to accidents than girls (Assailly, 1997). Apart from genetically defined differences in behaviour, there is a cultural background to this, as it is suggested by many researchers that parents and society tend to be more protective towards girls than boys. Societal expectations and gender role socialization influence pedestrian injury risk (Morrongiello and Hogg, 2004). Zeedyk and Kelly (2003) in their study concerning the behavioural observation of adult-child pairs at pedestrian crossings revealed that adults were more likely to hold girls' hands than boys' hands. Boys are expected and permitted to take greater risks, to approach physical hazards more quickly and fearlessly, and to consider 'accidents' to be bad luck more often than girls (Morrongiello and Rennie, 1998).

2.1.5 Behavioural control

Children with some kind of behavioural problems are more likely to be involved in a crash (Stavrinos et al., 2011). Younger children, boys and children with less behavioural control engage in riskier pedestrian behaviours (Barton, David and Schwebel, 2007). Also, *Dunbar et al.* (Dunbar Lewis Hill, 2002) aiming to identify features of successful interactions between parents and children, revealed that younger children and girls showed greater dependence to their parents, while boys showed greater recklessness. Moreover, more educated parents had better control of their children.

2.1.6 Socio-Economic Status

There is substantial literature on socioeconomic inequalities in traffic injury rates of children worldwide (Laflamme and Diderichsen, 2000). In Athens, Greece, in a study (Moustaki, Petridou and Trichopoulos, 2001) investigating whether socioeconomic status of town of residence is associated with risk for childhood pedestrian injuries, the researchers concluded that there is a considerable social gradient for childhood injuries irrespective of place of accidents, a finding that could be partly attributable to lower socioeconomic background rather than to adverse environmental factors prevailing in less wealthy towns.

2.1.7 Child-parent interaction

A parent is a child's most important role model and their traffic behaviour influences them highly. Antill (1991) showed that parents perceived road safety as the greatest threat to their child, and the perception of problems, a child is facing in the street, is significantly related to the familiarity of the road environment. Also, parents in this study generally demonstrated safe attitudes and claimed to be safe drivers, although they drove through orange lights, exceeded speed limit, and did not use pedestrian crossings, when walking without their child. A study by Ehrlich et al. (2004) attempted to evaluate the impact of parental practices on the use of child safety devices. Matched analysis demonstrated that a significant proportion of parents, who always wore a seatbelt, were more likely to have children who sat in the back seat and wore seatbelt. In contrast, parents, who seldom wore a seatbelt, were more likely to have children who sat in the front seat unbelted. Furthermore, perceived risk (low crash and injury threat), lack of understanding that booster seats prevent injury, ignorance of the booster seat law, the perception that violations of the child restraint law are not enforced, inconvenience, parental permissiveness, and situational factors are usually the reasons provided by parents and experts related to the prevalence of unrestrained children in the age group of 5 to 7 (Dunbar, Lewis and Hill, 2002).

Parenting styles have their own distinct value on the behaviours and attitudes of children. It is confirmed that safe driving belongs to the list of adolescent behaviours known to be influenced positively by authoritative parenting (Ginsburg et al., 2009). Although the literature suggests that the effects of socioeconomic status on parenting are both profound and pervasive, there are indications that the positive correlations of authoritative parenting transcend ethnicity, SES, and family structure (Steinberg et al., 1991).

Lam (2000) aimed to investigate factors associated with parental safe road behaviour as pedestrians with their young children. They found a significant correlation between parental safe road behaviour while accompanying children, age of child, and their risk perception of road environment.

All the above parameters of vulnerability are closely related with each other and they are all important. However, it is crucial to understand how each one of them is linked to the safety of children in traffic.

According to the OECD, (2004, page 19):
"Personal safety concerns and changing economic and social patterns also affect children's travel behaviour. Given parent's perceptions of children's circulation in traffic being inherently hazardous, parents increasingly drive them to school and other destinations in private vehicles. The significant shift to car travel is believed to account for the fact that more children are killed today as car passengers than in any other transport context."

