

## Children's Everyday School Travel and Mode Choice in a Post Socialist city: the case of Riga, Latvia

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**Abstract.** In the last two decades transformation processes of a city and rapid automobilization changed mobility and commuting patterns over the world and also in the post-socialist cities. Although commuting is extensively studied in post-socialist cities, in the context of these changes there is still little known about children's everyday mobility and travel behaviour. The aim of this study is to analyze daily mobility and travel mode choice of children aged 12 to 17 for school trips. The study was carried out in Riga, Latvia which represents the case of a post socialist city. In this paper, drawing on results from children's survey analysed by multinominal logistic regression, the study identifies that changes in structure of population distribution and functional structure of a city affect travel distances to school increasing public transport and car use for school trips and decline in young people's walking. The results also show that family driving habits and age affect young people's commuting patterns to school and choice of private auto as the main transportation mode.

**Keywords:** children, post-socialist city, travel mode choice, school trip, Riga

### 1. Introduction

Over the past two decades in post-socialist cities due to dramatic economical and social changes as well as dynamic urban transformation processes travel behaviour in post-socialist cities sharply changed shifting away from walking and public transport to automobile use [1-3]. The evidences from cities of Western Europe and North America which experienced rapid automobilization shortly after the Second World War show similar changes in travel patterns and behaviour [4, 5]. Western studies also show that car use by children for daily routine trips to school and leisure activities in the last 10-15 years have grown faster than in the rest of population [6].

Although nowadays similar consequences are observable in post-socialist cities, children's travel patterns in former soviet cities received little research attention. Dynamics of urban transport system transformation effect on children's lives has not been studied sufficiently. In this respect, the aim of this paper is to analyze travel patterns and mode choice for children's aged 12 to 17 living in Riga, Latvia trips to school. This study considers Riga as a generalized example of a post-socialist city which has undergone intense urban transitions, including commercialization of the city centre and deconcentration of population. Using the multinominal logistic model for analyzing the sample data, the results show that the distance to school has mainly influenced passive transportation for school trips and has decreased children's independent mobility. The model also shows that sociodemographic and household characteristics affect children's transportation mode choice.

### 2. Children's everyday mobility and mode choice: the evidences from Western cities

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The car dominance and automobilization of cities in the last 50-60 led to deep changes in human daily routine through extension of human habitats and the fragmentation of temporal flow as well as transformation of cities dispersing activity places across space and progressive spread of urban hinterland at lower densities which mean decline in pedestrian accessibility, longer trip length and reduced catchments population for public transport routes [4]. These factors along with complexity of modern life encourage the non-active and car oriented mode of family mobility which directly affects children's travel patterns through immaturity and dependency on adults.

The growing interest about this issue is generally associated with dramatic increase of car use for daily trips to school over the last 15-20 years [6] and the negative effects on children's health and development determined by these travel behaviour changes. The growing children's dependency on car has two negative consequences which are considered very often. First, the problem of physical activity reduction and obesity increase among children [7-9]. Second, it has also been claimed that regular usage of car decreases independent mobility and autonomy [10, 11], constrains development of social and spatial skills [12] and promotes unsustainable travel mode choice in the future [13]. These works generated growing body of systematic studies which inquired options to change children's travel behaviour from motorized to non-motorized, unsustainable to sustainable and non-active to active and discussed factors affecting and constraining travel mode choice.

The built environment such as urban form and neighbourhood density expressed as distance between various activity sites and amenities as well as quality and safety of transport infrastructure has strong influence on all commuting choices. Some researchers from various countries [14-16] have argued that the distance between dwelling and school or other activity sites is a critical factor which promotes children to walk or choose other transportation modes.

The other branch of studies examines importance of social factors on commuting patterns. Significant differences of travel behaviour and mode choice are observed among children of various age and gender. However, these differences mostly based on stereotypical parents' views on the safety of girls gradually disappear at the age of 14 [10] or are not observable if the use of active transportation modes is rooted in family values [17]. Several studies show that the mobility rate of children and passive or active travel depend on household income, the number of cars owned by family and family driving habits associated with convenience of parents [18].

