Demographics do matter: an analysis of people's travel behaviour of different ethnic groups in Auckland

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Abstract

New Zealand in general and Auckland in particular is experiencing a significant change in travel volume, marked by an increase in the car ownership and public transport use. The increase in the travel volume is accompanied by a growth of the new immigrant population in Auckland. This paper seeks to find out the ways ethnic demographic characteristics might affect travel behaviour. It uses data from two sources, Statistics New Zealand and the Ministry of Transport New Zealand. Statistics New Zealand provides data on demographic characteristics which was collected from 2006 Census of Population and Dwellings and the Ministry of Transport feeds the data which was collected from 2010 New Zealand Household Travel Survey. This study found that demographic characteristics, ethnicity in particular, do matter in terms of travel choices, travel distance and needs. For example, the NZ Europeans was the group with the highest use of cars, especially as a driver, and Pacific Islanders was the largest in car use as passengers compared to other ethnic groups. The study also found that income, household structure and residential location can have a big impact on ethnic groups' travel behaviour. Understanding the differences in travel behaviour among ethnic groups and the possible explanations for these differences can help in the development of more appropriate policies, best suited to meet the travel needs of all population groups. As Auckland becomes more diverse over the next few decades, a significant portion of growth in travel demand will undoubtedly come from the minority population. Therefore, differences in travel behaviour, such as those identified in this paper, are likely to have wide-reaching consequences for short- and long-term travel demand forecast, planning, and policy development.
Keywords: travel behaviour, ethnicity, minorities, travel demand, Auckland.

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1 Introduction

New Zealand in general and Auckland in particular is experiencing a significant increase in travel volume, marked by a rise in the car ownership and public transport use. The increase in travel volume is accompanied by a growth of new immigrant population in Auckland. Why, when and how much the people travel, and what modes they use for travelling are dependent on various factors including household demographics, land use, resource availability, and cultural norms [1]. Although some factors may weigh more than others, it is likely that people's demographic backgrounds also play an important role in determining travel demand and choice. This paper attempts to investigate the ways ethnic demographic characteristics might affect travel behaviour, using data from two sources, Statistics New Zealand and the Ministry of Transport New Zealand.

Statistics New Zealand defines ethnicity as a measure of cultural affiliation and for statistical reasons it categorises people into six major ethnic groups; New Zealand (NZ) European, Maori, Pacific Islanders, Asian, Middle Eastern, Latin American and African (MELAA), and Other ethnic groups [2]. NZ European, Pacific, Asian and MELAA groups are based on regions where the individuals come from. Maori is the first indigenous ethnic group in New Zealand. They inhabited Aotearoa (New Zealand's name in Maori language) long before the European people and still live there. Other ethnicity includes people who identify themselves as New Zealanders. New Zealander is a new category that was introduced by Statistics New Zealand in the census in 2006. It refers to tenure in New Zealand, affinity with New Zealand, being born in New Zealand, nationality and to a few, ancestry. This categorisation is consistent with that of Thomas [3].

This paper is divided into three parts. The first part provides the background to the study, the second part mentions the socio-demographic characteristics of Aucklanders, and the last part discusses the travel behaviour of different ethnic groups.

2 Background to the paper

In the last two decades, New Zealand in general and Auckland in particular experienced a significant increase in travel volume [4]. An increasing level of car ownership and public transport patronage has led to a rise in travel volume. In 2008, NZ Transport Agency (NZTA) reported that average annual increase in vehicle kilometres travelled was 2.4% between 2003 and 2007 [5]. In 2009, Auckland Regional Transport Agency (ARTA) also reported that public transport users increased by 7.7% from previous year [6]. The increase in travel volume is accompanied by the emergence of new problems in transport system, such as, energy consumption and congestion problems. New Zealand is not an oil producing country. It makes New Zealand in general and Auckland in particular depend on other countries to get oil and the issue of energy sustainability very important. This dependency makes Auckland vulnerable to energy and economic crisis if the oil distribution is disrupted. Moreover, the high

