

COMMUNITY-BASED ENGINEERING RESEARCH: WHY AGING NEW ZEALANDERS LIVING IN RURAL NEED BETTER TRANSPORT SERVICE?



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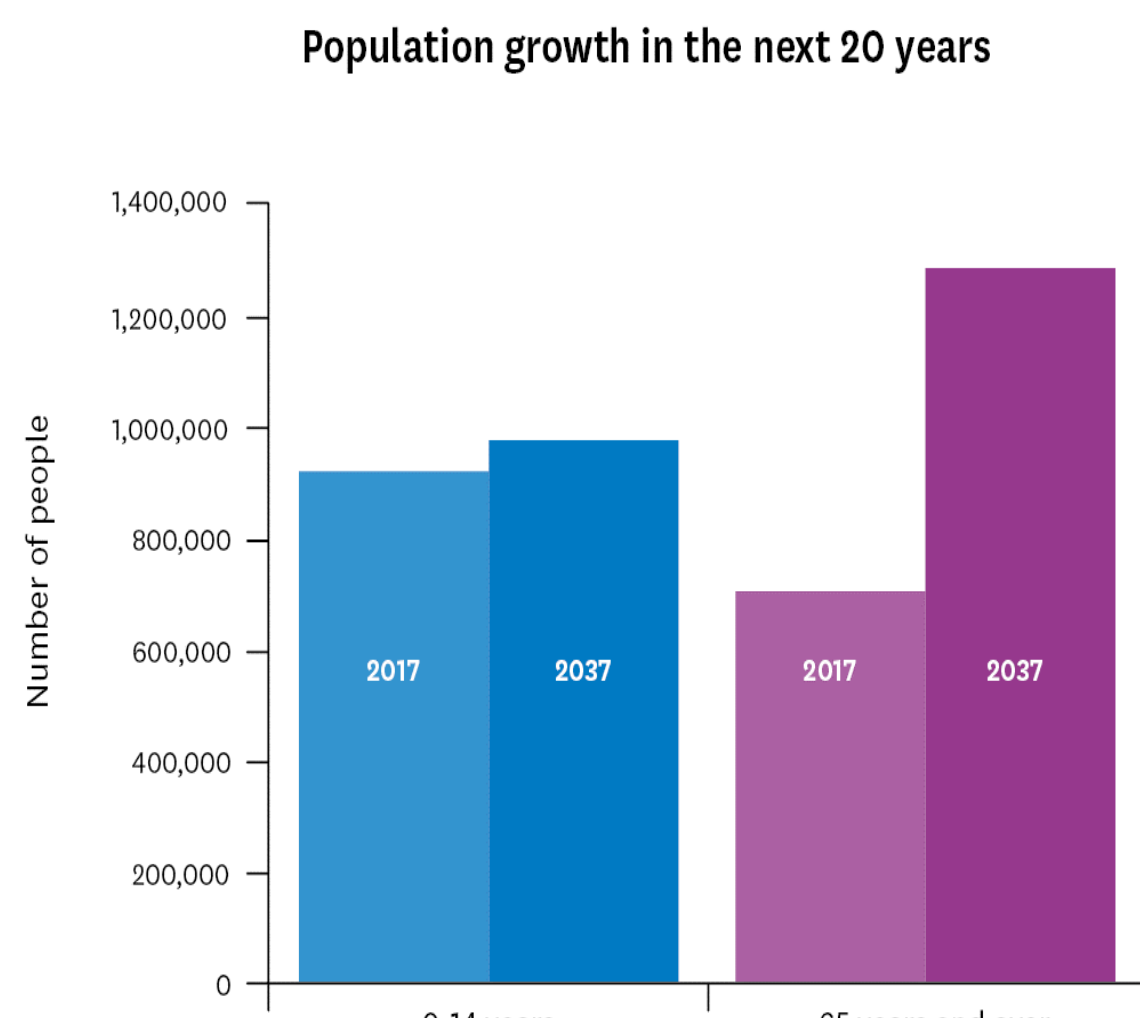
Keywords: elderly, rural area, demand responsive transport, revealed preference survey, rank-ordered logit



