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Exposure School Travel among Primary School in Selangor, Malaysia

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Abstract

This study reports the results of an exposure school travel survey for 30 primary schools in Selangor, Malaysia. This study based on the survey method which is approaching parents via student as a child and student. This study aimed to collect data on exposure school travel by a student as well as improve the quality of information on exposure travel among the student. A total of 2543 parents have participated that included items relating to the characteristic of children, mode of transport, distance home to school and crash history. Mean travel home to school is 1020 km each year. The mean crash rate (based on self-reported crash involvement) was 0.22 crashes/10,000km. The crash rate was high at age 10-12 years old, urban area, less than RM4500 household income and mode of transport home to school by walking. This paper provides knowledge and understanding about exposure school travel home to school in Malaysia.

Keywords: Exposure, School Travel, Mode, Crash Risk, Children.

Introduction

Exposure is defining as the amount of travel, either by vehicle or on foot. The amount of travel and the number of crashes can be calculated as a risk ((Hauer, 2014; Hakkert & Braimaister, 2002). The use of exposure widely uses to compare the safety level especially compare by type of the mode of transport (IRTAD, 2013; Nurulhuda & Jamilah, 2010; Akmalia, 2017). School travel is of special interest because it is an everyday routine for most children. They are several modes of transport to school which is walking, bicycle and motor vehicle. Nowadays, the motor vehicle were common methods by student traveled to school (Beck & Nguyen, 2017).

Royal Malaysia Police reported in 2016, a total of 5036 youth between 6-20-year-old were recorded involved in casualties' road accident. The record also shows 322 casualties in the school area and involved 38 pedestrian casualties in the school area (RMP, 2016). The road safety issue is not based on accident statistics. Road safety education is not enough to change travel behavior. The facility for pedestrian safety should provide, especially near the school area. The existing research on school

infrastructure found the presence of sidewalks and traffic warden lead to a 56% decrease in the conflict count per hour (Alvin, 2010). Along with RSE that has been held in the school syllabus, the authorities have also been keen to upgrade road facilities for the student to and from school. By the effectiveness strategies from the authorities and public the crash injury and risk exposure can reduce.

Methodology

Sampling

Based on Ministry of Education record, there is 10,201 school, and 76% of it are primary schools. The total enrolment in 2016 in Malaysia is 2,685,403 students for primary school. This study focus in one of the state in Malaysia which is Selangor because Selangor has the highest number of students enrolment for standard one though the number of school in Selangor is not the highest in Malaysia. Up to Jun 2017, the Selangor state education department reported that there were 512,749 students in 659 primary schools around Selangor. Hence with this, on average there are 950 students in each school in Selangor. The random sampling was used where each school is chosen entirely by chance and each student of the student population in Selangor has an equal chance of being included in the study. This method also a handy and cost-effective way where it provides a 95% confident level of critical value is 1.96 and error is 0.02. The minimum sample size is 2400 for each type of school; primary and secondary school.

In this study, the respondent is the parent of the student due to the reason they are the decision maker for their children mode of transport to and from school. The factor that affecting parents' decision on travel mode to and from school are the convenience, accessibility, safety, and security. Besides than this, the location of the home, school, and workplace also might be the factor influencing the mode choice to and from school. There are 30 schools was selected for this study. These schools are categorized by type of road and urban-rural area.

Design Questionnaire

The primary tool for this study is a questionnaire. The questionnaire was designed with the aim to get the information on student characteristic and mode choice to and from school. Prior to the actual data collection, a pre-test study was conducted to assess the respondent understanding about the questionnaire. The pre-test study was conducted to 30 respondents, and the feedback was used to improve the questionnaire to ensure the quality of the data collected. The questionnaire is divided into three categories; student information (home, gender, age, sibling, household income), mode choice (distance, mode transport, journey time) and crashes of their children had been involved during home to school journey.

Data

Prior to the data collection at the 30 selected school, consent and approval from MOE and District Education Office (DEO) are required. With the consent and approval from MOE and DEO, a letter of authorization together with the questionnaire and simple instruction was delivered to an identity in charge teacher at each school. The in-charge teacher was brief by the researcher to ease the understanding of the data collection process when the questionnaire was delivered. The in-charge

teacher will disseminate the questionnaire to parents through the student and will be returned to the in-charge teacher for compilation. The questionnaire was collected two (2) weeks after the questionnaire was delivered to the in-charge teacher. Once the researcher has obtained back the questionnaire from all schools in this study, the next step is to input the info from the questionnaire in the Statistical Package for Social Science Software (SPSS) for further analysis.

An estimate annual of home to school exposure (distance) was calculated for each student travel from home to school distance and multiplied by 242 days (school days only). Analysis of the survey data relied on descriptive techniques. Descriptive analysis was used to obtain information on the distribution and variability of a variable. The analysis was presented by chart and histogram.

