TRAVEL PROFILING

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Abstract: *Gaining a thorough understanding of daily travel for all trip purposes and by all modes of travel is essential to transport policy and planning. The Ministry of Transport's New Zealand Home Travel Surveys (NZHTS) have, since 2003, been undertaken as continuous ongoing surveys. This research was undertaken by Trips Dababase Bureau (TDB) on a New Zealand Transport Agency (NZTA) contract. The Dataset resulting from these years of survey include 13,000 people from 6000 households. The objective of this research is to describe daily travel behaviour by different modes and for different purpose as defined in the NZHTS. The travel behaviour profile includes a number of other variables such as age, income and time of the day. In the first instance this is a comprehensive coverage from the database as it relates to travel patterns by mode and purpose. This research project provides a detailed description of individual travel profiles in different areas along with tables and plots of trip leg related survey results from the 2003 to 2006 continuous travel survey data. This presentation will be of interest to transportation planners and local authorities seeking up-to-date information on travel profiles for New Zealand.*

INTRODUCTION

The first Ministry of Transport National Household Travel Survey (HTS) was undertaken in 1989/90, followed by the second in 1997/98. These surveys were designed to provide a databank of personal travel information for New Zealand. The results of these one-off travel surveys have been used by transport planners, road safety researchers and engineers to formulate transportation policies and to improve the safety and efficiency of the New Zealand transportation system. However, in earlier research documents undertaken using this survey data there has been little focus on analysing trip profiles. Trip profiles, such as trip length and trip durations categorised by different modes and trip purposes, are particularly valuable for future planning for sustainable transportation modes and transport assessments. The 1989/90 and 1997/98 surveys were discrete. Since 2003 these have now been complemented by ongoing continuous survey processes.

Given that there is a research need to investigate and describe more fully New Zealand travel profiles, Land Transport New Zealand (LTNZ) commissioned the Trips Database Bureau (TDB) along with Abley Transportation Engineers Limited (ATEL) to undertake analysis on "National Travel Profiling – Description of Daily Travel Patterns" in 2007. This technical note provides descriptions of the individual household travel profiles in major urban, secondary urban and rural local government areas together with highlights of trip related survey results from the 2003 to 2006 continuous travel survey data. This technical note has not attempted to analyse trends or undertaken any time series analysis.

BACKGROUND

This research relies on household travel survey undertaken in 14 local government areas in New Zealand. Approximately 12,700 people were interviewed from 5650 households, between March 2003 and June 2006. The data supplied by the Ministry of Transport (MoT) was dated 23rd of April 2007.

The analysis focuses on 'trip legs' rather than a 'trip chain'. The definitions for a 'trip leg', and a 'trip chain'' is presented in Table 1.

Table 1   Definition of a 'Trip Leg' and a 'Trip Chain'

Terminology	Definition
Trip Leg	A 'trip leg' is a surveying unit of non-stop travel by a single mode for a single purpose. For example, walking to work with a stop at the shop is two trip legs; catching a bus to work may be three trip legs (walk – bus stop, bus trip leg, walk from bus stop to work). The Travel Survey does not record trip legs under 100 metres, off-road travel or travel on private property (eg farms, malls)
Trip Chain	For some purposes it is desirable to link travel into longer trip chains. For example, if one drives from work to home, but stops at a stop 200 metres from home to buy bread, this may be considered as a single trip chain (work to home travel)

RESULTS

This technical note summarises the NZTA Resrearch Report 353 "National Travel Profiles Part A: Description of Daily Travel Patterns" published in May 2008 and is designed to be useful to practitioners in their understanding of travel patterns in the:

- Major Urban Areas (MUAs): populations over 30,000;
- Secondary Urban Areas (SUAs): populations between 10,000 and 30,000; and
- Rural Areas (RAs): lesser populations and all other rural areas.