2.2 Parents as educators

Results of the 'Behavioural observations of adult–child pairs at pedestrian crossings' (Zeedyk and Kelly, 2003) showed that, although adults observed in this case provided reasonably good models of pedestrian behaviour, they rarely treated the crossing event as an opportunity to teach children explicitly about road safety. Parents are the primary educators of their child, and are with them in the traffic environment more often than anybody else. At the same time, road safety education is best undertaken in the actual road environment; it would seem that the best way for young children to learn best practices in traffic would be through the paradigm, control and encouragement of informed parents.

2.3 Discussion

Several studies approach aspects of this study, but only a few focus particularly on pre-school children. In addition, these studies have been prepared in other countries and the generalizability of findings in Greece can be difficult, mainly due to transport environment and cultural differences that affect children's traffic safety. Traffic environment differences include poor parking facilities and poor road and sign conditions. Cultural differences include aberrant behaviour on the roads (Kontogiannis, Kossiavelou and Marmaras, 2002) but also concepts and perceptions of parenting styles (Keller, 2003, Antonopoulou, Alexopoulos and Maridaki-Kassotaki, 2012).

3. METHODOLOGY

A questionnaire was developed and administered to a sample of pre-schoolers' parents living in Ilioupoli, Athens, Greece.

Three key elements are examined: (a) the child transport practices, the obstacles parents face and their preferences, (b) The child-parent interaction when commuting together, and (c) the parent's perceived danger compared to the actual level of exposure to danger of the child during their journey.

3.1 Questionnaire design

The questionnaire was developed with one starting section, collecting information about the child demographics, specifically number of children attending the specific school, their gender and age, followed by three discrete sections of questions:

1. Travelling to and from nursery school: This section included questions relating to the person accompanying the child, relationship to the child (parent, grandparent, etc.), age and gender. Following this, there are two questions asking whether the person accompanying the child combines their commute to this school with the commute of another child to another place, or with their commute to work, shopping etc. There are also six questions referring to the mode of travel, restraint use for the child and the person accompanying, the parent's perception of safety during this commute, as well as the practices and obstacles of their everyday travel to school.
2. Child-parent interaction and traffic safety: This section included a question asking whether there is a vehicle available in the family. Other questions refer to the child-parent physical interaction while walking together, and whether parents believe their road behaviour can influence their child's future road behaviour. Furthermore, there are three questions regarding traffic safety education and the willingness of parents to educate children. There are also three questions in relation to traffic accident involvement. The first one is regarding personal involvement of the parent at some time in their lives in a traffic accident (as driver, pedestrian, etc.) The second refers to the perceived probability of a person (adult and child) to be involved in a traffic accident in Greece and there is also a specific question about the number of fatalities due to traffic accidents in Greece per year. The last question in this section, asks the respondent to state the danger (among those a child faces in their everyday lives) that most concerns the parents.
3. Parent demographics: including questions about their age, family status, education, family income, which of the parents completed the questionnaire, but also the specific neighbourhood they live in, and distance to school.

Parents were asked to fill all the questions. In Section 2 of the questionnaire there was a particular column referring to the journey towards school and another one referring to the journey from school. If there were no differences on those two journeys, they could fill only one of the two columns.

The questionnaire was piloted with three parents for assessment of clarity, and took approximately 10 minutes to complete. Therefore, it was concluded that no issues existed and that it was suitable for distribution, in terms of its length and effort required for completion.

In order to improve the acceptance of the questionnaire and response rate, it is essential to follow a structured protocol. We planned a series of preparatory activities, which –while time-consuming– are essential to the success of the data collection effort.

The questionnaires were approved for distribution by the local authority. Following this, the principal of each nursery school was contacted by an experienced and suitably trained researcher (in this case the first author of this paper). The researcher informed the principal and the teachers about the aims of this study and the procedure that would be followed.

