TECHNICAL NOTE

SCHOOL TRAVEL BEHAVIOUR IN NEW ZEALAND

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ABSTRACT:

School travel plans offer a valuable source of information on school travel behaviour for individual school sites. However, the information within such plans is often presented in various formats making it difficult to undertake a comparable assessment of school travel behaviour on a national basis. This technical note summarises research into school travel behaviour using data from the Household Travel Survey (HTS) which quantifies the travel behaviour in New Zealand for education travel purposes for different area types and travel modes.

The findings presented in this technical note can be used to assist planning decisions involving where new houses or schools should be located in relation to each other based on travel time expectations. The technical note also provides a benchmark of the current journey to school behaviour that is useful for assessing progress towards meeting the aims of policy to reduce car travel and encouraging healthier lifestyles amongst school children.

This technical paper can be of special assistance to school travel planners by illustrating the similarity in travel times between active and non-active travel modes in particular circumstances. The analysis of the HTS data can also provide transport practitioners and school travel planners with information that can be used to direct limited resources to gain the maximum benefit by targeting school travel plan initiatives and demand management measures towards specific age groups, within particular catchments.

INTRODUCTION

This paper reports on the findings of research undertaken by Abley Transportation Consultants on behalf of the New Zealand Transport Agency (NZTA). The research utilised the Ministry of Transport (MoT) Household Travel Survey (HTS) to examine the school travel behaviour profiles in different catchments relating to Major Urban Areas (MUAs) with populations of more than 30,000 people, Secondary Urban Areas (SUAs) with a population between 10,000 and 30,000 people and Rural Areas (RAs) with a population of less than 10,000 people.

The research was commissioned by the NZTA because of a concern regarding the lack of understanding of the transport effects of school resource consent applications in rural areas. Consequently interrogation of the HTS enabled key travel behaviour trends to be revealed including travel by mode categorised by gender and age in accordance with geographical area in addition to the amount of travel by distance and time. Such data can be used to provide a better insight as to suitable targeted intervention to assist in reducing car travel and encouraging healthier lifestyles amongst school children as well as understanding the transport effects associated with school resource consent applications.

USES OF THE HOUSEHOLD TRAVEL SURVEY

This research uses 'trip legs' and 'trip leg purposes' as defined by the MoT (2007). MoT defines a trip leg as:
"A section of travel by a single mode with no stops. Thus if one walks to the bus stop, catches the bus to town and walks to his/her work, he/she has completed three trip legs (home-bus stop, bus stop 1 to bus stop 2, bus stop 2-work)." This is shown in Figure 1 where work has been substituted by a school destination. The 'Trip Data' contains over 108,400 separate rows, one for each trip leg.

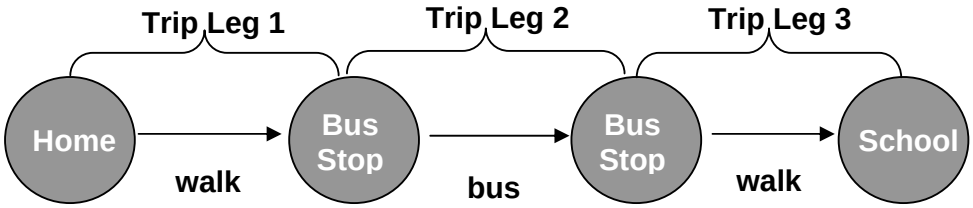

Figure 1. Illustration of Trip Legs

Each trip leg has a trip leg purpose and the trip legs in the database are categorised by an activity which details what activity is undertaken at journey purpose destination. There are 15 activities or trip leg purposes in total. This research focuses on Education which is defined as follows:

Education: includes travel as a student to institutions such as primary and secondary schools, colleges of advanced education, technical colleges, universities etc. This also includes school-related activities that aren't at school, e.g. school outings, school patrol or school sports in school time. Sports at the weekend or after school are coded to Recreation. This does not include trip legs to pre-school care/education facilities as these are included as 'Social/ Entertainment'. Travel by parents dropping off or picking up students will only be included in Section 6 of this report in the mode split analysis.

