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## **Fare-reduction vouchers for pupils on public transport: methodology and first results**

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# **Fare-reduction vouchers for pupils on public transport: methodology and first results**

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## **Abstract**

The city of Lucerne provides the city's pupils with vouchers reducing fares for public transport based on a participatory process rooted in the "Children's and Youth Parliament". Our accompanying research examines how this intervention changes the travel behaviour of young children from the ages of 6 to 16 years. The study will be carried out in the years 2023, 2024 and 2025 as a cross-sectional trend design study. Our paper will present this methodological design and initial empirical results from the first study wave in March 2023. From a methodological perspective, we present a cluster sampling to select pupils based on the elementary school register, followed by a discussion of the organization of the field. We also present sample characteristics and descriptives from the first wave ( $n = 321$ , 53% response rate). Based on the results of this study, decisions will be made by the city council as to whether the public transport subsidy should definitely be introduced, or whether adjustments to the vouchers may be necessary.

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## **Keywords**

Public Transportation; Transportation Behaviour; Pupils; Intervention Design; Price Reductions; Voucher; Participatory Approach; Trend Study

## **Preferred citation style**

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# 1 Introduction

Children and young people are often excluded from the political process. One possible response to this situation is children's parliaments allowing children to become involved in the political process. To a large extent, here children and young people deal with the issues that concern themselves (DSJ 2019: 4f.). In Lucerne, for example, the idea of a children's parliament was to support families regarding their mobility behaviour and to provide children with vouchers for public transport. In this way, sustainable mobility is to be trained and promoted at a young age.

The city of Lucerne has accepted this mandate and will offer vouchers for public transport from 2023. Children and young people between the ages of 6 and 16 will be provided with a voucher worth 300 Swiss francs to use public transport every year for three years starting in summer 2023. The city council wants on the one hand to relieve families financially and on the other hand to create an incentive to use public transport. Children should increasingly use public transport and travel independently.

At the same time, the effects of public transport vouchers on the travel behaviour of children and adolescents should be evaluated. We will investigate how the intervention changes the travel behaviour of young people over time and how they favour sustainable mobility. The survey focuses on trips to school, leisure trips (to sports, to music lessons, to visit friends) and accompanying trips (e.g. with parents to go shopping).

In March 2023, prior to the introduction of the vouchers, a questionnaire was sent to 600 parents' households with pupils to record their travel behaviour (control survey). In summer 2023, the intervention will be rolled out by distributing the vouchers to households. Both the intervention and the survey will be conducted in two additional waves (2024 and 2025) so that changes over time can be determined through a cross-sectional trend-study design. Empirical analyses of the data from this trend study will be used to measure the effectiveness of the plan to introduce vouchers for public transport.

This conference paper presents the methodology of the study and the results of the first wave of the survey. On this basis, a first interpretation of the results will be given with a preview of future steps in the project.

## 2 Literature review

Adolescents and young adults are seen as bearers of hope for future sustainable developments, including in the topical area of "mobility and transport". Mobility encompasses more than just the ability to move from one place to another in physical space. It also describes the ability to participate in social activities and enables interactions in social space (Jahn & Wehling 1999: 130f.). Attending school or meeting friends are activities in physical and social space that require mobility decisions. Various pieces of literature show that basic mobility decisions are formed in childhood and adolescence (Limbourg, Flade & Schönharting 2000: 8; VCÖ 1999: 9; Flade 1999: 107; Flade 1997: 3). Research on mobility biographies shows that new living situations can lead to new mobility decisions (Rabe, Miller & Lien 2002: 141; Heinickel & Dienel 2006). For this reason, there is great potential in studying the mobility behaviour of children and adolescents (Hunecke 2002; Tully & Alfaraz 2017).

Especially after 1970, the appropriation of public space by children and their mobility behaviour became an object of study. In this context, a growing interest in planning and transport sciences in childhood, developmental psychology and pedagogy in the physical design of settlement and traffic space can be observed (Bongard & Winterfeld 1977; Schulte 1978, Moore & Young 1987). As early as the 1980s, empirical studies proved that children could master a wide variety of spatial tasks (for example, recognizing landmarks, drawing routes, estimating distances, retrieving objects, etc.) better the longer and more actively they were able to engage in the corresponding spaces. However, little research has been done on the effects of traveling distances in motorized transport on spatial cognition, rather than through one's own active movement and the multilocational lifestyle this favours (Fuhrer & Kaiser 1994). Streets have traditionally been multifunctional public spaces and have in earlier days served as playgrounds for children. As an important consequence of the mass motorization of the 1950s, they were increasingly transformed into monofunctional spaces reserved for cars. It became apparent that children's action spaces were increasingly being restricted (Haefeli & Kaufmann 2009: 317).

The general restrictions on children's freedom of movement in public spaces become particularly obvious when it comes to ways to and from school, which became both a political issue and a subject of research in the 1990s (Haefeli & Kaufmann 2009: 318). Walking to school independently has traditionally been a developmental task that children must master when they start school. This entails several challenges for the children, their parents and society.

For the past fifteen years or so, studies have been accumulating showing that more and more children are no longer making the journey to school (nor leisure journeys) unaccompanied and are increasingly being driven in cars. Overlapping trends to accompany children on their way to school and to do so by car can be seen throughout Europe (Haefeli & Kaufmann 2009: 320).

Although social responses to children's exposure to traffic hazards (road safety, traffic education) and to their displacement from road spaces (child-friendly cities) have had visible effects for some time, the trend to accompany and chauffeur children on their everyday journeys continues unabated (Haefeli & Kaufmann 2009: 323).

Especially in Switzerland, the mobility patterns of children and adolescents are an important indicator of their quality of life and of how transport behaviour develops in the future. These mobility patterns of children and adolescents have changed in Switzerland over the last twenty years in line with the international trend. In this context, Sauter's (2019) research report on *Mobility of Children and Adolescents* compares the behaviour patterns of children and adolescents in Switzerland between 1994 and 2015, based on the National Travel Survey. Since 1994, the concept of a stage in the National Travel Survey has allowed time series analyses. For the latter, values are available from 1994, 2000, 2005, 2010 and 2015. Included in the microcensus are both mobility preconditions, e.g. the availability of bicycles or public-transport season tickets, and household availability of cars, as well as trip lengths and transport use, presented by purpose, school and leisure trips, age, gender, part of the country and other criteria.

The time comparison of Sauter (2019) reveals a variety of findings. For example, a different development of transport use can be seen depending on the age group. For 6- to 12-year-old children, little change over time is evident. The data reveal that the share of parental transport on school-related trips is not as high as generally assumed and only occasionally in double digits (Sauter 2019: 8). For 13- to 15-year-olds, the low share of bicycle use stabilizes after shifting to pedestrian traffic, public transport and MIV (Sauter 2019: 10). In particular, the mobility patterns of young people between the ages of 16 and 20 have changed markedly. They now make many more trips by public transport and on foot. This replaces trips by bicycle and, to some extent, motorized private transport (Sauter 2019: 10f.). Education and leisure are the most important mobility purposes. Basically, shifts in the availability of means of transport can be seen. The availability of bicycles continues to decrease, while the ownership of public transport passes is increasing. Also, a car license is acquired later today. There are also major regional differences in the choice of transport in Switzerland (Sauter 2019: 11f.). For example, the share of bicycles is significantly lower in French-speaking Switzerland than in German-speaking Switzerland (Sauter 2019: 7ff.).

Furthermore, although children have short distances to school, for young people, the distances to and from school are becoming longer and longer. One's own feet, a bicycle and public transport are the most important means of transport on school routes. Distances for leisure travel are increasing sharply, but half of them are still in the local area. In their leisure time, children and young people travel mainly on foot or by motor vehicle. The availability and quality of



bicycle parking spaces, the availability of a public transport pass and the number of cars in the household also have a decisive influence on the choice of transport mode (Sauter 2019: 11ff.).