BACKGROUND

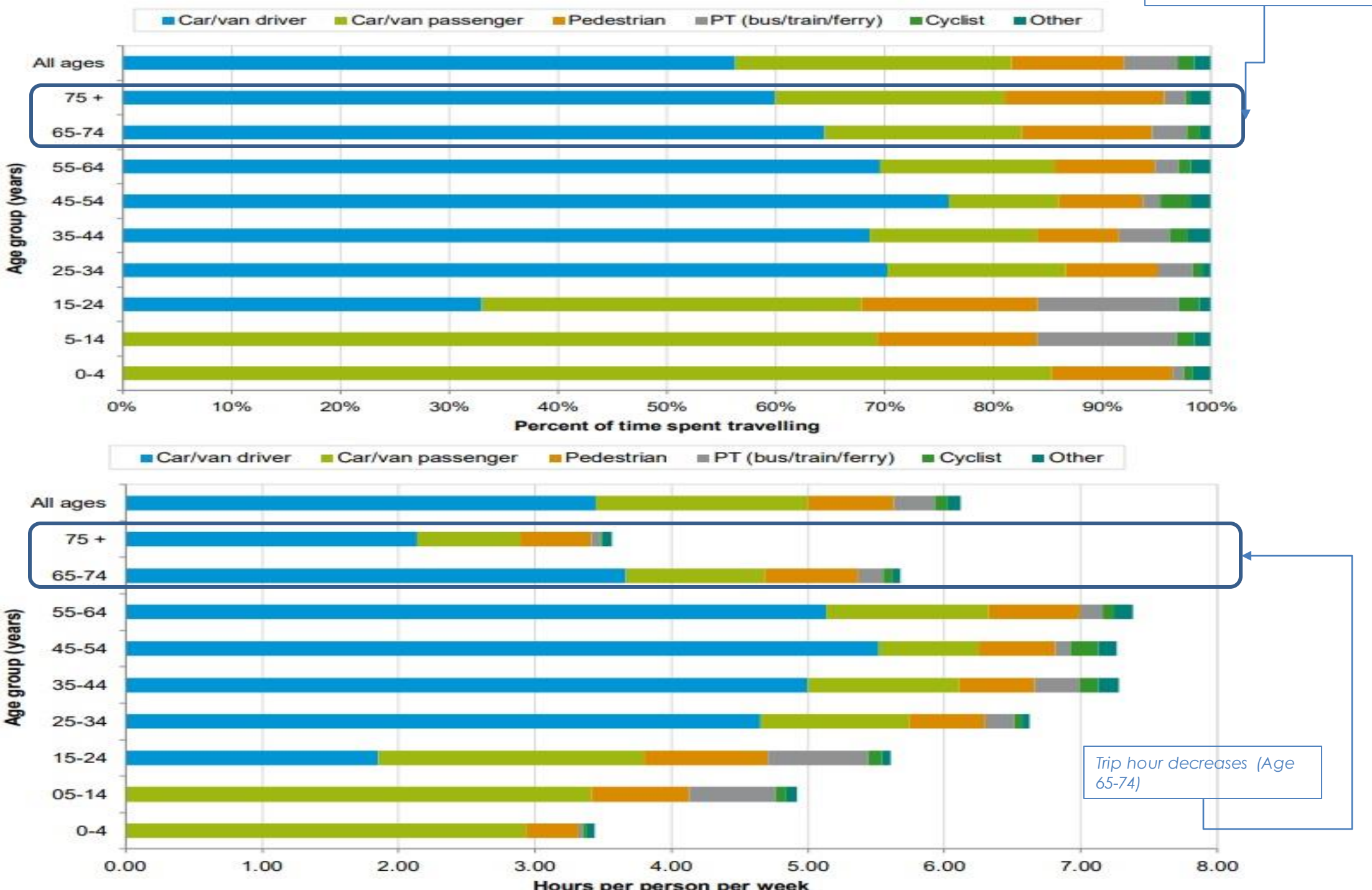
A trend of Elderly Population in NZ

- The elderly population in NZ and NZ rural is increasing
- At the June of 2018, 747k people were aged 65-plus, those aged 65 years and older will roughly double in 2046 with 1.3 - 1.5 million (or 23 % of the total population, up from 12 % in 2016*).



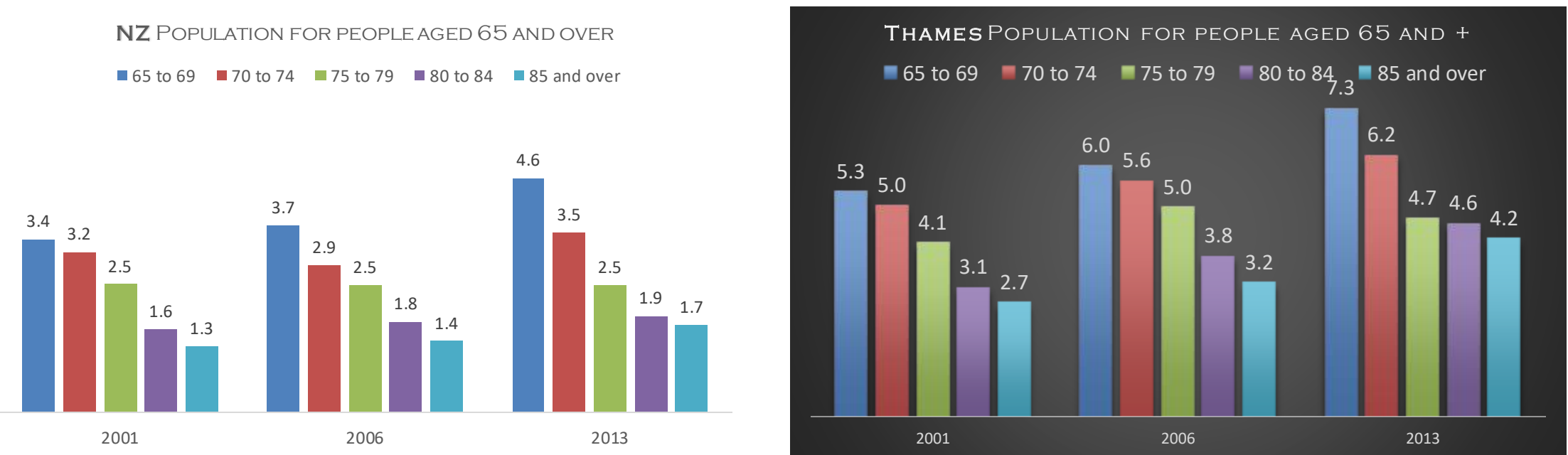
Travel Behavior: Modal Share

- After age 65, driving a vehicle declines but walking and PT use increases. The number of hours travelled per week drops dramatically**



Case Study

- Thames, Waikato is a popular location to live for people aged 65 and over.
- The study in transport for the elderly in Thames investigated the option for a Demand Responsive Public Transport (DRPT) service



Source: *Stats NZ (2018), **Mot (2017)