The analysis that was undertaken is based on trip leg destination. With the exception of the analysis of travel by time of day which assesses arrival and departure profiles, the outputs from the HTS relate solely to the journey to school.

ANALYSIS OF MEAN TRIP LEG DISTANCE, TRIP LEG TIME AND NUMBER OF TRIP LEGS

The analysis indicates that the mean trip leg arrivals per student per day for education purposes in all areas are about 1.18 trip legs. The mean number of trip legs per student for the catchment areas range between 0.98 associated within SUAs, to 1.3 trip legs per student in a RA.

Although the trip leg distances in MUAs are about half of those associated with the RAs and SUAs, the mean travel times for all modes for each catchment are broadly similar ranging from 13 minutes to 15 minutes. This may reflect the lower travel speeds and potential road congestion associated with MUAs.

This 13 minute travel time threshold can be used to benchmark people's travel expectations in relation to the journey to school and taking into account the variability around the 13 minute travel time, can be used as a benchmark level of accessibility for schools. This can then assist in deciding the best geographical location of new schools to meet or exceed the journey to school travel time expectation. It could also assist monitoring the achievement of the NZ Transport Strategy objectives to improving access and mobility and assisting economic development.

TRAVEL BY MODE AND STUDENT AGE

This section provides details about how students travelled using different transport modes between 2003 and 2006. It also illustrates how the different journey to school travel behaviours differ based on age groups and gender. The analysis revealed that the dominant mode of travel to school for all catchment areas is as a vehicle passenger.

The proportion of walking trips is reasonably similar across the different catchment areas and is about 64% - 71% of the proportion of vehicle passenger trips. Walking represents the second most popular travel mode to school.

In RAs, significantly greater trip legs are undertaken by bus than in other areas reflecting the remoteness of rural origins to education facilities.

Cycling represents one of the least popular travel modes in most catchment areas. This finding reveals there may be scope to improve cycle use especially within urban areas. **Figure 2** illustrates the comparison of trip leg duration and trip leg distance for the different catchment areas.

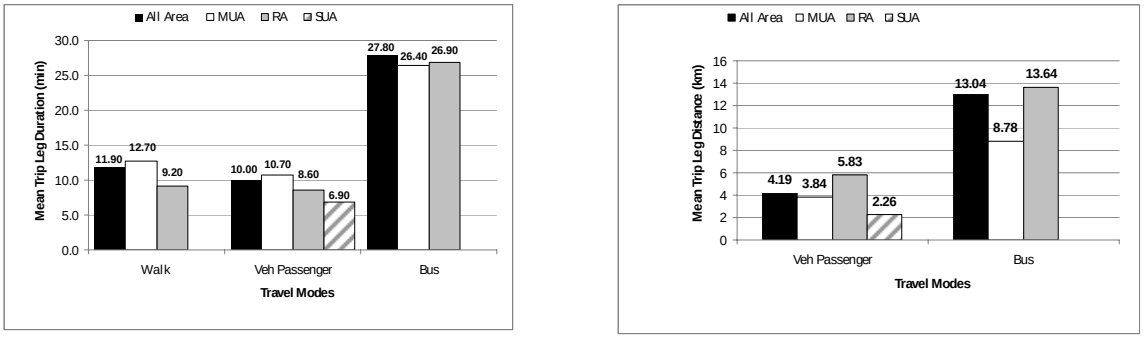

Figure 2 Mean Trip Leg Duration and Distance/Person /Day by Mode of Travel and Area

From Figure 2 it can be seen that bus journey times are generally the same for RAs and MUAs and take more that double the time taken to get to school as a private vehicle passenger. For MUAs, this difference in travel time is influenced to a large degree by the fact that mean bus journey distances are more than double those associated with mean vehicle passenger travel distances. This suggests that over a similar distance buses can compete equally well with the

private motor vehicle in MUAs in terms of journey times. This factor also applies to travel to school in RAs albeit to a lesser extent due, in part, to the less direct travel route of a rural bus service.