In summary, current research on the mobility behaviour of children and adolescents in Switzerland shows that between 1994 and 2015 there was a strong decrease in cycling and a strong increase in taking public transport and walking. It is assumed that the increasing distances of routes to and from educational institutions are one of the causes of the changes in mobility behaviour. This circumstance leads to the fact that some young people can no longer cover the way to school by bicycle and are switching to public transport (Sauter 2019: 10.). The increase in the use of public transport means that journeys to and from bus stops or railway stations are often made on foot. In addition, at the destination, more independent walking trips are made (Sauter 2019: 10). Increased use of public transport is also accompanied by an increase in walking trips in one's leisure time. The share of both private cars and bicycles has therefore also continuously decreased here (Sauter 2019: 10f).

### **3 Study Background and Method**

#### **3.1 Study background**

In September 2020, the Children's Parliament submitted a motion asking the Lucerne city council to enable children and young people in tariff zone 10 (city and conurbation) to use public transport (PT) free of charge or at a greatly reduced rate. This is intended to promote the independence of children and young people and reduce the use of parental cars. The City Council supported the will of the Children's Parliament and in May 2021 passed the motion as a suggestion.

The idea of the Children's Parliament is to provide a discount on the use of public transport through a voucher that can be personalized and used for a specific purpose. The voucher has a value of 300 Swiss francs, which corresponds to around 50 percent of the cost of an annual season ticket for children and young people in zone 10. The voucher is available to all children and young people between the ages of 6 and 16 who are required to attend elementary school in the city of Lucerne, regardless of their main place of residence. Use of the voucher is limited to predefined public transport products: monthly and annual season tickets in fare zone 10 and other fare zones (fare zone 10 must be included), multi-ride tickets, multi-ride tickets for short trips, multi-day tickets in fare zone 10, and the General Abonnement (GA) for children.

The introduction of these public transport concessions will take the form of a three-year pilot study. City of Lucerne children and young people between the ages of 6 and 16 will thus receive

vouchers worth 300 Swiss francs for the purchase of bus and train tickets from summer 2023. The first voucher will be sent to parents or guardians by mail in mid-June 2023. The other vouchers will follow in the summers of 2024 and 2025. In this way, the City Council aims to relieve the financial burden on families and, as proposed by the Children's Parliament and the City Council, create an incentive to use public transport. A special credit of almost 5 million Swiss francs is being made available for this three-year pilot trial. After the pilot phase, the City Council wants to decide whether this form of promoting public transport will be introduced permanently. For this, the regulations for sustainable urban mobility would have to be changed.

Figure 1: Project information of the City of Lucerne



The screenshot shows the website of the City of Lucerne (Stadt Luzern). The main navigation bar includes 'Barrierefreiheit an', 'Login', 'Suchen', and 'Menü'. The breadcrumb trail reads: 'Home > Projekte > Weitere Projekte > ÖV-Förderung durch Vergünstigungen für Kinder und Jugendliche der Stadt Luzern'. The main content area features a large image of children boarding a bus. A text box on the left reads: 'Passpartout' and 'ÖV-Förderung durch Vergünstigungen für Kinder und Jugendliche der Stadt Luzern'. Below the image, a paragraph states: 'Stadtluzerner Kinder und Jugendliche zwischen 6 und 16 Jahren werden ab Sommer 2023 Gutscheine im Wert von 300 Franken für den Bezug von Bus- und Bahnbillets erhalten. Der Stadtrat will damit die Familien finanziell entlasten und wie vom Kinderparlament und vom Grossen Stadtrat vorgeschlagen, einen Anreiz zur Benützung des öffentlichen Verkehrs schaffen. Für einen dreijährigen Pilotversuch steht ein Sonderkredit von knapp 5 Mio. Franken zur Verfügung.' On the right side, there is a sidebar titled 'Auf dieser Seite' with links for 'Ausgangslage', 'Massnahmen', 'Kontakt', 'Häufig gestellte Fragen ÖV-Vergünstigung', and 'Personen'.

Source: [www.kinderunterwegs.stadtluzern.ch](http://www.kinderunterwegs.stadtluzern.ch)

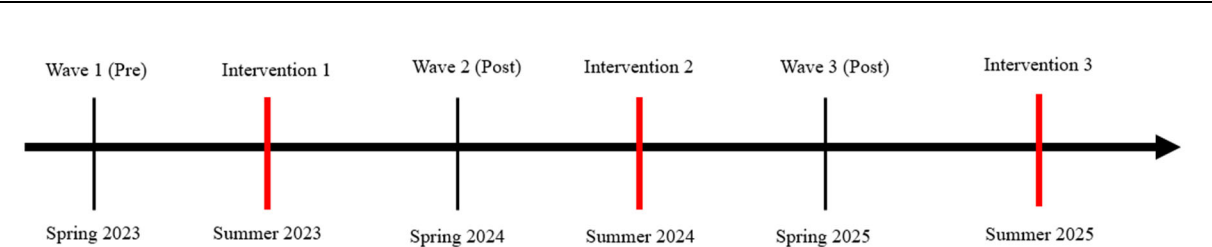
The introduction of the voucher creates an incentive to use public transport. The price of public transport should not be a reason to forego leisure activities or to depend on one's parents' car. Getting children and adolescents to use public transport is considered an important step in the sustainable development of children's and adolescents' independence. If they increasingly use public transport instead of parental cars, this not only contributes to the thrust of the mobility strategy of the city of Lucerne to shift to area-efficient means of transport, it also promotes mobility awareness. Children and young people should develop a conscious approach to mobility. This also includes the fact that mobility has its price. The proposed solution of reducing the cost of public transport for children and young people can meet all these requirements. The next section explains the design of the study.

### 3.2 Trend study design

This research project aims to measure the impact of the voucher over time. On the one hand, we are interested in whether households intend to redeem the voucher. On the other hand, we ask which means of transport the children and their families use and for what purposes, both before and after implementation. Based on the analyses of the data from a trend study, the effectiveness of the public transport vouchers are assessed. The results based on this research design form an important basis for the City Council to decide whether this form of public transport promotion should be continued or even adapted after the three-year pilot phase.

Three surveys will be conducted to evaluate the intervention. The survey will be conducted in three waves (2023, 2024 and 2025) so that changes over time can be determined by means of a longitudinal study. The trend study with samples from the elementary schools of the city of Lucerne allows us to determine temporal changes in pupils’ mobility for three cross-sections (2023, 2024 and 2025) that can be attributed to the public transport vouchers. Data will be analysed cross-sectionally and over time. Since the vouchers are distributed to households annually, they are presented as three interventions in Figure 2.

Figure 2: Long-term intervention and survey design



Own graph

No survey will be conducted after intervention 3 (vouchers in the third year); instead, the status quo will be measured before implementation (base line study). In the next section, the sampling methodology will be discussed in more detail.

### 3.3 Sampling frame

Sampling is based on the registers of elementary schools to ensure randomness of selection and field access. In this case, the population is defined as all elementary school students in the city of Lucerne. To ensure the representativeness of the study, a cluster sample is used. This is a

multi-stage random sample to ensure representative statements (Kauermann & Küchenhoff 2011: 160 ff.).

To ensure comparability of the study results across the three waves, the general conditions of the study with regard to sampling and the survey and evaluation design are kept identical for each wave.

In the first stage, 8 of the 19 elementary schools are randomly selected. This selection is made on a quota basis according to the proportions of school types (13 elementary schools, 6 secondary schools). In each of these 8 elementary schools, 5 classes are randomly selected. Thus, 40 school classes in the city of Lucerne are randomly selected each year per wave, in which all children are invited to participate in the survey. Thus, a total of 600 households in the city of Lucerne are contacted by mail. On average, 15 pupils form part of a school class. The information on the class and address data of parental homes are taken from the elementary school's official registers.