### **3. Transformations of urban transport in a post-socialist city**

The economic and social changes experienced in Latvia as well as in other post-socialist countries after the fall of the Soviet Union changed the conditions which previously guided the development of Central and Eastern Europe cities. Most rapid transformations took place in the urban transport system significantly changing inhabitants' travel behaviour. The urban transport system of socialism which was primarily based on subsidized public transportation and was very inexpensive collapsed in a very short period in the early 1990s. Collapse of the Soviet Union determined that urban public transport also faces several problems: shortages in the supply of cheap spare parts, sharp reduction of subsidies and growth of technical maintenance expenses [19]. These changes lead to dramatic increase of public transport prices which stimulated explosive car ownership and use [1].

The other significant reasons were also associated with the turn to market economics which resolved shortage of cars characterizing the Soviet Union [3] where production was restricted keeping supply of vehicles limited and prices in relation with wages very high. Simultaneously there was a resolved cost of car maintenance which previously was very expensive because, in order to use a car regularly, the owner had to buy both petrol and spare parts in black market. Significant changes in employment structure, development of private business, foreign investment inflows contributed to the household's financial resources, which together with the car availability in the market and the growing supply have made vehicle purchase and use more affordable than before. Financial incentives and generous supply obviously do not provide the only explanation for immense growth of car owners. In Latvia as well as in other Central and Eastern European countries the automobile has become an extremely important symbol of freedom and social status [3].

Under the conditions of newly established real estate market, the ability of commercial uses to outbid all other activities from the central zone pushed residential functions to more peripheral locations [20]. Inhabitants shift from high priced apartments in the city centre to cheaper or newly-built dwellings in urban periphery. The city centres of post-socialist cities have grown to a significant recreation, commercial and business zone. These transformations shaped and strengthened monocentric functional structure of the city where the centre attracted a large part of labour force and leisure activities. Increase of distances between residential places to workplaces, schools or organized activity sites decreased opportunities to walk and made commuting by car or public transport common.

## **4. Materials and methods**

### **4.1. Data collection**

The data for this study was obtained from a survey called “The Study of Children’s Activities and Perception of Urban Environment” conducted in February 2010. Questionnaires were distributed to students from primary school grades 6 to 9 and secondary school grades 10 to 11 in three Riga schools located in different parts of the city. 942 students were surveyed in total, of which 32 were out of the defined study sample age group 12 - 17 years and 143 were residing in Riga outskirts. These questionnaires filled by respondents not corresponding to conditions of the sample were eliminated from a further analysis. Further, from remaining 767 questionnaires 69 incorrectly completed were ignored. In data analysis it was determined that for the statistical analysis 725 correctly filled questionnaires from respondents residing in Riga were used.

### **4.2. Key variables and data analysis**

In this paper the emphasis is on the use of quantitative data to explain children’s travel behavior and mode choice. Qualitative analysis has been used elsewhere [21] to show patterns and historical changes of children’s everyday mobility. To explain the youth travel behaviour and the mode choice for school trips the respondent’s self-reported most frequently chosen travel mode to school as a dependent variable was used. For increasing reliability of dataset and preventing a highly unstable regression model, an insignificant number of respondents’ answers who regularly use bicycle for school trips (27 - nearly only 3%) from further analysis were removed. Consequently, 698 respondents’ answers were included in the multinomial logistic regression model. The dependent variable consisted of three categories such as car, public transport and walking.