Following this, a note informing all parents for the aims of the study and an invitation to contribute, by answering the questionnaire, was placed at the main entrance of each school. A week later a package, which included an invitation letter, the questionnaire and an envelope, was given to all parents by the teachers of the schools. Lam (2000) in their study aimed to investigate factors associated with parental safe road behaviour as a pedestrian with their young children, noted the risk of 'social desirability' in parents' responses. To limit this risk, in our case, parents were informed by the teachers that the participation is voluntary and that all answers and data would be given anonymously and the answered questionnaires would be sealed in the provided envelopes.

The number of questionnaires prepared was equal to the number of children attending the municipality nursery schools. While there are several different ways of administrating a survey and there are strengths and limitations associated with each method, distribution through the teaching staff of the nursery school was the preferred option. All questionnaires were collected in four weeks' time.

3.2 Recruitment and participation rate

There are clear socioeconomic criteria implemented for the enrolment of children to the municipality nursery schools (i.e. priority given to single parent and large families, families with low income and special social conditions); also there is a clear priority given to people living in the municipality. Consequently, the vast majority of children attending them are of middle and low SES, and their families reside in the same town where the school is located.

All municipality nursery schools in Ilioupoli participated in this survey. Participation in the study was voluntary and anonymous, and there was no financial incentive to undertake the study. The distribution took place during the first week in February 2014 and the collection of the answered questionnaires was completed a month later. In total 514 questionnaires were distributed and 247 parents replied referring to 286 pre-schoolers, in a four-week period. The majority of the questionnaires were completed within the first two weeks. Parents of siblings attending the nursery schools were asked if they used different ways of travel for each one child. If they travelled the same way with all their children they could use only one questionnaire, but mention the number of children, they were referring to. Consequently participation rate was 56% (286 responses out of 514 children).

3.3 Study area selection

Ilioupoli is a suburban municipality in the south-eastern part of the Athens metropolitan area, Greece, located 6 km (4 mi) southeast of Athens city centre. It lies at the western foot of the Hymettus mountain.

The real estate zone price of Ilioupoli spans between 1400 and 1900 Euros/m^2. In terms of property values it would be reasonable to argue that Ilioupoli is an upper medium suburb of Athens. Ilioupoli has an uncommon street plan, characterised by 5 sets of concentric circular or oval streets. The suburb covers an area of 12.724 km^2 and the density of the area is 6,142 persons/km^2. Ilioupoli is characterised as a socially mixed urban area (Arapoglou and Sayas, 2009). At the same time there is a very low percentage of immigrants living in the area and the majority of the population have higher and intermediate occupations but there are some locations, which are characterised by mixed and polarised residents (Maloutas, 2007). The current population of the suburb is 78,153 (2011 census).

Ilioupoli was chosen for this study as it has socioeconomic and built environment characteristics of a typical upper medium suburb of Athens. At the same time, there are segregated areas in the suburb, which we take into consideration, in our research.

4. RESULTS

In total, 286 questionnaires were considered eligible for analysis (as mentioned above, some of the 247 respondents have more than one child in the system). All subsequent results and analysis are based on 286 completed questionnaires.

4.1 Parent demographics

In this study, most participants were: female (80%) and married (93%); this was expected as an inherent problem of surveys of this kind is that participants are more likely to be: female, married, more likely to have higher annual income (Lam, 2000). 46% of participant mothers had completed tertiary education (college, university, MS, PhD). The same level of education applies for 32% of participant fathers. Participants are aged between 26 and 45 (92%), their family size is 4 persons for (53%) and they are earning an annual household income up to 25.000 Euros (68%).

4.2 Child restraint system use, seat belt use

90% of the children in this study were escorted by car to the nursery school. As the only safe way of escorting a pre-schooler is always using child restraint system, we evaluate the results against this response. Most parents responded that they use child car seats, but not always. A small percentage of them are always using child restraint system for the everyday trip to nursery school. In addition they were not using seat belt for themselves. Nevertheless only 4% of parents responded they believe the way they travel is not safe enough.