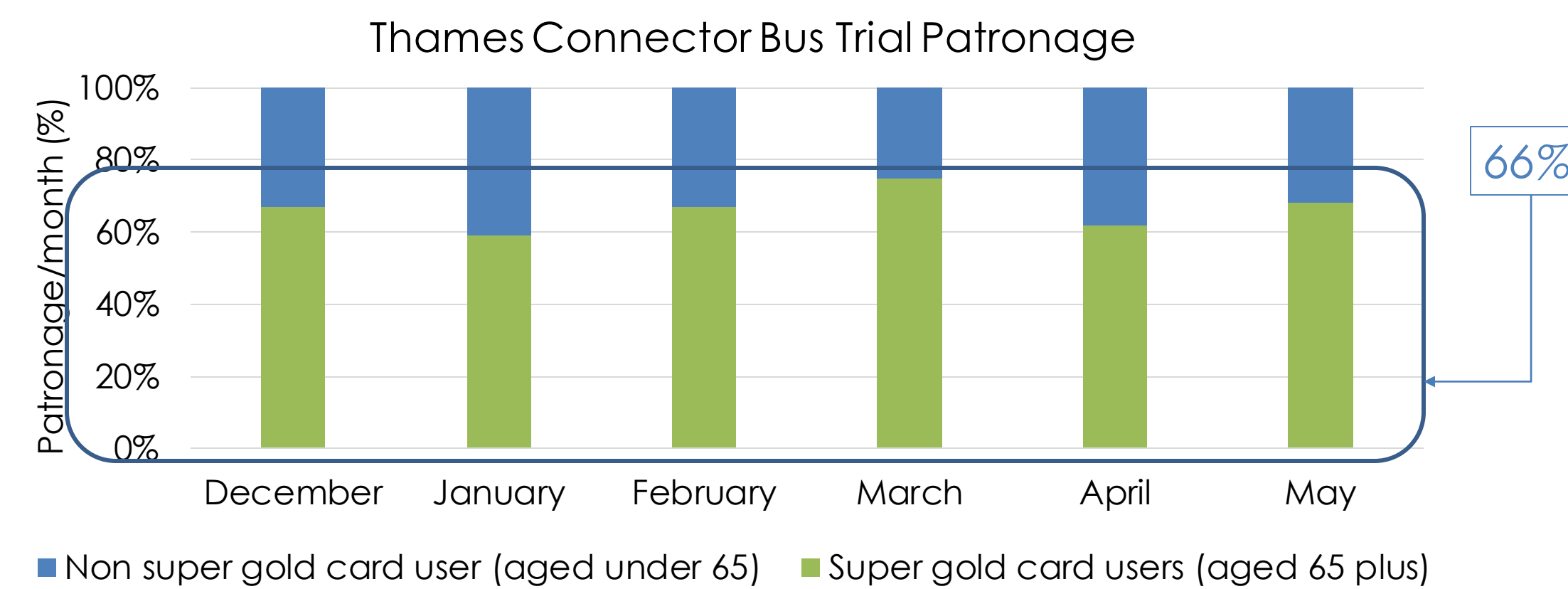


Demand Responsive Public Transport (DRPT) Service

- Door to Door service
- No fixed schedule or route
- Short booking period
- Suitable for areas of low passenger demand
- May fully funded or partially funded (i.e. U.S., U.K., Switzerland, etc)

METHODOLOGY

- Ridership Data from the 6-month trial bus service in Thames (Urban Connector) provide that high demand from the elderly population.



- In comparison, percentage (%) of bus users over age 65 in other NZ cities

- Palmerston North: **4.8%** (50,668)
- Whanganui: **26.4%** (38,396)
- Feilding: **9.9%** (8,686)
- Ashhurst: **12.1%** (676)

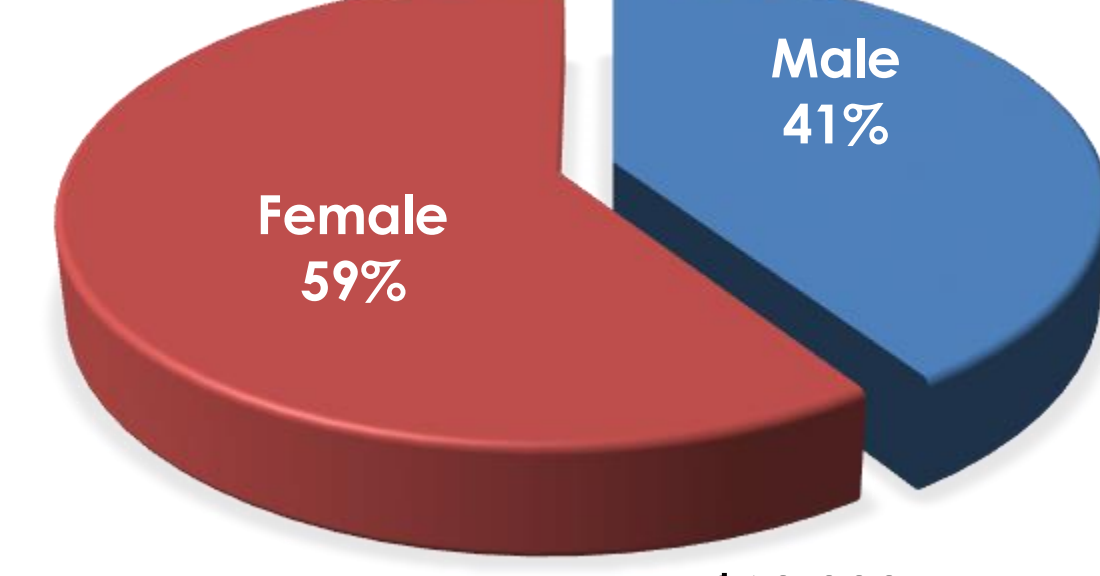
- A Revealed Preference survey completed between July and September 2018