In these 40 classes, an exhaustive survey is aimed for, although refusals to answer are to be expected in principle. With this sample, participation in public transport use can be reliably determined for the population as a first step.

Table 1 compares the population of all 322 classes differentiated by school type and grade level with the result from the random sampling (cluster=classes). The random sample at the class level reflects the proportions in the population well.

Table 1: Population and Sample

	Population		Sample	
	n	%	n	%
1st grade	59	18	6	15
2nd grade	22	7	1	3
3rd grade	66	20	9	23
4th grade	23	7	3	8
5th grade	62	19	9	23
6th grade	23	7	2	5
Secondary level 1	24	7	3	8
Secondary level 2	22	7	4	10
Secondary level 3	21	7	3	8
	<b>322</b>	<b>100</b>	<b>40</b>	<b>100</b>

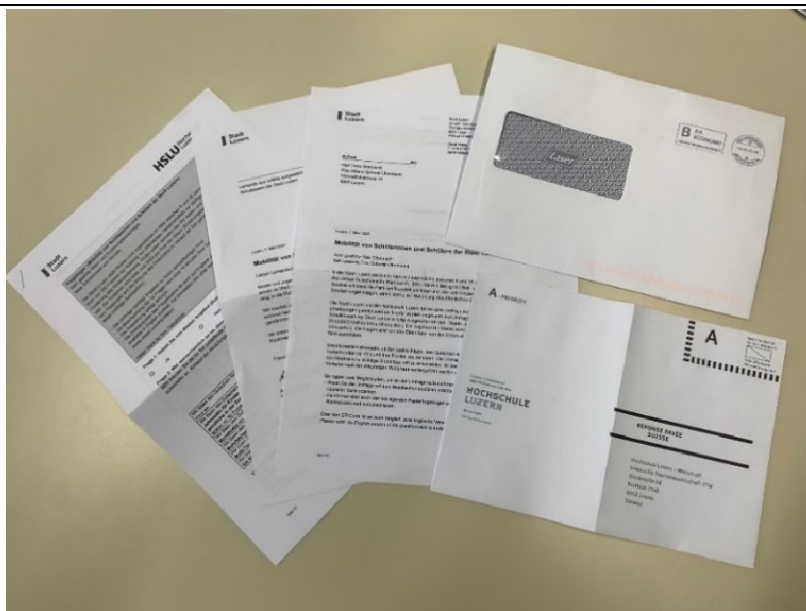
Own calculations.

### 3.4 Organization in the field

Informants are not offered any incentives for participation. Incentives may lead to bias due to self-selection. It is assumed that the reason for the survey should be a sufficient incentive to participate in it. In addition, the covering letter is written so as to motivate the parents as well as the pupils to participate in the study.

The selected families received a letter with a personal covering letter, a physical copy of the German survey and a QR code, which will lead the individuals to a digital survey link. The motivation letter was prepared in two forms. The covering letter was addressed to both parents and children. It was pointed out that the survey would ideally be conducted together, with the children accompanying the parents as they completed it, so as to provide the best information. The questions are to be completed by the parents or guardians on behalf of, and ideally accompanied by, the child. The survey is anonymous. Regarding the input option, the survey uses a mixed-methods approach (online and in writing with enclosed questionnaire).

Figure 3: Direct mail to the households (2 motivation letters, prepaid return envelope, questionnaire)




Own photograph


The Unipark survey platform is used as the survey instrument for the online survey. It is also possible to fill out an online version of the questionnaire in English via the QR code (see Figure 4).

Figure 4: Online-Version of the Survey in Unipark

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Stadt  
Luzern



HSLU Hochschule  
Luzern

Dear parents and legal guardians,  
dear pupils

Welcome to the survey on the topic of "Mobility of pupils"!

**Why do we collect and use your data**

The City of Lucerne provides children and young people between the ages of 6 and 16 with a voucher worth 300 francs for the use of public transport. This is in response to a demand made by the Children's Parliament. Children should increasingly use public transport and travel independently. The voucher will be sent to parents (legal guardians) by post in mid-June 2023. The effect of the voucher will be measured over time in a pilot project. This is why this survey is being carried out.

**Your participation is very important for obtaining meaningful results!**

- The survey requires information about your school-age child.
- Answering the 12 questions will take about 10 minutes of your time.
- The evaluation will be anonymous.

Thank you for your participation!

I agree to the processing of my personal data in accordance with the information provided herein

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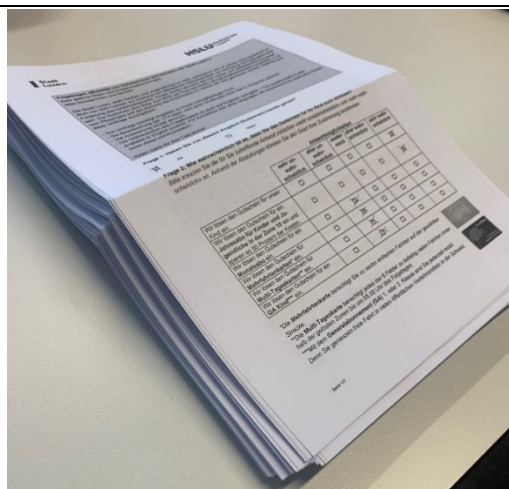
### Own screenshot

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Answering the 12 questions took an average of 7 minutes and 37 seconds. The questionnaire contains survey items for the children's households and mobility tool ownership.

The children and adolescents report retrospectively on a "typical" school week in the form of a mobility diary for each Monday, Wednesday and Saturday. Since it is of interest to see how the children travelled to school or to their leisure activities on these days, they were advised not to complete the survey until the following Saturday and no later than the following Sunday. For each of the three waves, the third week of school after the carnival vacations was selected for comparison purposes.

Figure 5: Paper-Version of the Survey (returned)



### Own photograph

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## 4 Response rate and sample characteristics: first wave

The city of Lucerne and the Lucerne University of Applied Sciences and Arts conducted an initial survey in March 2023 to find out how the benefits are used. A total of 333 responses were received in one wave. The response rate is 55.5%. Due to the high response rate, the city decided not to send a reminder.

Table 2: Response table

<b>Brutto</b>	<b>600</b>	<b>100%</b>
Sample-neutral defaults (relocations, etc.)	0	0%
Brutto adjusted	600	100%
<b>Response</b>	<b>333</b>	<b>55.5%</b>
... of which German survey	330	99.1%
... of which English survey	3	0.9%
... of which physical survey	221	66.4%
... of which online survey	112	33.6%
Note: own calculations.		

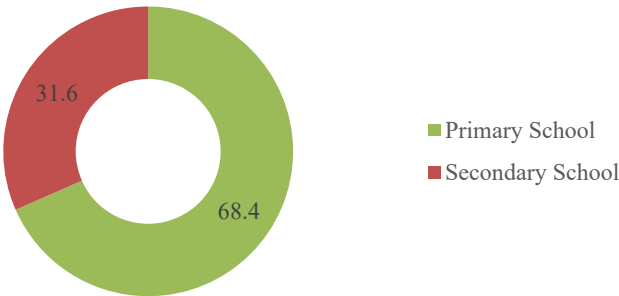
Table 2 shows that 333 people took part in the survey. This number corresponds to a response rate of 55.5%. Table 3 shows a non-response analysis. The results of the study are compared with the population for the number of persons in classes. Overall, it can be stated that the characteristics of the population are comparable to those of the sample. However, Table 3 shows that the 1<sup>st</sup> and 2<sup>nd</sup> grade are slightly underrepresented, whereas the 6<sup>th</sup> grade has a tendency to be overrepresented. The data were not reweighted since this deviation can be tolerated.