The journey time and distance data, can enable school travel planners to determine walking and vehicle based catchment areas and hence target Travel Plan measures to suit students who live within suitable catchment distances.

TRAVEL BY TIME OF DAY

The analysis of school travel by time of day and by age indicated that there is little difference between the three identified age groups of 5-10, 11-12 and 13-17 years of age. The highest concentration of travel occurs at the start and end of the school day with between 43% to 48% of the daily movement activity occurring during the morning peak 8am to 9am and between 25% to 38% of daily movement activity occurring in the afternoon peak 3pm to 4pm.

Travel outside the morning and evening peak periods is negligible except for secondary schools where 12% of movement activity occurs during the lunch time period mid-day to 1pm. The travel pattern after 4pm is generally the same for all age groups.

APPLICATION OF RESULTS

The proportion of trip leg types per person per day for each age group and catchment area is illustrated in **Figure 3.** The figure illustrates the student mode split for different age groups by area types. A small proportion of student travel is undertaken by 'other' modes which include modes such as skateboards, scooters etc.

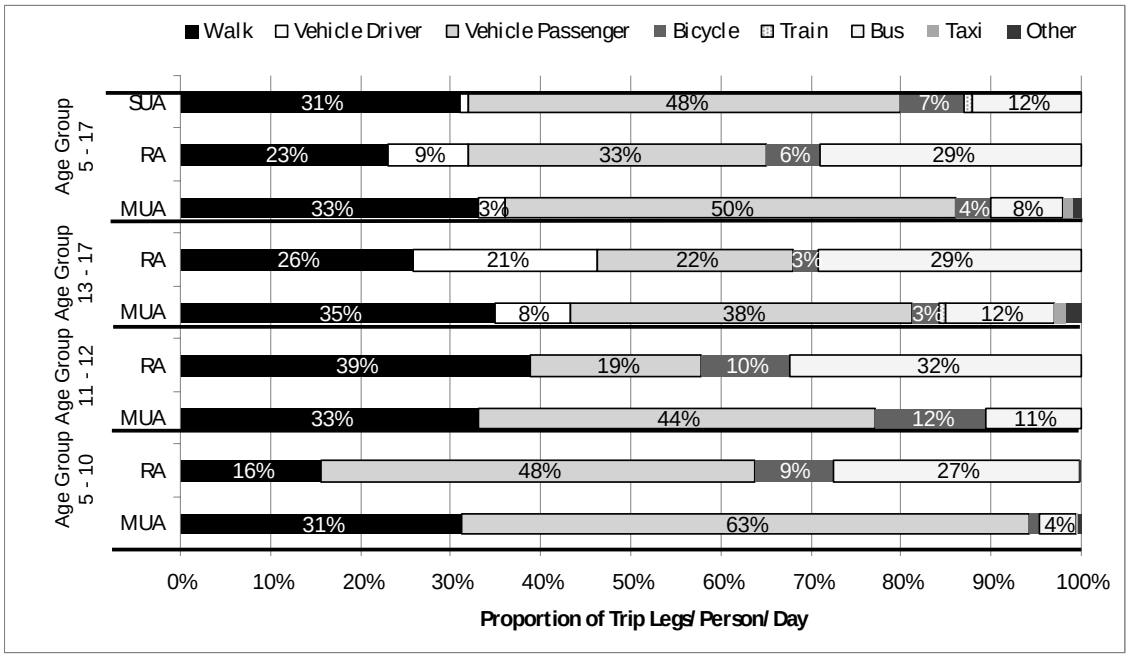

Figure 3 Proportion of Trip legs/Person /Day

The data within Figure 3 can be used as a guide to assist school travel planners to identify age groups within certain locations that can benefit the most from school travel plan initiatives. For instance, from Figure 3 it can be seen that effort could be directed at the Major Urban Areas to maintain and enhance travel by walking and bus between the 11-12 age group and the 13-17 age

group. A passenger per vehicle ratio by age group can be derived by dividing the number of passenger vehicle trip legs by the number of passenger-carrying vehicle trip legs. The passenger per vehicle ratios by age group are shown in **Table 1**.