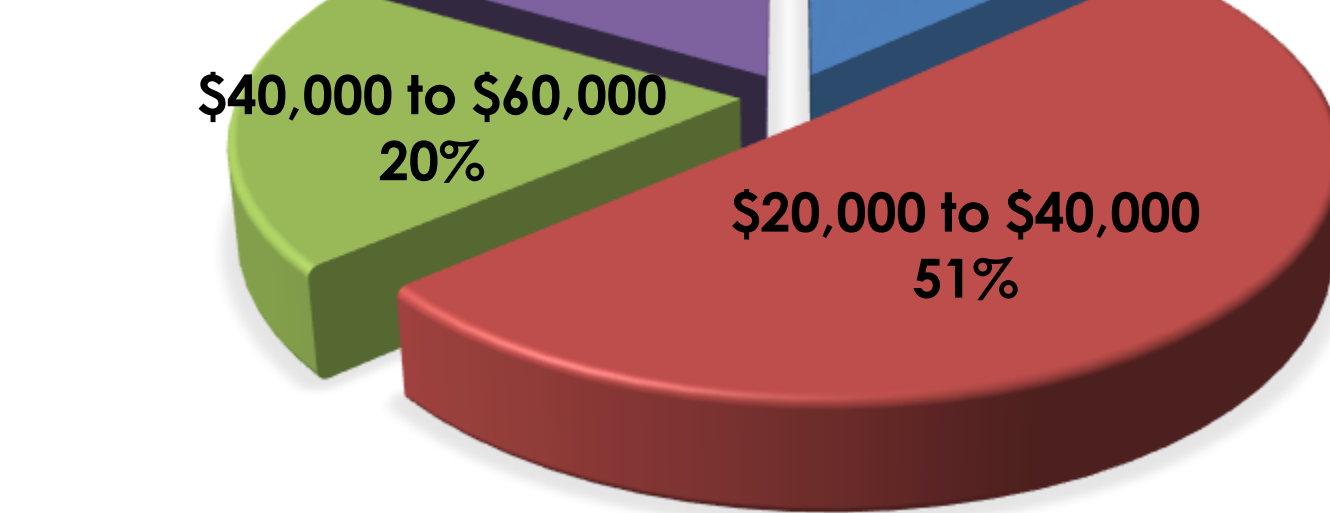
Acknowledgements:
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ANALYSIS

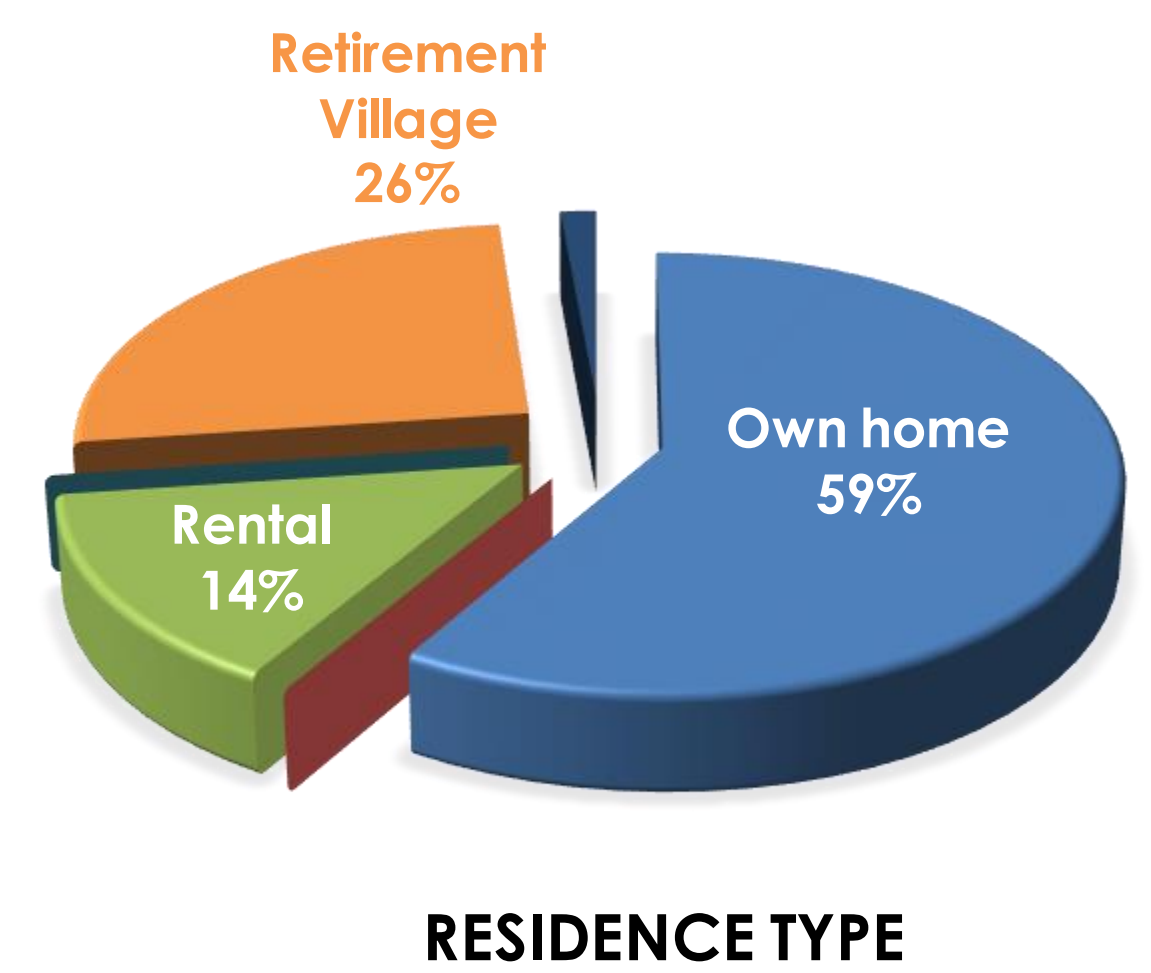
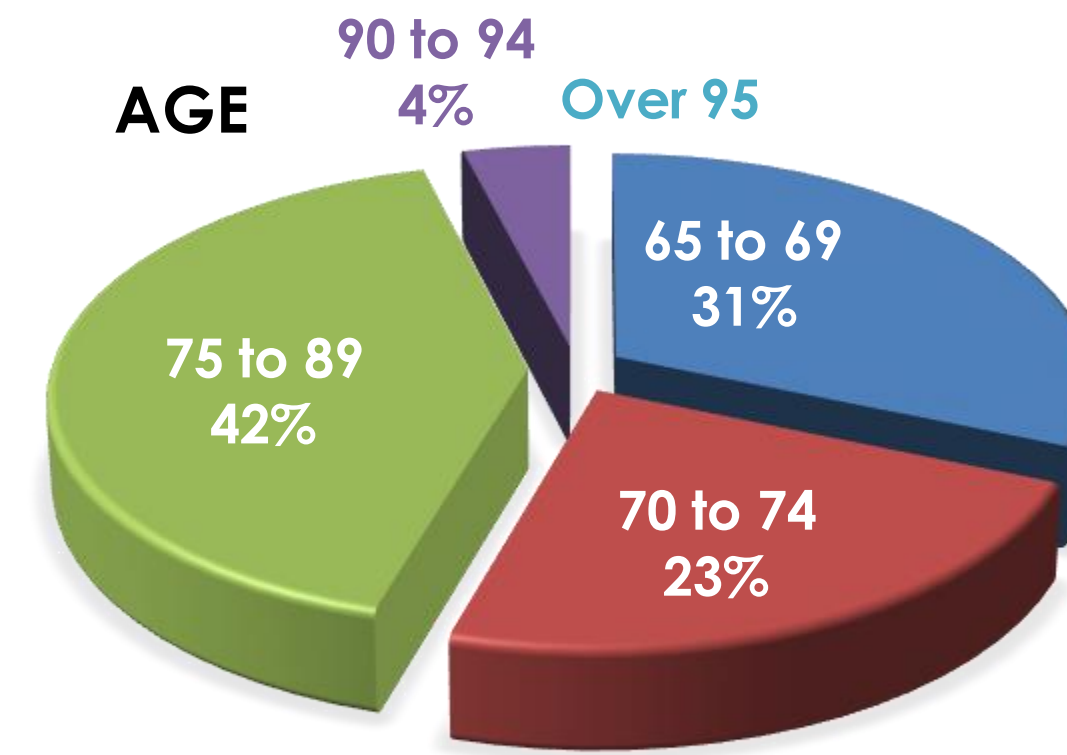
GENDER