Table 3: Non-Response Analyse

	<b>Population</b>		<b>Sample</b>	
1st grade	614	12.64%	21	6.40%
2nd grade	590	12.15%	21	6.40%
3rd grade	612	12.60%	45	13.70%
4th grade	602	12.40%	44	13.40%
5th grade	596	12.27%	39	11.90%
6th grade	601	12.38%	55	16.70%
Secondary level 1	451	9.29%	34	10.30%
Secondary level 2	415	8.55%	35	10.60%
Secondary level 3	375	7.72%	35	10.60%
Note: mixed classes were divided equally between the two grade levels. Own calculations.				

Figure 6 presents the results of the question as to which school classes the children surveyed attend.

Figure 6: Primary vs. Secondary School (percentages)



n = 329, own calculation

Figure 6 shows that most of the children surveyed in the sample attend a primary school in the city of Lucerne. Table 4 below presents an allocation of the school buildings in the city of Lucerne indicated in the survey, grouped between city-centre and outer quarters according to our own classification.

Table 4: Assignment of selected school buildings

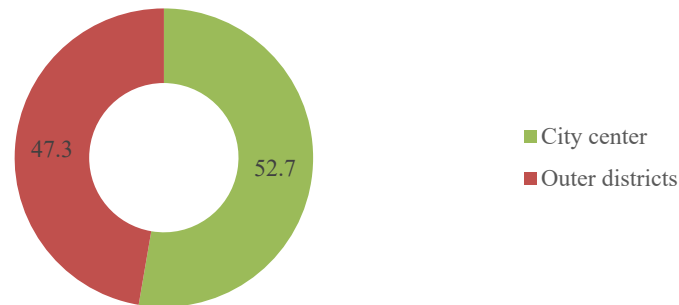
School in the city of Lucerne	Assignment
Moosmatt	City centre
Hubelmatt	City centre
Säli	City centre
Maihof	City centre
Grenzhof	Outer districts
Tribschen	Outer districts
Unterlöchli	Outer districts
Matt	Outer districts

Note: Own assignment to the categories “city centre” and “outer districts”.

The allocation shows an even distribution of schoolhouses in schools in the city centre and the outer neighbourhoods of the city of Lucerne (Figure 7).



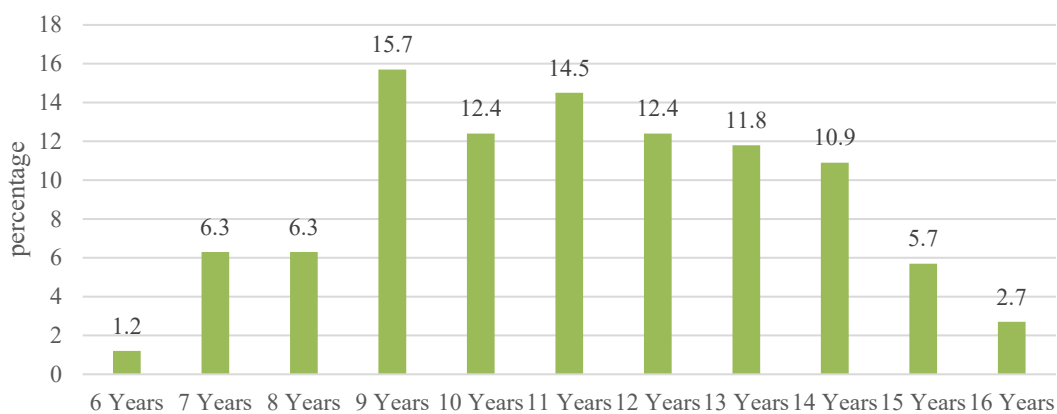
Figure 7: School location: centre vs. outer districts (aggregated). (percentages).



n = 328, own calculations

Figure 8 shows the age of the children in the sample.

Figure 8: How old is your child (in completed years of life)? (percentages)



n = 331, own calculation

Figure 8 shows that children aged 9 to 16 tended to be represented in the survey more frequently than children aged 6 to 8.

## 5 Descriptive results: first wave

In the following, the content-related results of the first survey wave are presented descriptively. First, the survey asked how many people had already heard about this offer before the survey. The responses to this question are shown in Figure 9.

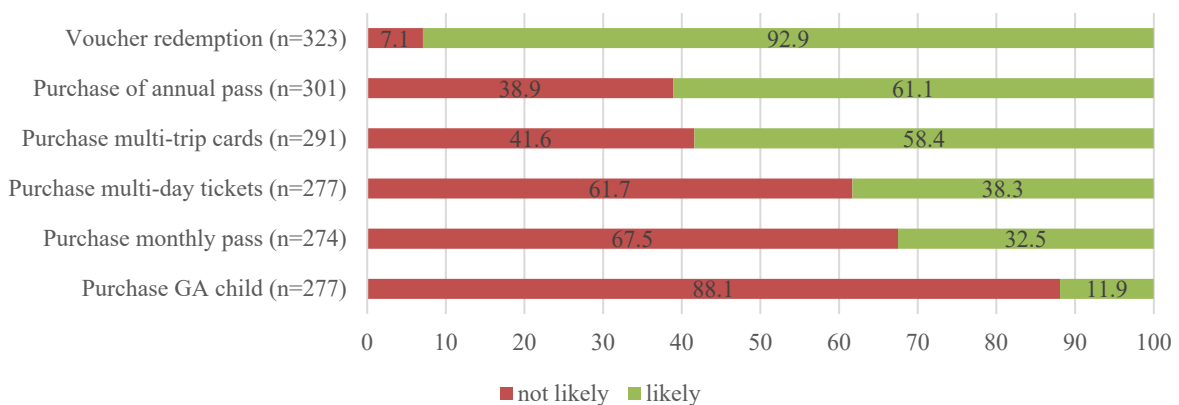
Figure 9: Have you already heard about this voucher offer? (percentages)



n = 318, own calculations

It can be seen that 54.1% of people had already heard of this voucher before the survey from the media or other sources And that 45.9% had not yet heard of this offer. Furthermore, it was asked how likely it would be that participants would also redeem the voucher for their child. The question was asked using a five-point Likert scale with the expressions "very unlikely", "rather unlikely", "neither nor", "rather likely" and "very likely". From these, the dichotomous expressions "probably" were generated by categories 5 and 6, and "not probably" by categories 1 to 3. Figure 10 presents the feedbacks.

Figure 10: How likely are you to redeem the voucher for your child? (percentages)