use of fossil fuelled cars certainly has an impact on the environment. Carbon dioxide (CO_2) from fossil fuel combustion pollutes the air and degrades the environment. Unfortunately, that is not the only problem as traffic congestion has also become a big problem in Auckland. Research conducted in Auckland found that the city has the lowest average speed of travel among the Australasian cities, both during peak and off peak periods [7]. This is mainly caused by high car ownership. Almost every second person in Auckland owns a car [8], and this reduces the ability of roads to meet the travel demand. To mitigate the transport and other problems, Auckland council is currently preparing The Auckland Plan and one of its priorities is to reduce private car use and increase the use of more sustainable transport modes, such as walking, bicycling and public transport. From the draft of The Auckland Plan, it is clear that the council is ensuring that the city still remains a comfortable place to live in. One of the elements of a liveable city is the availability of good access to transport and connections, so that people can move around quickly and comfortably.

In the last few decades, the population of Auckland has increased significantly. Auckland's population is not just growing in number but also in diversity. The increase in Asian and Pacific population in the last few decades has reshaped the population structure in Auckland. An increase in population means more people need to travel. A more diverse population might result in the rise in travel demand differences. It is important to understand what factors affect travel demand in order to cater to the requirements of different groups of people. Travel demand is influenced by many interrelated factors. The mainstream research on travel demand has focussed on using intelligent transport systems, such as traffic recorders, and basic household demographics, such as car availability in the household and income level for modelling and forecasting travel [1]. However, ethnicity is rarely considered as an aspect of demography. Other socio-economic and demographic factors, such as income, employment status, and car availability have been the traditional inputs in the travel demand forecasting process. It seems travel behaviour analysis of specific groups, especially based on ethnicity, can provide valuable insights for planning and policy making. Understanding how the demand varies with the characteristics of the people would enable the policy makers to anticipate how different population groups would respond to and be affected by their various initiatives.

3 Previous research on travel behaviour and demographic characteristics

A large number of papers have studied the impact of socio-demographic variables on travel behaviour and found a significant relationship between travel behaviour and variables such as income, age, gender, and ethnicity (for example, [1, 9, 10]). Income level is known as an important variable that affects people's travel behaviour. Many studies show that low income people or households allocate less fund for travelling, compared to high income people. It means a high income person or household can travel more often and longer because they are able to spend more [10, 11]. Statistics show that income level

has a relation to car ownership. High income enables people to possess a car, but this argument is debatable because some other scholars found that income level has negative correlation to car ownership. The car ownership according to them is influenced by some other factors such as household size and cultural norms [12].

Studies show that income level affects people's residential location. Low income people tend to live in a deprived area because they cannot afford the housing costs in a wealthy area. The deprived areas are usually located far from job opportunities and public services. The cases of low-income minorities in the US and the UK who lived in (deprived) inner city are useful examples [13, 14]. The selection of residential location is crucial to people's travel distance and mode choice. If someone lives in a location where public services are inadequate they need to travel longer to avail a service [15]. People prefer to use motorised transport for long distance travels rather than walking or bicycling that will cost them fatigue. For the low-income groups, they have limited residential location choices.

Another factor that has an effect on travel behaviour is age. According to previous studies, children, young people, adults and older people have differences in their travel behaviour [16–19]. These differences occur because they engage in different types of activities. Children are mainly engaged in educational and playing activities, young people mainly in educational and social activities, adults or parents in work-related activities and the elderly mainly in leisure and social activities. These activities influence their travel distance. For example, children's activities are usually concentrated in a small area. Children travel less distance because their destinations, such as primary-secondary schools and parks, are usually not far from home. It is different for adults. Their activities are scattered. They might work in the Central Business District (CBD) and socialize in the parks or restaurants or they do other things in the different parts of the city. It makes their travel distance longer than other groups. For the elderly, physical constraints affect their travel behaviour.

The next important factor is employment status. Studies show that people who are engaged in part-time work usually travel longer than full-time workers as they are engaged in more than one work activity. Furthermore, previous research has shown that a person who works part-time, especially a woman, travels more often than full-time workers because they are engaged in other activities such as shopping for household needs or escorting the children or elderly [20].