INCOME



Survey Sample



Use of the Alternative Mode: Non-vehicle Owner

Alternative Mode	Weighted Avg. (%)	Rank
Walking (include Mobility scooter)	36.9	1
Friend/Family support	26.0	2
Bus	19.6	3
Taxi or Companion driver service	13.7	4

Estimation of a ROL model

The likelihood can be written as $Pr(U_1 > U_2 > \dots > U_j) = Pr(U_1 > U_j, j = 1, 2, \dots, J) \cdot Pr(U_2 > U_j, j = 3, 4, \dots, J) \cdot Pr(U_3 > U_j, j = 4, 5, \dots, J) \dots \cdot Pr(U_{j-1} > U_j)$

$$\frac{e^{V_1}}{\sum_{j=1}^J e^{V_j}} \cdot \frac{e^{V_2}}{\sum_{j=2}^J e^{V_j}} \cdot \dots \cdot \frac{e^{V_{j-1}}}{\sum_{j=j-1}^J e^{V_j}} = \prod_{j=1}^{J-1} \left[\frac{e^{V_j}}{\sum_{m=j}^J e^{V_m}} \right] Pr(U_1 > U_2 > \dots > U_K, K \leq J) = \prod_{j=1}^{J-1} \left[\frac{e^{V_j}}{\sum_{k=j}^J e^{V_k}} \right]$$

The main reason you stopped driving:

Vehicle and road factors

Causes	Weighted Avg. (%)	Rank
Operating costs of owning a vehicle	26.5	1
Dealing with traffic congestion	18.0	3
Poor road conditions	18.9	2
Lack of parking/difficulty parking	11.3	4
Design and comfort of your vehicle	3.3	5

Physical factors

Causes	Weighted Avg. (%)	Rank
Worried about getting lost	22.7	2
Concerned with other driver's behaviour	13.7	4
Health reasons (poor eyesight etc)	23.6	1
Confidence with driving	8.1	5
Traffic moves too fast	15.6	3

Trip Destination

Destination	Trip/wk	Rank
Shopping	1.91	1
Medical	0.32	5
Social	1.55	2
Recreation	0.42	3
Other	0.35	4
Total Avg. Trip	4.54	