The analysis results are divided into the following sections:
- Personal Travel – Includes information on area variations and personal travel from 2003 to 2006.
- Travel Mode – Includes details about how residents travel within New Zealand categorised by mode.
- Travel purpose – Includes details about why residents in New Zealand travel
- Social Inclusion and Accessibility – Includes information on how vehicle availability and income affect households' and individuals' travel profiles.
- Travel by Time of The Day – Includes information on personal travel patterns categorised by time and purpose.

Personal Travel

The distance, number of trip legs and mean trip leg time travelled per person (or per respondent) per day categorised by area are presented in Table 2. The table shows that:
- The mean amount of trip legs per person per day for all areas is around 4.4 trip legs.
- SUA has the highest mean amount of trip legs per person per day with 4.7 trip legs.
- RA has a mean trip leg distance of about 13km per trip leg. This reflects the remoteness of the trip activities from origin to destinations in rural areas.
- SUA has the lowest time per trip leg with 13.4min compared with other area types. This reflects less congestion than MUA and a trip length shorter than those in RA.

Table 2   Mean Trip Leg Distance, Trip Leg Time and Amount of Trip Legs/Person/Day Categorised by Area

Area	Distance Travelled/Person /Day (km)[1]	Trip legs/Person/Day	Time Travelled /Person /Day (min)	Mean Trip Leg Distance	Mean Trip Leg Time (min)	Unweighted Sample Size (People)
All	35.6	4.4	67	9.7	15.3	12698
MUA	32.1	4.5	69	8.7	15.4	7645
SUA	39.1	4.7	63	9.4	13.4	1189
RA	44.5	4.0	64	13.0	16.0	3864

Travel Mode

The number of trip legs/person/day, total travelling time/person/day and the mean trip leg distance and duration, categorised by mode of travel and area are presented in Table 3. The table shows that:
- The number of trip legs per person per day made as 'vehicle drivers' is substantially higher compared with other travel modes. On average an individual travels 2.4 trip legs per day as a vehicle driver nationally.
- Individuals travel more trip legs by walking in MUAs compared with other area types. On average an individual travels 0.7 trip legs per day by walking in MUAs.
- RA have the highest mean trip leg duration of 'all modes' which is 16 minutes compared with that of 13 minutes and 15 minutes in SUA and MUA respectively.

Table 3   Mean Trip Leg Distance, Trip Leg Time and Amount of Trip Legs/Person/Day Categorised by Area

Mode description*	Unweighted trip legs	Trip legs/person/day by mode	Mean trip leg length (km)	Mean trip duration (min)	Total travelling time/day/person (min)
Area: All					
Walk	16 530	0.7	–	12	8.1
Vehicle driver	58 239	2.4	9.1	15	35.1

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[1] Only includes vehicle passenger, vehicle driver, bicycle and bus and taxi trip leg distances.

Mode description*	Unweighted trip legs	Trip legs/person/day by mode	Mean trip leg length (km)	Mean trip duration (min)	Total travelling time/day/person (min)
Vehicle passenger	28 384	1.1	11.2	17	18.5
Bicycle	1901	0.1	2.8	15	0.9
Bus	2200	0.1	11.7	27	2.9
Taxi	442	0.02	7.4	17	0.3
Other	786	0.03	-	196	1.4
All modes	108 482	4.4	9.7	15	67.2
Area: MUA					
Walk	11 066	0.7	–	12	9.0
Vehicle driver	35 326	2.4	8.1	15	35.4
Vehicle passenger	17 768	1.1	10.0	16	18.8
Bicycle	1065	0.1	3.0	16	0.9
Bus	1422	0.1	9.8	26	2.8
Taxi	353	0.02	7.5	17	0.3
Other	589	0.04	–	193	1.6
All modes	67 589	4.5	8.7	15	68.8
Area: SUA					
Walk	1374	0.5	–	13	6.9
Vehicle driver	6182	2.8	8.3	12	32.7
Vehicle passenger	2851	1.3	11.4	15	19.4
Bicycle	216	0.1	1.7	11	1.0
Bus	76	–	–	–	–
Taxi	42	–	–	–	–
Other	34	–	–	–	–
All modes	10 775	4.7	9.4	13	63.1
Area: RA					
Walk	4090	0.5	–	11	6.1
Vehicle driver	16 710	2.2	12.4	16	34.8
Vehicle passenger	7765	1.0	15.1	18	17.4
Bicycle	620	0.1	2.5	15	1.1
Bus	702	0.1	14.1	30	3.4
Taxi	47	–	–	–	–
Other	163	0.02	–	199	0.8
All modes	30097	4.0	11.2	16	63.6