Own calculations

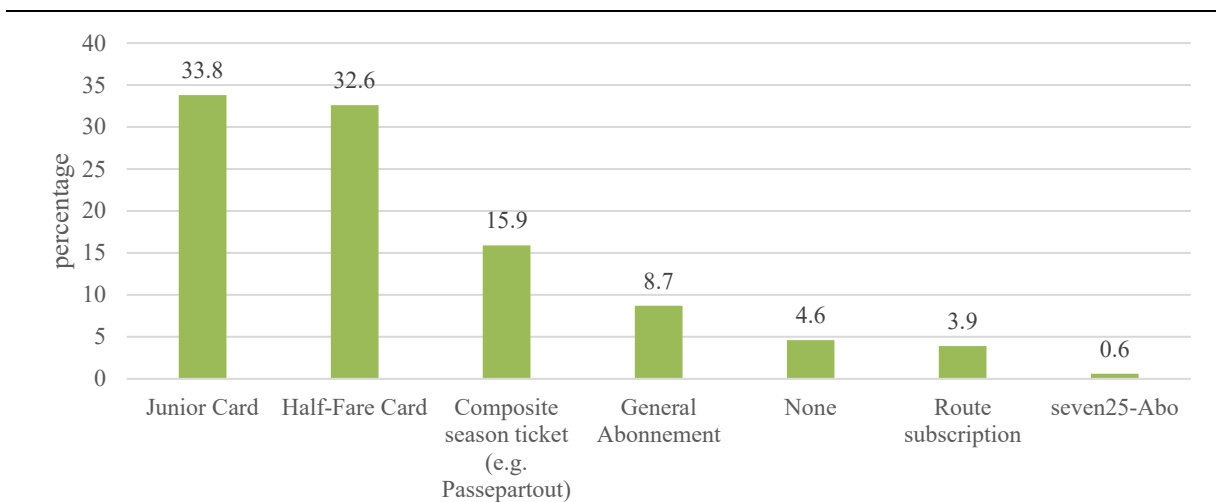
Overall, Figure 10 shows that 92.9% of participants are likely to redeem the voucher. Furthermore, 61.1% indicate that they would use the voucher to purchase an annual season ticket, while 58.4% would use the voucher to purchase multi-ride tickets. 28.3% would purchase multi-day passes, 32.5% would use the money for a monthly pass, and 11.9% would

use the money to pay for a portion of a General Abonnement for children. The following section reports some of the household information that was collected in the survey.

## 5.1 Public transport tickets in the household

Figure 11 shows which public transport subscriptions are available in the households.

Figure 11: Does your household have one or more of the following public transport season tickets? (percentages, multiple answers)



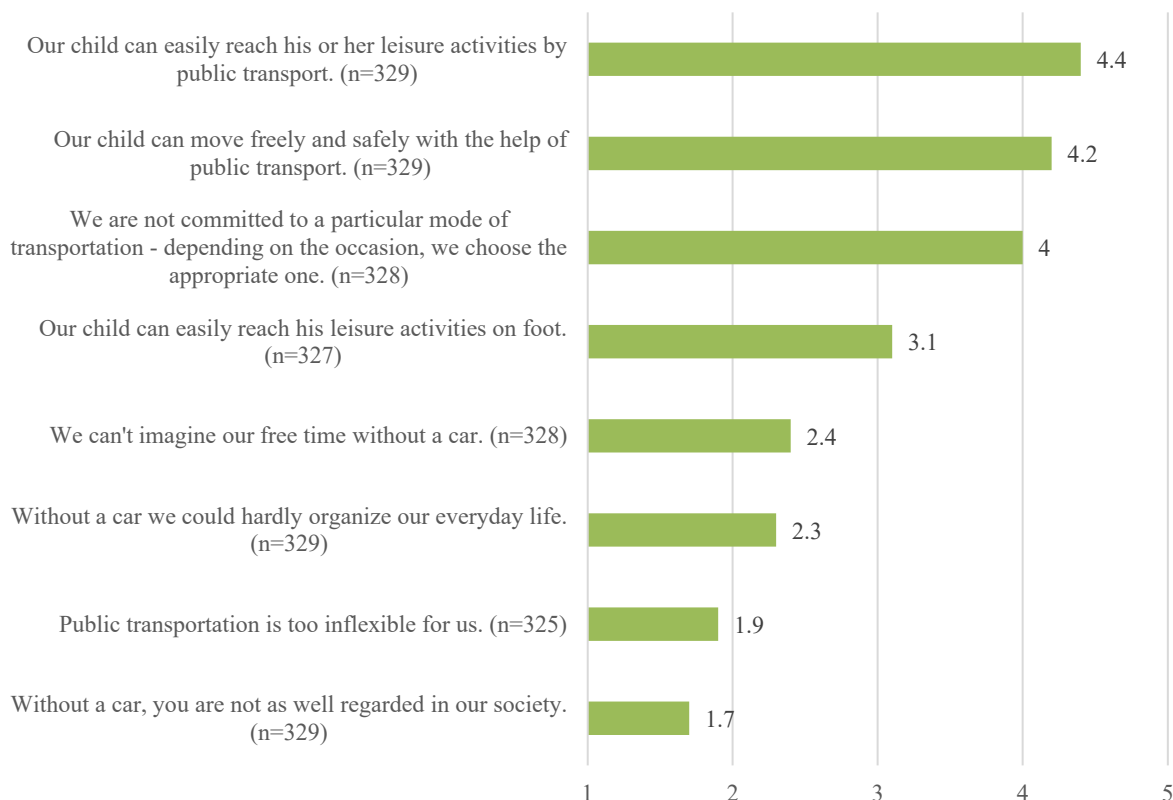
n = 333, own calculations

A total of 675 responses were received for this question (multiple responses). Of these, 33.8% stated that a Junior Card was available. 32.6% of the responses were for the Half-Fare Card and 15.9% of the responses were for the regional travel system passes. The remaining 17.8% are attributed to the categories of general subscription (GA), no subscription, route subscription and seven25 subscription. The seven25 season ticket is a season ticket for young people that can be purchased before their 25th birthday. The seven25 season ticket is valid up to a stop reached by 5 a.m. or 7 a.m. on weekends and public holidays.

## 5.2 Attitude of the household towards mobility

Likert scales were used to assess items relating to attitudes towards mobility. The mean values on a scale from 1 (strongly disagree) to 5 (strongly agree) are given below.

Figure 12: Please indicate the extent to which these statements apply to your household (mean of the scale values)



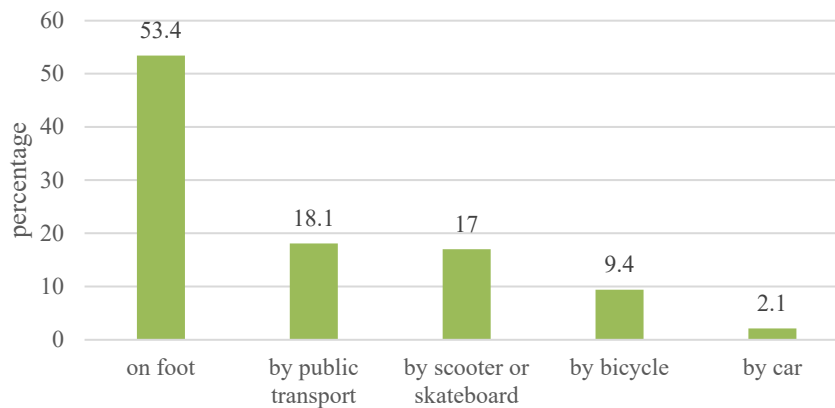
### Own calculations

The feedback shows that children can reach leisure activities well by public transport (scale mean value = 4.4; the middle value of the scale is 3). In addition, there is a high level of agreement with the statement that children can move freely and safely with the help of public transport (scale mean value = 4.2). The mean value is also in the positive range for the statement that one is not tied to a particular means of transport and chooses the appropriate one depending on the occasion (scale value = 4). Furthermore, it is evident that not all leisure activities can easily be reached on foot (scale value = 3.1). The statements that one cannot imagine leisure time without a car (scale value = 2.4), that one can hardly organize everyday life without a car (scale value = 2.3), that public transport is too inflexible (scale value = 1.9) and that one is not so well regarded in society without a car (scale value = 1.7) received less agreement. In the next section, the general use of the children's means of transport is reported.

### 5.3 General use of children's means of transport

Furthermore, Figure 13 shows how a child gets to school on a regular basis.