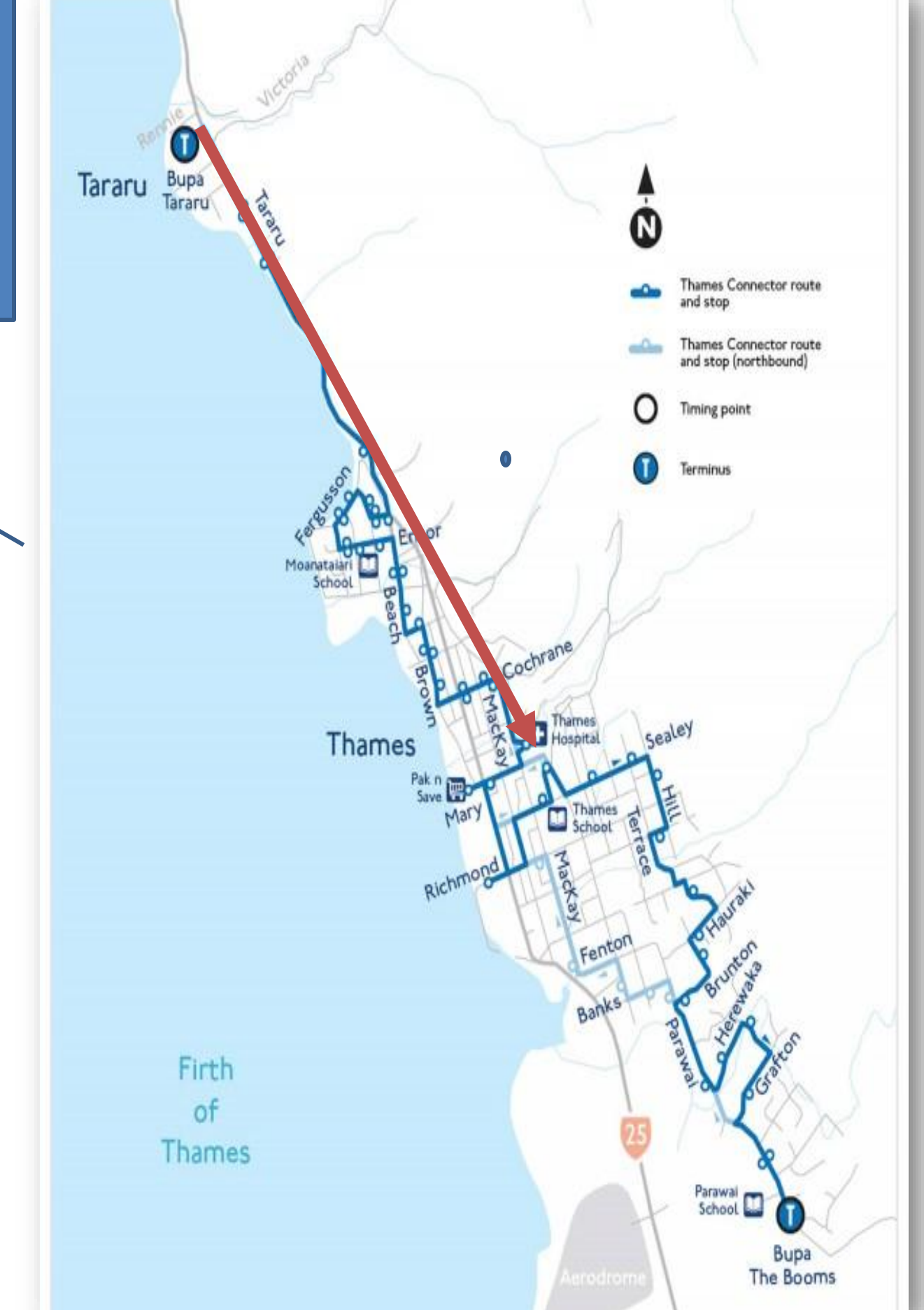
Use of Mode (Overall)

Mode	Trip/wk	Rank
Own vehicle	4.03	1
Bus	0.32	3
Taxi	0.13	5
Walking	0.52	2
Mobility Scooter	0.15	4
Friend and Family	0.07	6

Perception for use of the Public Transport: Constraints

Constraints	Weighted Avg. (%)	Rank
Accessibility (getting to the stop)	20.7	1
Difficulty boarding	16.6	3
Being able to get a seat	15.9	4
Being worried about crime	17.9	2
Public transportation is too expensive	14.1	6
Public transportation doesn't go where I need to go	15.3	5