Results

Characteristic of the Children's

The response rate for this study is 95%. However, there are only 2543 respondents completed all the questions in the questionnaire. 56% of the respondent are living in urban areas, and 44% are living in rural areas. This descriptive data show in line with the Selangor State Education Department (SED, 2017) there are 55% of school is located in the urban area, and 45% were built in the rural area. It is shown that the respondent represents the population on this survey. Both the schools were located on federal road/arterial and resident road/local street are 35%. The second higher is situated on 30% is located on the main road/ collector.

Age and gender are the crucial variables among school children's characteristic. In Malaysia, the level of primary school is divided by two (2) level. Level one (1) is aged between 7 to 9 years old, and level two (2) is aged between 10 to 12. In this survey 40% is aged between 7 to 9 years old and 60% are aged between 10 to 12 years old. As for the gender of the respondent children, 42% were males, and 58% were female. The majority of respondents at 64.4% earned a household income less than RM4500. This was followed by those in the RM4501 and above, which is 35.6%. The mean household income is RM 4,990, and the median is RM3, 000.

School Travel Mode

Figure 1 illustrated the distribution of mode of transport among student to school. The main school travel mode is motorcar which is 46.2%. This is followed by the school bus/van, and public transport which is 26.5% and about 23.1% of the respondent children chose the motorcycle as the school travel mode. There is a small number of primary schools were going to school by walking or cycling to school. There is only 10% as the non-motorist (walk and bicycle). This finding is expected like the previous study (Beck & Nguyen, 2017; Yarlagaadda, 2006; Zhang, Yao, & Liu, 2017).

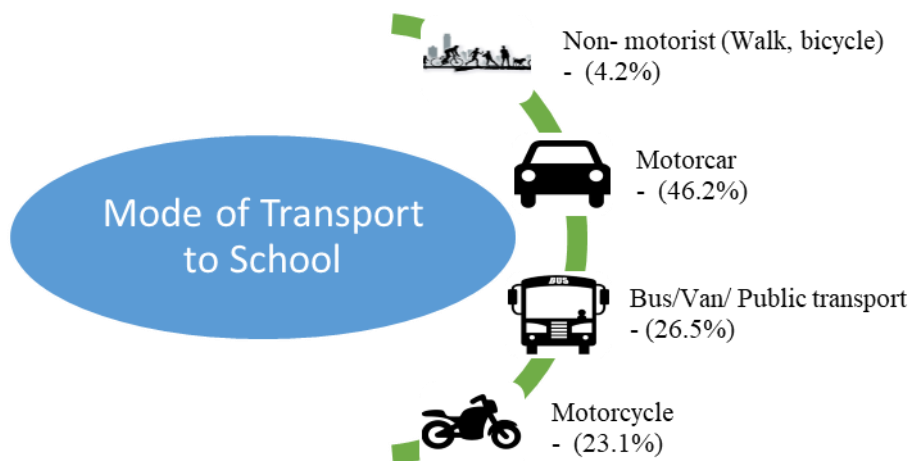


Figure 1. Distribution of mode of transport school travel.

Table 1 presents the percentage of the school travel mode by the characteristic of the student. 3.8% of female children use to walk than male children (2.8%). A contrast to the mode by bicycle, the male children are higher than the female which is 1.7% and 0.3% respectively. However, the observed difference between male and female in this study for the other groups of transport was not significant. The difference in gender is only for the non-motorized mode to school. This finding is in agreement with Zhang et al., 2017 finding which is showed the gender difference in school travel only made for short distance. Usually, the non-motorized mode is for short distance travel. Mcmillan, 2006 found the children under supervised change the influence of gender on mode choice to school especially for the female student.

Another important finding was that mode choice by the age of school children. 4.5% of the children age 10 to 12 years, walk and bicycle to school, which is higher than age 7 to 9 years (3.8%). The results show that 28.1% children age 7 to 9 years go to school by school bus/van, and only 25.3% are aged between 10 to 12 years. Same as the school bus, the mode by motorcar is higher for children 7 to 9 years (47%) compare to the age of 10 to 12 years (45.4%). Younger children are usually being kept closely under supervision than older children (Yarlagadda, 2006). At that age, they are trained to develop cognitive abilities (Barton & Schwebel, 2007). Same as a gender, 51% of the parents in this study, felt that their mode choice for the children to school is safe because it is under supervised by an adult (School bus, Motorcycle, and Motorcar).

From Table 1, we see that resulted in the lowest value of the rural location compare student from urban area choose the walk as the mode to school. This finding is supported by He, 2011, which is when the increase in residential density, the probability of walking or biking will increase. Comparing the household income, it can be seen that 31.2% choose the motorcycle for the group of less than RM4,500 compare more than RM4,500 (8.3%). It is because of the culture in Malaysia society.

Motorcycle is less cost and convenience, but in term of safety, it is lower compared to school bus and motorcar. The further analysis of risk is in the exposure part.