Along with several characteristics of post-social cities 10 independent variables were used for examining children’s travel behaviour and mode choice in total. The analysis primarily focuses on variables widely discussed in previous researches from Western countries: population density of neighbourhood, travel distance and family driving habits. For estimating the travel distance from home to school the Google maps were used. The sociodemographic characteristics were also used. To reveal whether the changes of public transport system in Riga reflect on children’s travel behaviour, the number of the public transport trips within the residence neighbourhood of particular respondent was used. Assessing the effect of residence place two variables were used. First, it was the type of dwelling they live in. Second, it was duration of living in the place of residence. These variables allow evaluate the consequences of residential deconcentration on young children’s travel behaviour through increase of distance. Two more descriptive categorical variables were used for explaining commuting patterns such as actual level of education reflecting respondent’s additional socio-demographic characteristics and location of school which were used as an indicator considering the importance of spatial distribution of schools.

A multinomial logistic regression model with statistical data processing software SataMP 10 was created and used for explaining travel patterns and mode choice of children residing in Riga. The travel mode to school in spring and autumn was used as a dependent variable and auto was the reference mode for regression model.

## **5. Results**

During warm months of the school year 47% of children walk to school. The high number of walkers among students can be explained by a relatively small average distance from home to school within the city (Figure 1). It is only 1.4 km which in several Western studies is suggested as an optimal distance for increase of walking [14]. In comparison with the research results from Western countries where population based surveys [6] for data mining were used the rate of car use for school trips is very low 16%. Nearly 32% use public transport while only 4% cycle to school. The seasonal changes in travel mode choice for school trips were not significant.

The regression model shows travel patterns of children residing in Riga and factors affecting their mode choice for school trips (Tables 1 and 2). The distance to school and parents' driving habits are very significant factors determining children's travel mode choice for school trips. The increasing distance by 1 km leads to a 4% increase of private car use, 17% of travelling by public transport and to 21% decline in walking. Although these findings are consistent with previous studies [14-16] the domination of public transport use with increase of distance is more observable in Riga. These differences support unquestionable historical significance of this transportation mode within post-socialist cities [1, 3, 19]. The effect of family driving habits increases probability by 25% of being driven and to 15% decline in walking.

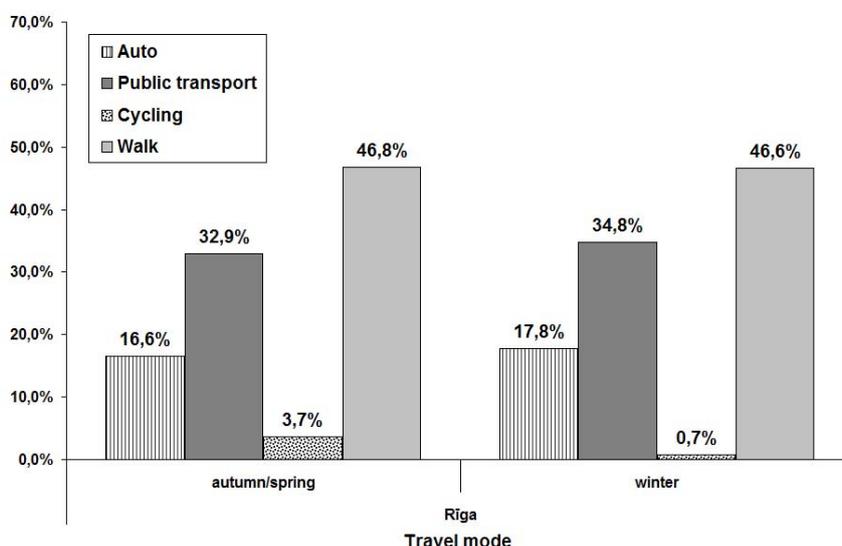


Fig. 1: Travel mode for school trips in spring/autumn and winter. Percent (N = 698).

Although the distance and family driving habits are the most important explanatory variables, several socio-demographic, school and residence characteristics are also important. A 1 year increase in age leads to a 4% decline in the probability of commuting by car. The previous researches focusing on independent mobility showed that spatial autonomy increases when children grow older and parents consider them competent enough for negotiating with danger in public space and public transport [10]. However, in this model the age variable is not significant for walking and public transport use.