Figure 13: How does your child usually get to school? (percentages, multiple answers)

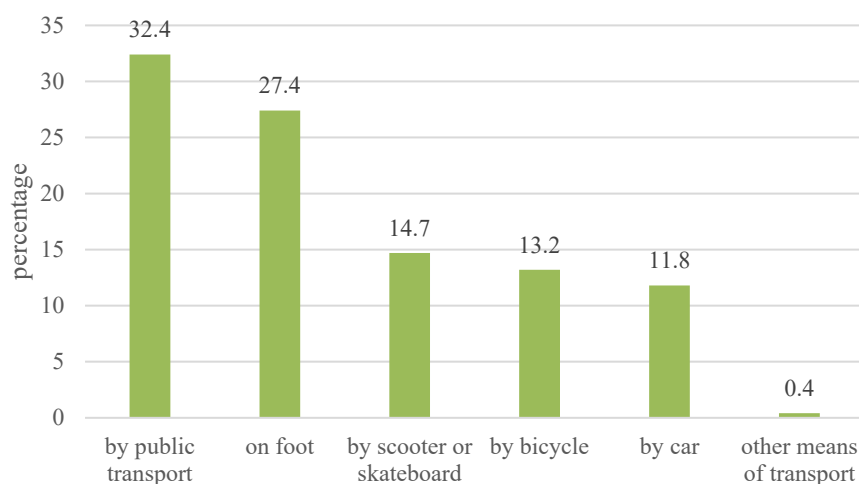


n = 530, Own calculations

The diagram shows that 53.4% of the answers state that children walk to school, 18.1% that they use public transport, 18% that they go by scooter or skateboard, and 9.4% that children make their way to school by bicycle. Only 2.1% of the multiple answers state that the children are taken to school in their parents' cars.

Figure 14 shows how the surveyed children usually get to leisure activities.

Figure 14: How does your child usually get to leisure activities (sports, music school, visiting friends)? (percentages, multiple answers)



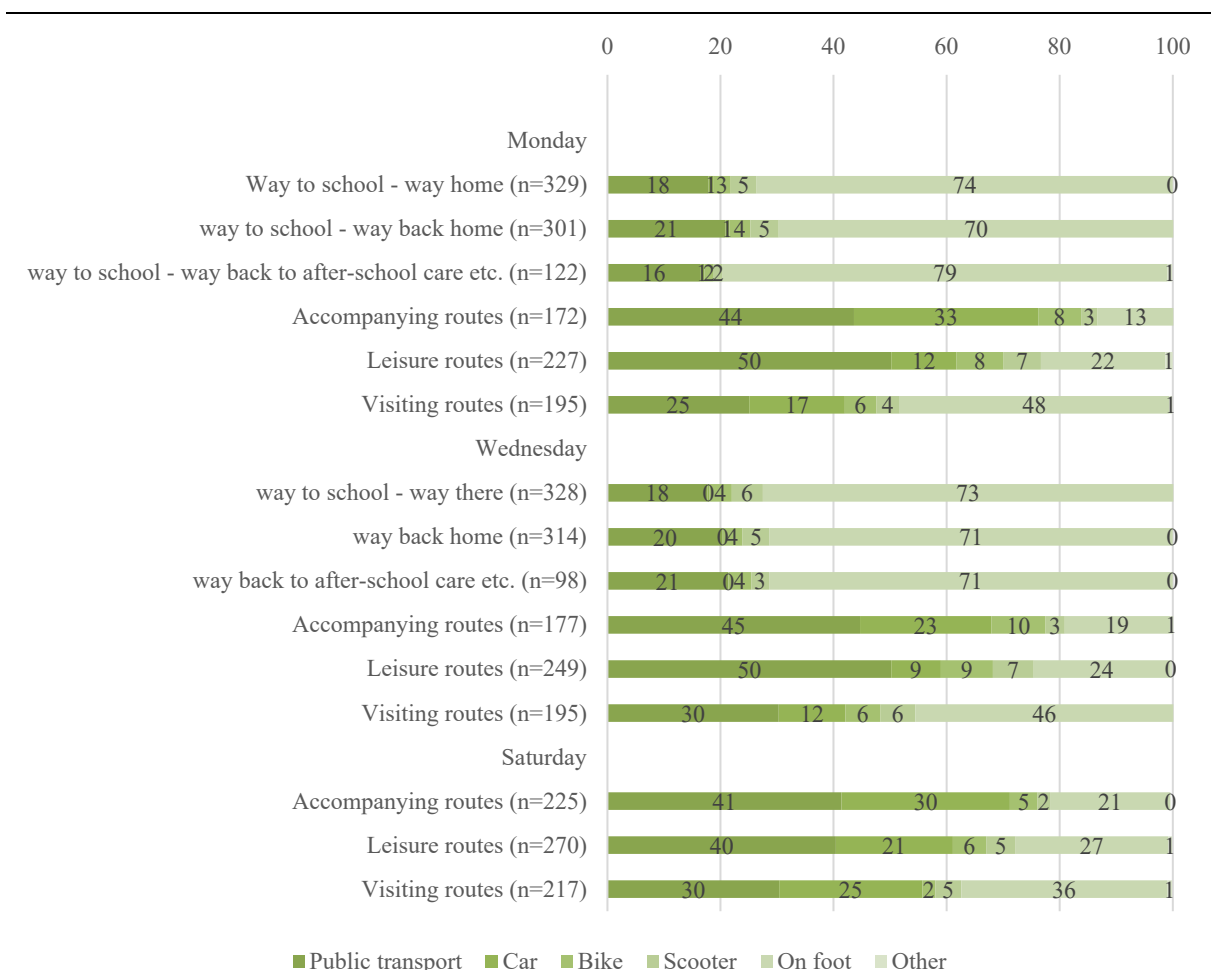
n = 780, own calculations

Figure 14 shows that 32% of the multiple answers state that public transport is used to get to leisure activities, 27% do so on foot, 14.7% by scooter or skateboard, and 13.2% ride their bike. 11.8% of the answers indicate that the children are taken by their parents to leisure activities by car. 0.4% of the children use another means of transport.

### 5.4 Results from the mobility diary

The following results explains the data of the mobility diary, which were collected within the survey. Figure 15 presents the mobility diary by mode of transport.

Figure 15: Mobility diary by means of transport (percentages)