The odds ratios (95th% CI) of mother's educational level associated with use of CRS and seatbelt use, are shown in Table 1(b). For a child who is always traveling in car seat and for a parent who is always escorting his/her child using seatbelt, the odds ratios (95th% CI) of his/her home being in the high price zone against the low, is shown in Table 1(c).

TABLE 1. Odds Ratios

(a) Mother's educational level, father's educational level, income, in relation to 1900 price zone

	OR	95th% CI	*P*
Mother Tertiary Education	0,94	0,43 to 2,07	0,8794
Father Tertiary Education	2,33	0,90 to 6,01	0,08
Family Income>25000 euros	1,48	0,70 to 3,15	0,3083

(b) CRS use and seat belt use in relation to mother's educational level

CRS use always			
	OR	95th% CI	*P*
Mother Tertiary Education	13,50	6,36 to 26,64	<0,0001
Seat belt use always			
	OR	95th%CI	*P*
Mother Tertiary Education	3,31	1,90 to 5,75	<0,0001

(c) Child always travelling in car seat, parent always using seat belt in relation to 1900 zone price

Child always travelling in car seat			
	OR	95th%CI	*P*
Home in high price zone	1,10	0,52 to 2,32	0,8047
Parent always using seatbelt			
	OR	95th%CI	*P*
Home in high price zone	1,19	0,78 to 4,48	0,1627

5. DISCUSSION

5.1 Synthesis of results

Children of low SES families are high-risk individuals for traffic accidents. Focusing on the parent-child relationship and the adaptation of safety behaviour standards can result in preschool child casualty reduction as well as the prevention of danger, when children get older and traffic accident numbers get higher.

Findings of this study show a very low seat belt and child restraint system use for the everyday travel to nursery school. On the other hand, 90% of parents believe they travel to school with their child in a safe way. Consequently, the perceived by the parent and the actual danger a child faces is completely different. There are several reasons for these results.

Firstly, parents are not well informed about the correct use of the restraint systems and the lifesaving effects of their use. The vast majority of parents (92%) believe that the route they follow, on the everyday travel to school by car, is safe and therefore the use of car seat is unnecessary.

Another reason for parents not using restraint systems is that there are no road safety cameras or other means of law enforcement in place in the suburb. Practically the compliance with the restraint system law is left to parents' beliefs alone.

5.2 Limitations of this research

An inherent problem of surveys of this kind is that participants are more likely to be: female, married, more likely to have higher annual income (Koppel et al., 2013). Secondly, there are differences between self–reported data and observational data, as demonstrated by Lennon (2012) regarding CRS use. Participants potentially report what they believe to be the most socially appropriate response (Lam, 2000). We tried to overcome this limitation by keeping the anonymity of the participants, but we suggest that future research should validate self-reported information with observations. Furthermore, it is probable that self-selection bias in the study is likely to have resulted in overrepresentation of more compliant parents (Lennon, 2012). Nevertheless, we believe that our results provide a close representation of reality, since the vast majority of parents believe they travel with their children safely to school, although they do not always use restraint systems and seat belts. Since so many parents do not use restraint systems, they feel that their response is socially appropriate.

5.3 Future research recommendations

To overcome all the limitations mentioned above, an observational study took place, in the same suburb of Ilioupoli. The use of seat belts and child restraint systems are recorded and will be compared with the results of this study. The observations include parents escorting their children by motorbike and child-parent interactions, when walking to the nursery school. Potential illegal and unsafe behaviors, such as the use of mobile phones by parents while driving, are also considered.

As already mentioned, our study is not restricted in only one area. Questionnaires are distributed in municipality nursery schools and observational studies are carried out in other suburbs of Athens, with different built environment and SES characteristics as well as locations outside Athens. The results of each area will be used for valuable comparisons.

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