Table 1. School Travel Mode by the characteristic of student

Variable		Mode of Transport				
		Walk	Bicycle	School Bus/Van	Motorcycle	Motorcar
Gender	Male	2.8%	1.7%	26.1%	23.2%	46.2%
	Female	3.8%	0.3%	26.8%	22.9%	46.2%
Age (Years old)	7 to 9	3.1%	0.7%	28.4%	20.5%	47.3%
	10 to 12	3.5%	1.0%	25.2%	24.8%	45.5%
Location	Rural	1.5%	0.7%	23.8%	25.4%	48.6%
	Urban	4.8%	1.0%	28.7%	21.2%	44.3%
Household Income	<=4500	4.0%	0.8%	25.2%	31.2%	38.8%
	>4500	2.5%	0.5%	30.4%	8.3%	58.3%

The travel mode choice might be influenced by the distance travelled by respondent children (student). Table 2 shows the percentage mode choice to school in different distance. From the analysis, if the distance is less than 1km, 72.9% of parents choose "walk," and 61.9% choose "bicycle" as a mode of transport for their children to school. The mode of motorcycle increases with the increase of the travel distance first and then decreases. Although 46.2% of the student live less than 3km from school, the majority of parents will choose the motorized (motorcycle, motorcar, and school bus) when the distance home to school more than 1 km. Steiner et al., 2008, found the 3.2 km from the school is too far for a child to walk or bicycle and suggested the walk zone should be reasonable walk distance. However, this study finds that there are still have some children walk/bicycle to school for less than 5km.

Table 2. Mode choice to school in difference distance

Distance (KM)	Walk	Bicycle	Motorcycle	School Bus/Van	Motorcar
≤1	72.9%	61.9%	20.6%	11.5%	12.2%
(1-2]	5.9%	9.5%	26.6%	15.7%	14.3%
(2-3]	9.4%	9.5%	13.8%	12.6%	12.2%
(3-4]	10.6%	14.3%	13.2%	17.4%	17.2%
(4-5]	1.2%	4.8%	9.2%	10.3%	10%
(5-6]	0%	0%	4.3%	6.9%	7.7%
> 6	0%	0%	12.3%	25.6%	26.4%

Exposure and crash rate estimate

Based on the exposure analysis, school travel by the student in this survey had a mean school travel is 4.2 km/ day (approximately annually is 1020 km) and median of 3.2 km/ day. The reported number of crashes which their children involved during the journey home to school in the year. The crash rate was calculated for defined groups by dividing the total number of self- reported by the total annual

estimate of distance kilometer home to school. The rate was expressed as the number of crashes/10,000 km traveled. All student in this survey had 57 crashes in a year, and the total annual exposure estimate for all students was 2,596,132 km. The crash rate for the whole sample is 0.22 crashes/10,000km. The results obtained from the exposure analysis and crash rate as shown in Table 3.

Table 3. Exposure and crash rate by the characteristic of students

Variable	Group	N	Self-reported crashes from home to school	Total of annual exposure estimate (school day =242 days)	Crash Rate (Crashes/10,000km)
All participant		2543	57	2,596,132	0.22
Gender	Male	1069	22	1,095,877	0.20
	Female	1474	35	1,500,254	0.23
Age	7 to 9	1020	13	1,070,605	0.12
	10 to 12	1523	44	1,525,526	0.29
Location area	Rural	1120	18	1,254,903	0.14
	Urban	1423	39	1,341,229	0.29
Household Income	<=4500	1540	39	1,458,340	0.27
	>4500	851	14	978,425	0.14
Mode of Transport	Walk	86	8	22,537	3.55
	Bicycle	22	2	6,998	2.86
	School Bus/Van	674	8	694,121	0.12
	Motorcycle	586	23	451,206	0.51
	Motorcar	1175	16	1,421,268	0.11

This study shows there are male and female had slightly similar crash rates. Surprisingly crash rate at age 10 to 12 years was found as the high risk than 7 to 9 years old. This might be the influence of the type of mode transport, which is the age between 10 to 12 years old is more independent and they likely to use the non-motorist mode. Crash rate in urban is was at least two times higher than in rural area. Same as for the household income, the crash rate for less than RM4,500 is higher than more than RM4,500. As we seen above (Table 1), the crash rate is influenced by the mode choice factor, and the mode choice is affecting by the distance from home to school. Walking has a crash rate that was more than two time the crash rate of a bicycle, which in turn was at least more than 50% above that of other modes. Strong evident found that school travel by non-motorist mode to school is high risk than the motorist mode.

Conclusion

The trend of the results is consistent with that reported elsewhere. The crash rate was high at age 10-12 years old, urban area, less than RM4500 household income and mode to school by walk. Although crash rate for walk is higher but from the severity perspective shows that fatal crashes involved the pedestrian is lower relative to the motorcycle crashes (PRM, 2016). Even though

motorcycle is the motorized vehicle, it is a same group as the walk (pedestrian) and bicyclist which is known as vulnerable road user (VRU). It is because they are slower mode and need protection. The authorities need to strategize the development of facilities near school. This paper report most of the student walk when the distance home to school is less than 1 km. Umar, 1998 point out that traffic segregation scheme can reduce the traffic accident among the VRU. The travel mode choice study helps the authorities build a better environment for student and community. The appropriate facility such as the walkway and intervention at the crossing location can decrease the risk exposure between home and school and develop safe route to school. It can contribute information to better design policies and infrastructure around school area.

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