*   Estimates could not be made in categories where the number of trip legs sampled was less than 120.

The 85th percentile, 15th percentile and mean walking duration by purpose in MUA for all the trip leg arrivals and home-based trip leg arrivals are shown in Figure 1. Walking trip legs from all the trip leg arrivals include trip legs that may not be home-based, such as arrivals at 'work-main job', 'social/recreation' or 'hospital/medical'. Home-based walking trip leg durations are calculated based on the first trip leg that the individuals make at the start of the day leaving home and has not included walking trip legs returning to home later in the day.

The analysis of walking trip leg durations categorised by purpose for home-based arrivals in MUA show that:
- Recreational trip legs have the highest mean walking duration. On average an individual will travel 17 minutes and 18 minutes for recreational (all trip leg arrivals) and recreational (home-based) respectively.
- Trip legs made to 'change mode' have the lowest mean walking duration of 8 minutes.
- The 'work (HB)' has higher walking trip leg duration (16min) compared with trip leg purpose by 'work'. This is because trip leg purpose by 'work' includes other short walking distance trip legs such as walking to a bus stop or from a bus stop to work. This therefore reduces the mean for 'work' walking trip leg duration.

Figure 1   Walking Trip Leg Duration by Purpose in MUA
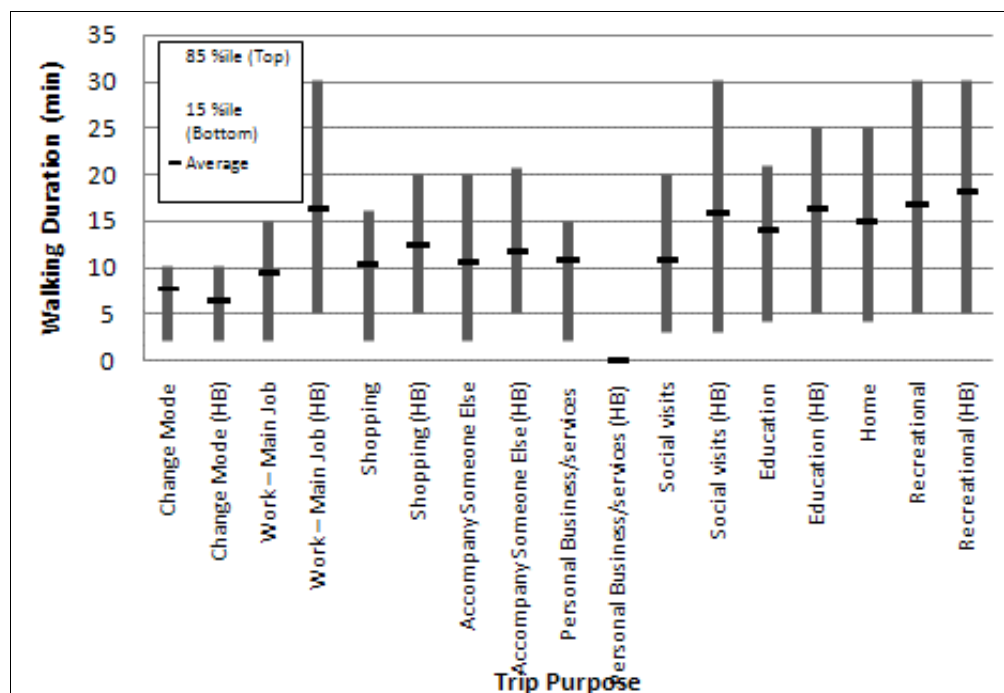
Travel Purpose