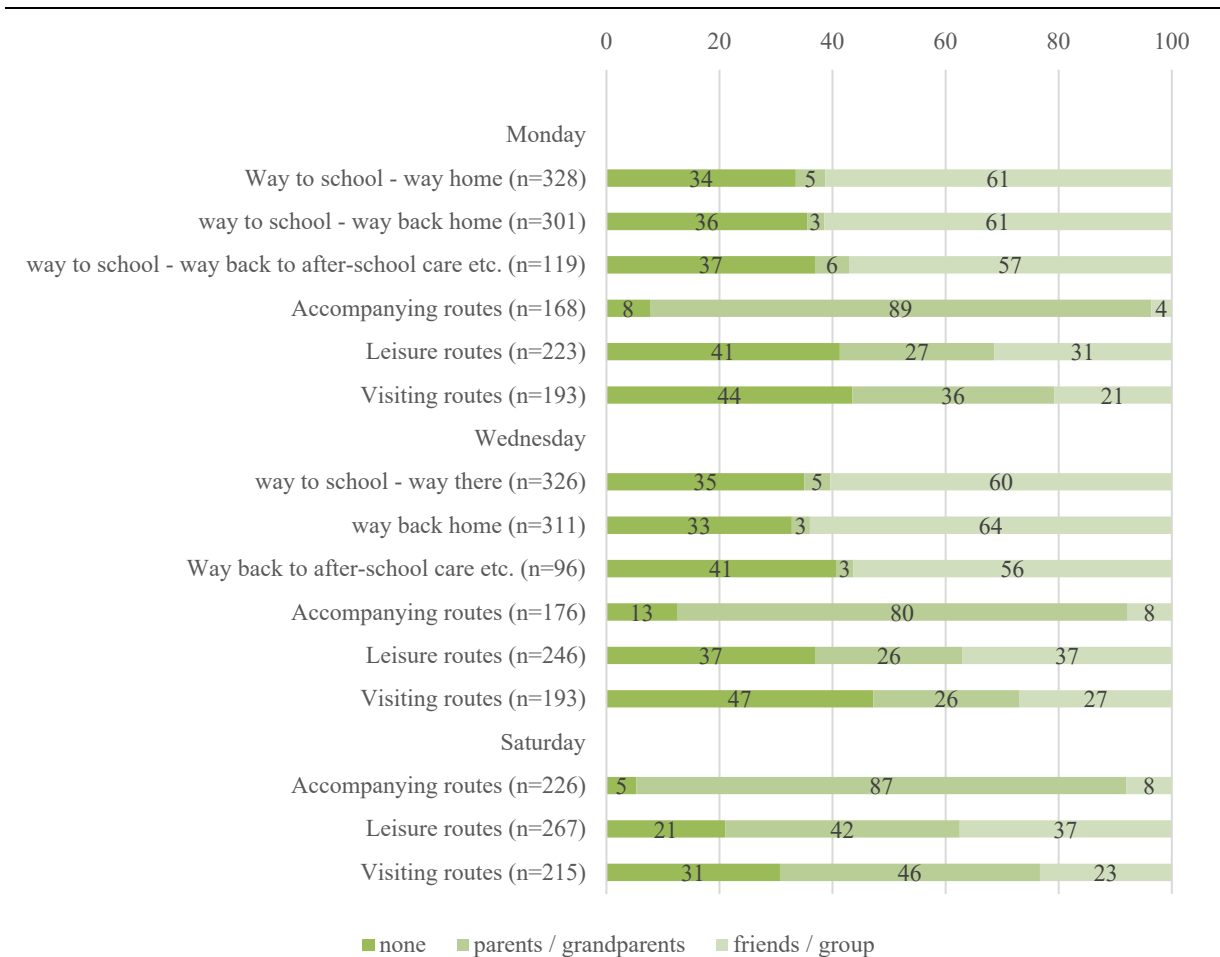


#### Own calculations

The mobility diary by means of transport shows that journeys to school are mainly made on foot or by scooter on both Mondays and Wednesdays. Accompanying routes, leisure routes and visiting routes, however, are more likely to be covered by public transport, car or bicycle by the children surveyed on Mondays, Wednesdays and Saturdays.

Figure 16 shows the mobility diary according to the accompaniment of the children.

Figure 16: Mobility diary after accompaniment (percentages)



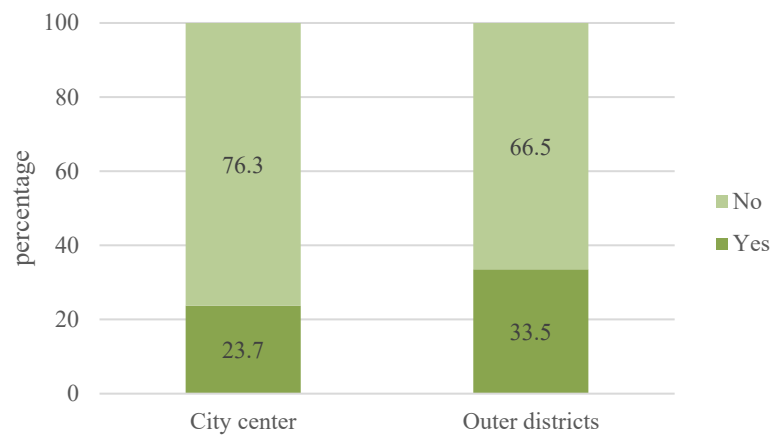
Own calculations

Figure 16 shows that both school routes on Mondays and Wednesdays and leisure and visiting routes on Mondays, Wednesdays and Saturdays are mostly completed by the children alone or with friends or in groups. The accompanying routes, on the other hand, are accompanied by parents and/or grandparents on Mondays, Wednesdays and Saturdays.

### 5.5 Bivariate statistics

In the following section, significant bivariate analyses are explained, which can be carried out using the available data. Figure 17 shows the bivariate statistics for the way to school. There is an association between the use of public transport to get to school and the location of the school building.

Figure 17: Travel to school by public transport and location of school (percentages)



n = 328, own calculations

A chi-square test was performed between the use of public transport to get to school and the location of the school building. There were no expected cell frequencies less than 5. There was a statistically significant relationship between the use of public transport to get to school and the location of the schoolhouse ( $\chi^2(1) = 3.904$ ,  $p = < 0.05$ , Cramer-V = 0.109). Consequently, the test allows the conclusion that children who go to school in outer neighbourhoods do so significantly more often by public transport.

Figure 18 shows a bivariate correlation in the area of leisure travel. There is a correlation between the use of public transport to get to school and gender.

Figure 18: Leisure travel by public transport and gender (percentages)



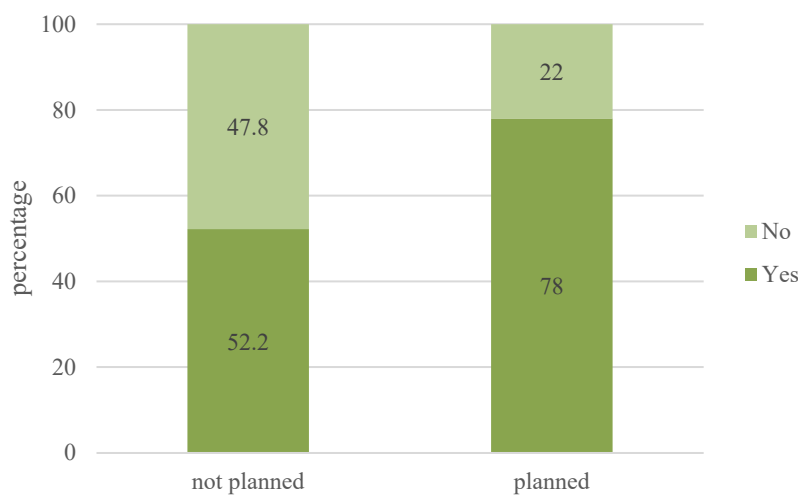
n = 321, Own calculations



A chi-square test was performed between use of public transport for leisure travel and gender. There were no expected cell frequencies less than 5. There was a statistically significant association between the use of public transport for leisure travel and gender ( $\chi^2(1) = 8.635$ ,  $p = < 0.05$ , Cramer-V = 0.164). Consequently, the test allows us to conclude that boys are significantly less likely than girls to use public transport for leisure trips.

Figure 19 shows another bivariate relationship in the area of leisure travel. There is an association between the use of public transport for the leisure trip and the planned redemption of the voucher.

Figure 19: Leisure travel by public transport and the planned redemption of the voucher (percentages)



n = 323, Own calculations

A chi-square test was performed between the use of public transport when going for a walk and redemption of the voucher. There were no expected cell frequencies less than 5. There was a statistically significant relationship between the use of public transportation for the leisure trip and redemption of the voucher ( $\chi^2(1) = 7.848$ ,  $p = < 0.05$ , Cramer-V = 0.156). Consequently, the test allows us to conclude that individuals who plan to redeem the voucher use public transport for leisure trips significantly more often than individuals who do not plan to do so to redeem the voucher.