Table 1 Results of multinomial logistic regression model. Comparison of various travel modes usage among children residing in Riga

	Auto (ref.)	Public transport	Walk
The number of public transport trips daily (trips/1000 inhabitants)		0.072	-0.037
Population density (000)		0.040	0.094
Travel distance (km)		0.088	-0.831 **
Age		0.313 **	0.263 *
Male		-0.161	0.181
Secondary school students		0.103	0.262
Detached house		-0.638 *	-1.135 **
Duration of living in a place of residence >5 years		-0.282	-0.285
Car usage >3 days in a week		-2.951 **	-3.144 **
School located in the city centre		-0.743 *	-0.438

Summary of the model	
N	698
Log Likelihood	-499.167
Model X2	428.27
Probability	0.000
Pseudo R2	0.30

Notes: Significance \*\* P<0,01; \* P <0,05

Children living in a detached house within the city more likely will use a car than walk to school. For example, living in a detached house increases probability to use a car by 13% and a corresponding 14% decline in walking. This has two considerable explanations. First, the historical growth of the city determined that spatial distribution of detached houses within Riga is located more peripheral than multi-storey apartment houses. This was approved by average distances from home of the respondent to school. The children living in detached houses have to cover 4.6 km comparing to 2.8 km for those who live in apartments. Second, the number of families which own a private car and live in detached houses (95%) is slightly larger than families living in apartment houses (84%). This relationship indirectly draws attention to effect of unequal distribution of income between families on children's travel behaviour. The school location has a moderate and questionable effect on mode choice for school trips. The probability being driven for children whose school is located within the city centre increases by 8,5%. Being aware that the city centre is transformed in a commercial district attracting many workers residing in residential areas out of the city core, this finding shows that parents combine their trip to work with driving a child to school. This is also not surprising that parents willingly use conveniences of this combination because spatial distribution of educational institutions within the city core is extremely dense.

Table 2 Marginal effects of regression model

	Auto	Public transport	Walk
The number of public transport trips daily (trips/1000 inhab.)	-0.003	0.025	-0.021
Population density (000)	-0.008	-0.006	0.015
Travel distance (km)	0.040***	0.167**	-0.207***
Age	-0.038***	0.032	0.010
Male	0.002	-0.072	0.071
Secondary school students	-0.022	-0.021	0.043
Detached house	0.130**	0.014	-0.144**
Duration of living in a place of residence >5 years	0.036	-0.020	-0.016
Car usage >3 days in a week	0.246***	-0.096	-0.150**
School located in the city centre	0.085*	-0.110	0.025

Notes: Significance \*\*\* P<0,01; \*\* P <0,05; \* P <0,1

The gender variable does not show the effect on travel behaviour contrary to previous researches from Western countries [11, 17]. There is some evidence that girls are less likely to use public transport, but the effect is not statistically significant.

## 6. Conclusions

The analysis of mode choice model identifies four significant findings, which explain children's travel behaviour in Riga as a generalized example of a post-socialist city. First, findings show and approve that the distance to school and family driving habits are the most influential variables. The increase of distance from home to school and car usage by parents both lead to more passive transportation by children. Second, the acquired results approve the hypothetical assumption that increase of age decline older children's dependence on the car encouraging more independent and active transportation to school. Third, this study also provided evidence that was not previously supported and discussed by the studies from Western Europe and North America enabling to conclude that they are more characteristic for post-socialist cities. Living in a detached house is directly associated with the increase of car usage for trips to school and decline in walking. Fourth, functional monocentricity of Riga reflecting in spatial distribution of workplaces and school location within the city has an effect on travel mode choice. The children attending schools located in the central part

of the city more likely choose an opportunity being driven by car. In this case a significant role is played by parents' rationality when their trip to a working place is combined with chauffeuring a child to school.

Finally, the findings of this study led to a logical conclusion and approve that if a further increase of distance and private car usage occur, more likely children will use passive transportation modes and particularly the car for their trips to school.

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