The mean trip leg distance and trip leg time categorised by trip leg purpose is shown in Table 4. The table shows that:

- 'Work – employers business' has the highest trip leg distance of 10.7km, followed by 'recreational' (10.5km) and 'social visits' (9.8km) trip legs.
- Recreational trip legs have the highest mean trip leg time of 19.9 minutes, followed by 'work – employers business' (19.2 minutes) and 'social visits' (16.4 minutes) trip legs.

Table 4   Mean Trip Leg Distances and Trip Leg Time Categorised by Trip Leg Purpose

Trip Leg Purpose	Mean Trip Leg Distance (km)	Mean Trip Leg Time (min)
Home	8.5	15.6
Work – Main Job	9.0	15.5
Work – Other Job	7.6	14.2
Work – Employers Business	10.7	19.2
Education	4.7	14.9
Shopping	6.1	12.4
Personal Business/services[2]	7.2	14.0
Medical / Dental	6.5	13.8
Social visits	9.8	16.4
Recreational	10.5	19.9
Change Mode	4.3	16.3
Accompany Someone Else	8.1	13.9
All Purposes	8.1	15.3

Travel by Time of Day

The morning and evening peak arrival times and their proportion of daily flow on weekdays and weekends, categorised by trip leg purpose are presented in Table 5. The table shows

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Personal business and services' includes trip legs for social welfare purposes.

that the morning and evening peak arrival times and their respective proportion of daily flow vary for different trip leg purposes.

Table 5   Morning and evening peak arrival times on weekdays and weekends, categorised by purpose.

Trip leg purpose	Weekday				Weekend			
	Morning peak period	Morning peak %	Evening peak period	Evening peak %	Morning peak period	Morning peak %	Evening peak period	Evening peak %
Home	10–11	6%	14–15; 16–17	15%	10–11	8%	16–17	11%
Work – main job	07–08	19%	12–13	8%	07–08	13%	13–14	7%
Work – other job	07–08	15%	15–16	9%	07–08	17%	15–16	9%
Work – employer's business	08–09	14%	13–14	10%	06–07; 09–10	12%	12–13	8%
Education	07–08	64%	11–12	5%	07–08	26%	11–12	8%
Shopping	09–11	11%	12–13	10%	09-10	14%	14–15	10%
Personal business/ services	08–09	11%	14–15	11%	09–10	14%	12–13	9%
Medical/ dental	09–10	18%	13–14	12%	–	–	–	–
Social visits	10–11	7%	16–17	10%	10–11	10%	17–18	9%
Recreational	08–09	7%	15-17	10%	09–10	12%	12–13	11%
Change mode	07–08	15%	14–15	13%	10–11	10%	12–13	12%

SUMMARY

This research project was commissioned as part of a National Travel Profile research project to analyse and make a 'Description of Daily Travel Patterns' from the continuing NZHTS 2003 to 2006. It was designed to provide a summarised description of New Zealand travel profiles on a national basis. It originated from a desire to provide a readily available information source which was convenient to researchers and transportation planners. It is presented through tables, graphs and diagrams in a concise form to meet the information needs of a wide range of persons and institutions who are involved in transportation policy and planning issues.

The range of tables and graphs included cover comparisons of:
- personal travel,
- travel mode,
- travel purpose
- social inclusion and accessibility, and
- travel by time of day.

The data has been sorted according to MUAs, SUAs and RAs.

The NZTA Research Report 353 is already in use enabling a greater understanding of mode split, trip leg length, trip leg duration and time of day analysis for the trip leg purposes defined in the MoT household surveys. Further analysis of the MoT household surveys Is recommended so that there is more detail for MUAs, SUAs and RAs of different sites.