The gender variable also has a considerable impact on people's travel behaviour. Previous studies have shown that women are likely to travel more often than men, but the total distance travelled is much less for the former. Some researchers have found that this is because of women's natural roles within the household. Their responsibilities include shopping or escorting children, that makes them travel more frequently than men, but trips are made close to home as their destinations are not far from their home [9]. A study in Germany by Vance *et al*. finds that women are less likely to use a car than men. The differences are also influenced by other socio-demographic factors, especially the presence of

the children. The children are found to play a significant role in reducing discrepancy of car use between men and women [21]. As women usually escort children to the places of their activities, the presence of children in a family lets women have more access to a car. McGuckin and Nakamoto also support the findings [22].

Only a few researchers have examined the association between ethnicity and travel behaviour. Contrino and McGuckin used data from the US Census Bureau and National Household Travel Survey and found that it is common in minority groups to have lower auto ownership, lower household income, greater household size, lower levels of employment, lower licensure rates, and concentration in deprived urban areas. With these characteristics, car sharing in minorities becomes a common choice [1]. Another study in America also reveals that the immigrant/ethnic minorities are more likely to use public transport than white people [23]. This is strengthened by Louikatou-Sideris who conducted a research in Los Angeles and found that around 96% of public transport users come from ethnic minorities [24]. The studies mentioned above, have shown that minorities tend to use more public transport and other "social type" of transport such as car sharing, compared to white/majority ethnic group. This indicates travel behaviour of different ethnic groups is likely to vary, resulting in different types of demand.

4 Data sources

This paper uses data from two sources, Statistics New Zealand and the Ministry of Transport. Statistics New Zealand provides data on demographic characteristics, which was collected from 2006 Census of Population and Dwellings. Data from the census in 2006 is the latest one because the census in 2011 was postponed due to the earthquake in Christchurch. The Ministry of Transport provides data which is collected from its New Zealand Household Travel Survey. The Survey has been conducted by the ministry since 2003 and this paper uses data from the survey in 2010. For the survey, each member of the selected households is asked to keep a record of all their trips on two specific travel days. They are then interviewed in person about their travel by trained surveyors.

5 Demographic characteristics of Auckland

People's migration makes destination cities more diverse in terms of socio-demographic characteristics. It is undeniable that economic and social segregation are also characteristics of diverse society [1]. In most cities, ethnic minorities, especially the low-skilled immigrants suffer from low economic prosperity. Auckland also shows this phenomenon.

In the last two decades, population growth in Auckland showed a steady increase. Population growth has been accompanied by the increasing diversity in the population. According to the census in 2006, the recent population diversity is higher than in the past. NZ European ethnic group was the largest but shows a

downward trend in the last four periods of census, from more than 70% in 1991 to around 51% in 2006. On the other hand, immigrant ethnic minorities show an upward trend. Asian shows the highest population growth, from around 5% in 1991 to more than 17% in the last census. Other minority groups (Pacific Islanders and Maori) show a very small growth with less than 1% in the last few censuses.

Regarding economic conditions, Auckland shows a positive growth marked by Gross Domestic Product (GDP) level that has increased from time to time. Based on the data from NZTA, every year there is a significant increase in the car ownership [5]. Data from the census in 2006 shows that the number of households who have minimum one car increased from the census in 2001 [25]. Although Auckland's economy shows a good sign in general, the income level varies with ethnicity. NZ Europeans had the highest income level of all ethnic groups, followed by Maori, Pacific Islanders (PI), and Asian and MELAA had the lowest (see Figure 1). The large number of Asian people who had yearly income level at $20,000 or less is due to the high percentage of people working part-time or not working at all (see Figure 2). One of the reasons why many Asians work part-time is that a high percentage of people belonging to this ethnic group who come to Auckland usually study at the universities. According to The University of Auckland (UoA) statistics in 2009, Asian was the second largest ethnicity in UoA (34.6%). NZ European was the largest one with almost 40% and the smallest was Maori (6.5%) [26]. This data is also supported by the data from Statistics New Zealand that shows the highest percentage of people who were not in the labour force was Asian [2]. The people who are not in the labour force include students who are not engaged in, or pursuing employment. The students from overseas usually rely on financing by their parents or they receive a scholarship that puts them under limited income.