Table 1 Passenger per Vehicle Ratio by Age Group and Area

Age Group	MUA	SUA*	RA
5-17	1.52	1.33	1.64
5-10	1.66	-	1.73
11-12	1.30	-	1.26
13-17	1.35	-	1.58

* Data not of sufficient size to calculate to an acceptable degree of accuracy.

The passenger per vehicle ratio can be used to determine the number of private motor vehicle trips undertaken in association with transporting students to school.

Typically, a high passenger per vehicle ratio would indicate that a private vehicle is being used more effectively. However, it may also indicate a culture of dependence upon the car as a means of travel to school. The national passenger per vehicle ratios set out in Table 1 can be compared against individual school passenger per vehicle ratios to test whether this type of culture prevails and whether better transport outcomes can be achieved through encouraging a change in attitudes amongst parents and students from a particular school.

The student mode splits shown in Figure 3 are based only on the consideration of travel by students and do not include trips associated with service people and staff. However trips associated with service people can be estimated using UK education trip data[1] and recent research[2] that illustrates that trip generation characteristics in the UK and NZ are very similar. The use of this supporting data indicates that service vehicles represent no more than 1% of the total daily flows to education facilities. The proportion of trips associated with staff can be assumed by applying the national teacher/pupil ratio of 1:20 to the number of students at the school and assuming that staff travel in single occupant vehicles.

The HTS data represents travel to a land use activity. Therefore it is necessary when seeking to determine the total effects of a proposal to consider arrival and departure legs associated with a land use activity. The research findings can be used in assessing the transport effects of a proposed school where the same mode of travel is used for both the arrival and departure trip legs is assumed and inputs such as school size, area category and school type is known. With the use of such inputs travel effects such as daily and peak time trip generation by travel mode and vehicle kilometres travelled can be determined.

CONCLUSIONS

The findings of this research provide new insights into school travel behaviour on a national basis. The results can be used to assist planning decisions in terms of where new houses or schools should be located in relation to each other based on travel time expectations. The analysis also provides a useful benchmark of current journey to school behaviour that can be used to assess progress towards meeting policy aims to reduce car travel and encouraging healthier lifestyles amongst school children.

The findings of this research report can be of special assistance to school travel planners by illustrating the similarity in travel times between active and non-active travel modes. The analysis

[1] TRICS 2010(a)v6.5.1 Database
[2] NTZA Draft Research Report LTS 0079 - Comparison of UK and NZ Trips and Parking Rates

of the HTS data can also provide transport practitioners and school travel planners with information that can be used to best direct limited resources to gain the maximum benefit from targeted school travel plans and demand management measures that focus on specific age groups and geographical locations.

The analysis also provides a convenient source of data to assist in determining the transport impacts of schools in terms of modal split, traffic generation, period of greatest impact and vehicle kilometres travelled.

RECOMMENDATIONS

In some cases, the low sample sizes in relation to Secondary Urban Areas limited the possibilities for further analysis. Abley recommends that the NZTA encourage the MoT to extend the HTS towards the collection of travel data associated with this catchment area in the future.

The trip legs associated with staff and service people, whilst relatively small in comparison to the trips made in association with students, could not be determined through analysis of the HTS data as presented. Abley therefore recommends that the NZTA encourage the MoT to release the HTS data in a geo-coded format that would allow for a more accurate assessment of teachers and staff and service trips associated with schools.

FURTHER RESEARCH

The effects of school sizes on school travel behaviour could be better understood if a question relating to the size of the school attended is included in the travel survey. It is therefore recommended that the NZTA encourage the MoT to extend the HTS to include a question that captures school size information in the future.

Abley Transportation Consultants is currently developing a more advanced method of analysing the HTS data that examines journeys that comprise multiple trip legs or trip chains in respect to school transport eligibility criteria.

Further research could also be undertaken following the recommended release of HTS data in a geo-coded format in terms of understanding the trip leg redistribution effects associated with the provision of new transport infrastructure or newly introduced Travel Demand Management measures such as enhanced public transport services.

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