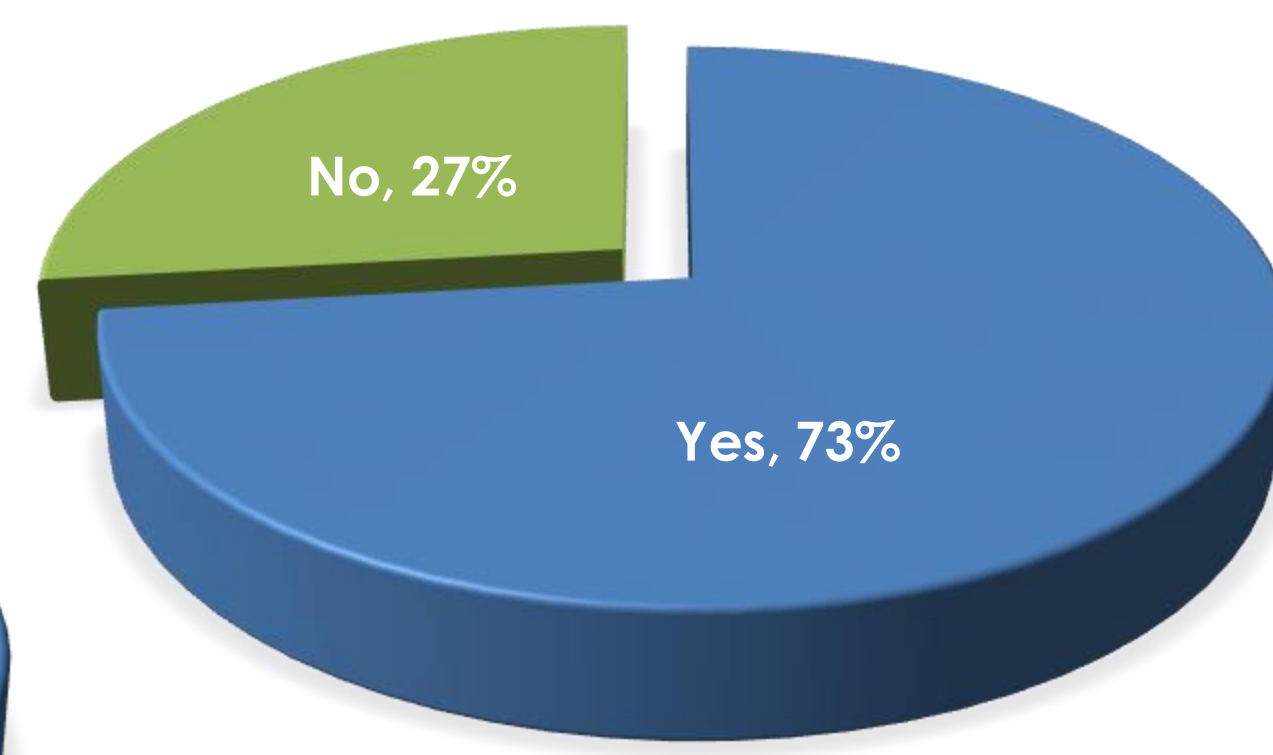
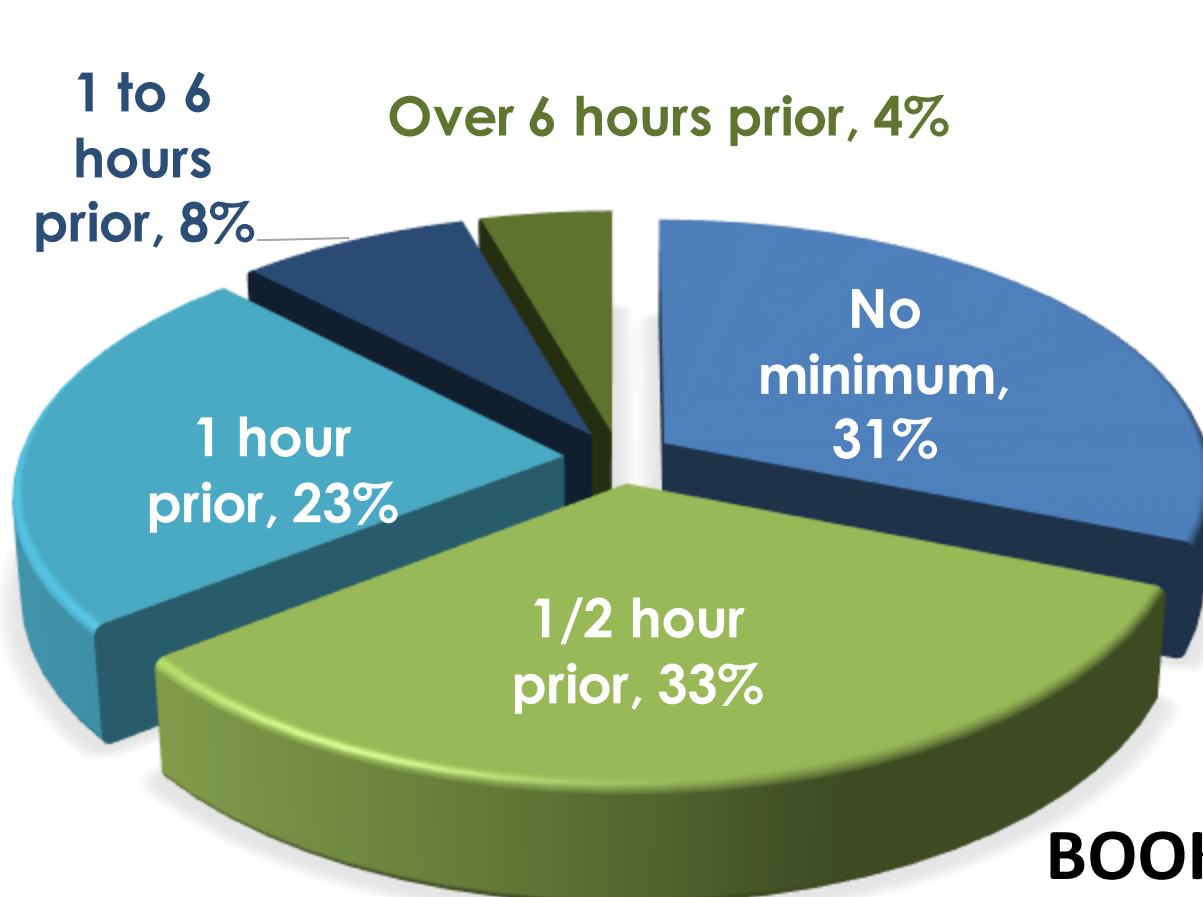
Sample Trip:
From Tararua to the Thames Civic Centre on Mary St.
• Total Distance: 3.7 km
• Travel Time: 5 minutes