## 6 Interpretation

Analysis of the survey on the mobility behaviour of schoolchildren in the city of Lucerne shows that on a general basis 53.4% of school trips are made on foot, 18.1% make their way to school by public transport, and only 2.1% are taken to school in their parents' cars. Furthermore, it can be seen that 32% of the children surveyed use public transport to get to leisure activities, and 11.8% are taken to leisure activities in their parents' cars. The mobility diary shows that routes to school are mainly made on foot or by scooter on both Mondays and Wednesdays. Accompanying routes, leisure routes and visiting routes, however, are more likely to be covered by public transport, car or bicycle on Mondays, Wednesdays and Saturdays. In addition, it can be seen that on Mondays and Wednesdays, as well as on Saturdays, the majority of children make their way to school alone or with friends or in groups. The accompanying routes, on the other hand, are accompanied by parents and/or grandparents on Mondays, Wednesdays and Saturdays. Bivariate analyses allow the conclusion that children and adolescents who go to school in the outer quarters do so significantly more often by public transport. Furthermore, it can be said that boys are significantly less likely than girls to use public transport for leisure trips and that those who plan to redeem the voucher use public transport for leisure trips significantly more often than those who do not plan to do so.

The results confirm the findings of Sauter (2019), who recognizes that the whole development is mutually supported by various factors that are essential for the change in mobility behaviour of adolescents and young adults. On the one hand, these are improved public transport services, whether in the form of an expanded network, timetable (tighter intervals, night buses and trains) and new travel passes (e.g. Gleis 7). The increased use of public transport may be promoted by the positive attitude of young people towards this means of transport: on public transport, one can talk to others, surf the internet or simply 'be' (see Sauter & Wyss 2014).

## 7 Outlook: second and third wave

An initial survey conducted before the introduction of the voucher clarifies the intention to implement a planned use of the public transport credit. In addition, future waves will be included, which will make it possible to compare the first survey data with the feedback after the introduction of the intervention. For the second wave in 2024, the concrete benefit of the public transport credit can now be surveyed after the introduction of the intervention. Thus, the intention can then already be compared with effective behaviour (intention-behaviour gap). Furthermore, from the second wave on, it is possible to make a comparison between different groups (multi-group comparison). In particular, voucher users will be compared with non-users (between-subject design, quasi-experiment). In order to enrich the data, actual sales can be determined by the transportation companies, which enables further comparisons. In addition,

values for unredeemed vouchers, as well as the type of public transport tickets purchased, are also analysed in more detail. Moreover, it will be investigated whether the voucher has led to higher shares of public transportation use in different domains of travel (school and leisure trips).

The developments described are taking place against the background of structural and social changes, such as the increase in distances to places of education and the expansion of public transport, which is complemented by a positive attitude towards this mode of transport on the part of children and young people. This may be changing the choice of means of transport not only for educational purposes, but also for leisure time.

## 8 Reference list

- Bongard, A.-E.; Winterfeld, U. (1977). Verkehrswissen und Verkehrsverständnis bei fünf- bis sechsjährigen Kindern. Köln; Unfall- und Sicherheitsforschung Strassenverkehr, 13.
- DSJ (2019). Dachverband Schweizer Jugendparlamente (DSJ), Bereich Grundlagen Politische Partizipation GPP. Grundlagen der politischen Partizipation von Jugendlichen. Bern.
- Flade, A. (1997). Mobilität und verkehrsbezogene Einstellungen 11- bis 15-jähriger. Studien und Texte zur Mobilitätsforschung Nr. 2, Institut für Wohnen und Umwelt, Darmstadt.
- Flade, A. (1999). Einstellungen zur Verkehrsmittelnutzung von Mädchen und Jungen. In: C. J. Tully (Hrsg.). Erziehung zur Mobilität. Jugendlichen in der automobilen Gesellschaft. Frankfurt / New York, S. 1007-128.
- Fuhrer, U. & Kaiser, F. (1994). Multilokales Wohnen: Psychologische Aspekte der Freizeitmobilität. Bern.
- Haefeli, U., & Kaufmann, R. (2009). Aufwachsen mit dem Auto. Das 1950er Syndrom und die Mobilität von Kindern. S. 307-327.
- Heinickel, G., & Dienel, H. L. (2006). Mobilitätsbiographien und Mobilitätsgenerationen. Ansätze für die Erklärung individueller und kollektiver Mobilitätskulturen. Informationen zur modernen Stadtgeschichte, 2, 43-60.
- Hunecke, M. (2002). Umweltbewusstsein, symbolische Bewertung der Mobilität und des Mobilitätsverhaltens, 47-63. In: Hunecke, M., Tully, C. J., & Bäumer, D. (Eds.). *Mobilität von Jugendlichen: Psychologische, soziologische und umweltbezogene Ergebnisse und Gestaltungsempfehlungen*. Leske + Budrich. Opladen.
- Jahn, T. & Wehling, P. (1999). Das mehrdimensionale Mobilitätskonzept – Ein theoretischer Rahmen für die stadtökologische Mobilitätsforschung. In: Friedrichs, J. & Hollaender, K. (Hrsg.). *Stadtökonomische Forschung. Theorien und Anwendungen*, Berlin, S. 127 – 141.
- Kauermann G., & Küchenhoff, H. (2011). *Stichproben: Methoden und praktische Umsetzung mit R*. Springer, Berlin, Heidenberg.
- Limbourg, M., Flade, A. & Schönharting, J. (2000): *Mobilität im Kindes- und Jugendalter*. Opladen.
- Moore, R.; Young, D. (1978). Childhood outdoors: Toward a social ecology of the landscape, in: Altman, Irwin; Wohlwill, Joachim F. (Hg.): *Children and the Environment*. New York, S. 83–130.
- Rabe, S., Miller, G., Lien, S. (2002). Mobilitätsverhalten von Jugendlichen und jungen Erwachsenen, 141 - 174. In: Hunecke, M., Tully, C. J., & Bäumer, D. (Eds.). *Mobilität von Jugendlichen: Psychologische, soziologische und umweltbezogene Ergebnisse und Gestaltungsempfehlungen*. Leske + Budrich. Opladen.

- Sauter D., & Wyss K. (2014). Pilotstudie zur Velonutzung von Jugendlichen im Kanton Basel-Stadt, im Auftrag des Bau und Verkehrsdepartements des Kantons Basel-Stadt mit Unterstützung des Bundesamtes für Strassen, ASTRA, Bereich Langsamverkehr, Zürich, Basel, Bern
- Sauter, D. (2019). Mobilität von Kindern und Jugendlichen: Veränderungen zwischen 1994 und 2015 – Analyse basierend auf den Mikrozensen «Mobilität und Verkehr». Bundesamt für Strassen ASTRA.
- Schulte, W. (1978). Strassenverkehrsbeteiligung von Kindern und Jugendlichen. Köln 1978; Unfall- und Sicherheitsforschung Strassenverkehr, 19.
- Tully, C., & Alfaraz, C. (2017). Youth and mobility: The lifestyle of the new generation as an indicator of a multi-local everyday life. *Applied Mobilities*, 2(2), 182-198.
- VCÖ (1999). Verkehrsclub Österreich (VCÖ): Jugend & Mobilität. In: Reihe Wissenschaft & Verkehr. Wien.

## A Appendix

### A.1 Appendix Tables

Table 5: School route by public transport and school building (city center / outer districts)

	<b>Yes</b>	<b>No</b>	<b>Total</b>
City center	23.7%	76.3%	100.0%
Outer districts	33.5%	66.5%	100.0%
Pearson chi-square: 3.904; Asymptotic significance (two-sided): < 0.05			

Table 6: Leisure travel by public transport and gender

	<b>Yes</b>	<b>No</b>	<b>Total</b>
Girls	83.4%	16.6%	100.0%
Boys	69.4%	30.6%	100.0%
Pearson chi-square: 8.635; Asymptotic significance (two-sided): < 0.05			

Table 7: Leisure trip by public transport and redemption of the voucher

	<b>Yes</b>	<b>No</b>	<b>Total</b>
not planned	52.2%	47.8%	100.0%
planned	78.0%	22.0%	100.0%
Pearson chi-square: 7.848; Asymptotic significance (two-sided): < 0.05			