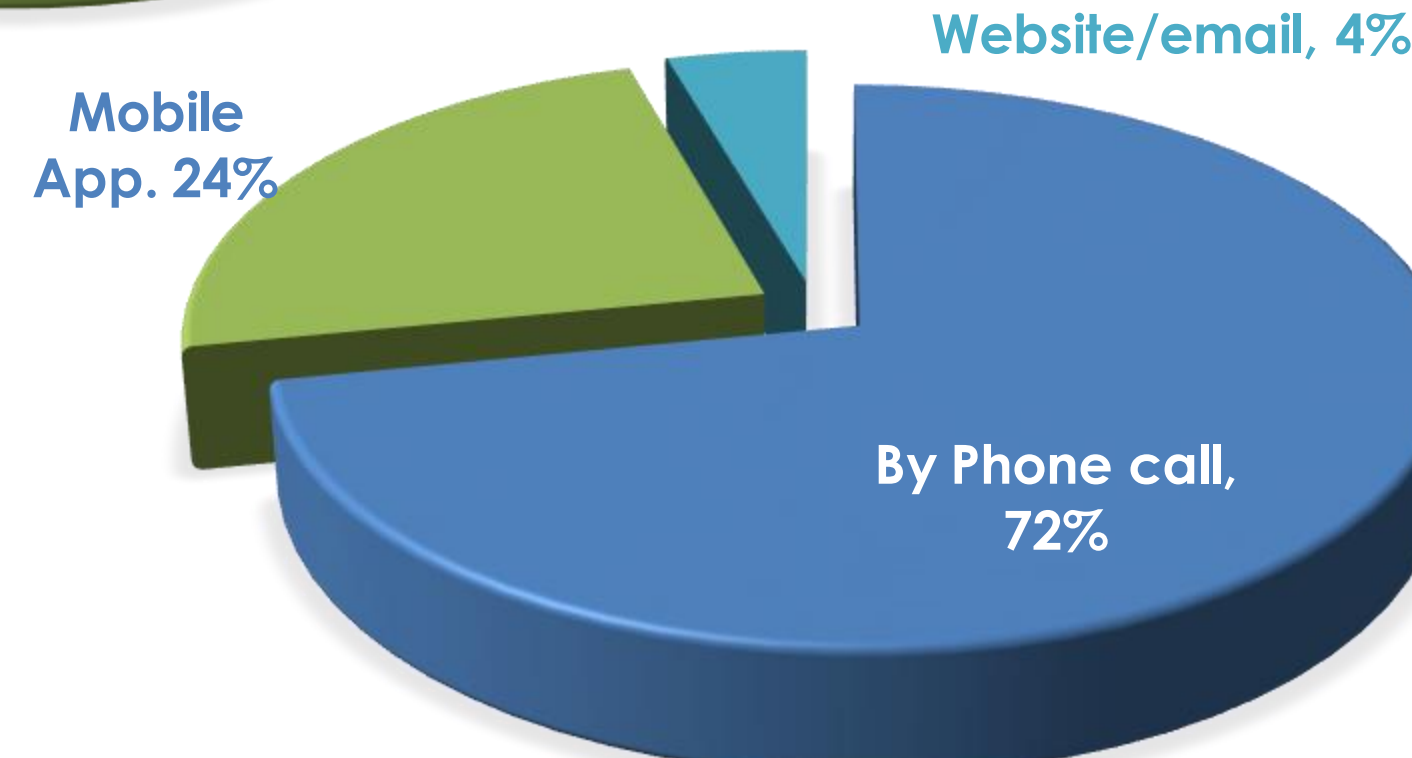
DRTP Demand Analysis

PERCEPTION FOR THE USE OF DRPT SERVICE

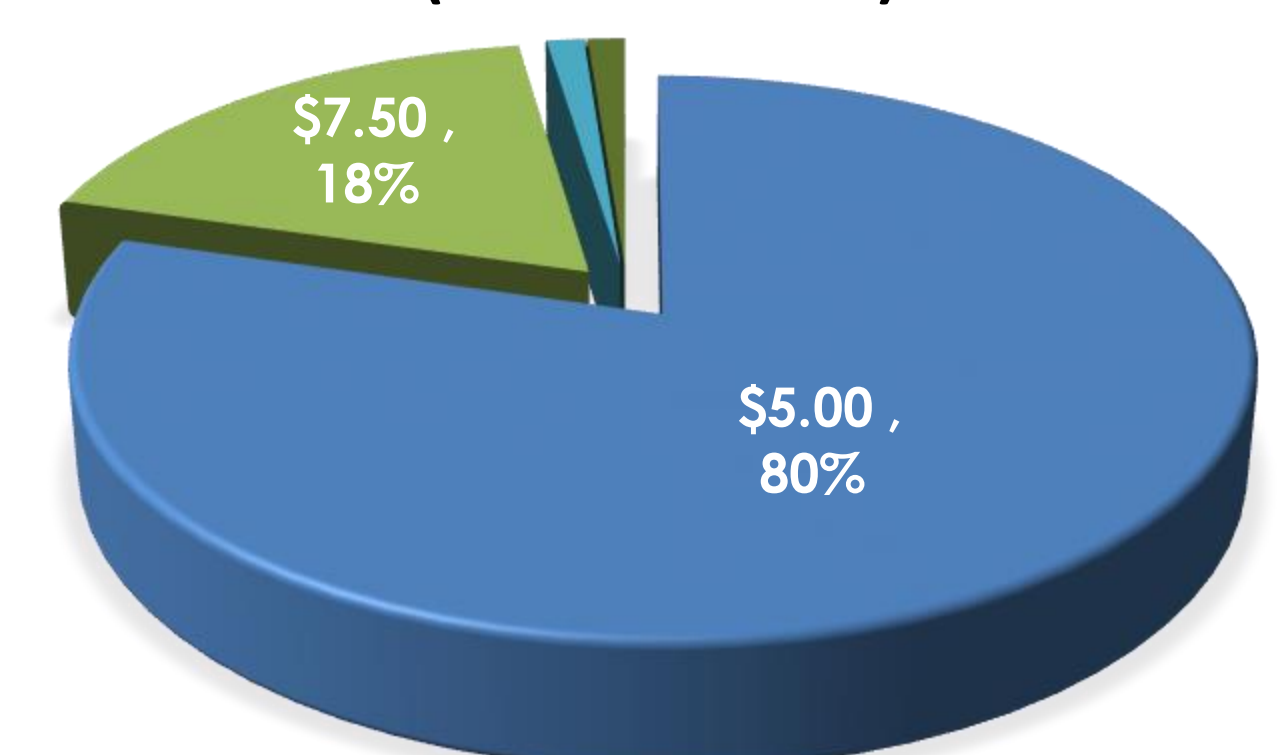
MINIMUM BOOKING TIME



BOOKING METHOD



FARE PER TRIP (DRPT SERVICE)



DISCUSSION & CONCLUSION

- The majority of elderly surveyed would consider using a Demand Responsive PT service if they could no longer drive their vehicle.
- The preliminary research confirms that there will be a greater need for flexible public transport options in small towns as the population ages.
- Accessibility is one of the biggest reasons why existing public transport needs to be improved to meet the growing demands for public transport for people aged over 65.
- The survey results suggest that the typical elderly user of a DRPT service in NZ rural would be: Female, Aged 75 to 89, Income \$20,000 to \$40,000, and Own their own home

FURTHER RESEARCH

- Feasibility study for a DRPT service and Operational requirements of a DRPT service,
- Accessibility of a DRPT service for people that have disabilities, and
- Expansion of the study to other small rural townships