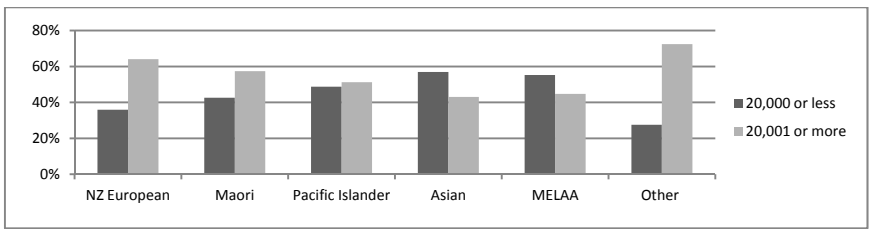

Figure 1: Income level of ethnic groups (source: [2]).

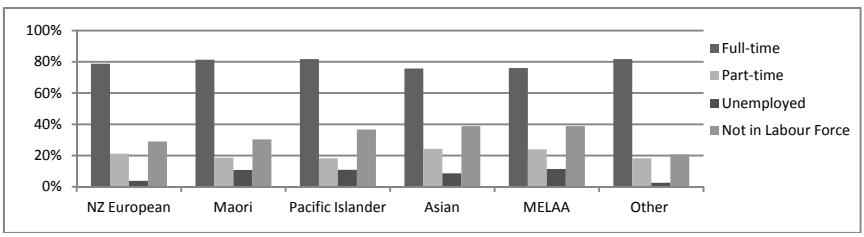

Figure 2: Employment status of ethnic groups in 2006 (source: [2]).

The population composition also shows different patterns among ethnic groups (see Figure 3). NZ European, Asian and MELAA were the groups that have highest percentage of people aged 30-59 which is a productive age cohort. On the other hand, Maori and PI were the groups with a large number of people aged 0–14. This age cohort is non-productive because this is a period when their main activities are playing and schooling. NZ European had the highest percentage of people in the 60 and over age cohort, while other ethnic groups had lower but almost similar percentages.

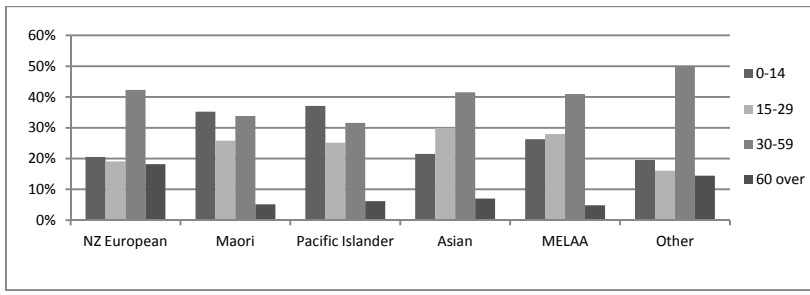

Figure 3: Ethnic composition in Auckland in 2006 (source: [2]).

6 Travel behaviour differences among ethnic groups

The New Zealand travel survey uses two different units of analysis, weekly and annual. The weekly measurement is based on how many trips are made in a typical week. Annual measurement includes all trips in a year. Travel behaviour data shows that NZ European, Maori and PI were the groups with the most frequent trips per week (see Table 1). The same pattern was shown by the total distance travelled in a week (see Table 2). The NZ Europeans travelled longer distance, followed by Maori, PI and Asian.

Table 1: Trip legs per person (Auckland residents) in 2010.

	Annually	Weekly
NZ European and other European	1590	30
Maori ethnicity	1500	29
Pacific Islander	1551	30
Asian	1278	25

Source: [27]

Table 2: Distance travelled per person (Auckland residents) in 2010.

	Annually (km)	Weekly (km)
NZ European and other European	11774	226
Maori	9459	181
Pacific Islander	9375	180
Asian	8781	168

Source: [27]

The pattern is almost similar if travel behaviour is measured on an annual basis. NZ European was the group with the highest number of trips followed by PI, Maori and Asian (see Table 1). For the distance travelled per year, the longest travel was made by the NZ Europeans followed by Maoris, PI and Asians (see Table 2). The pattern is not surprising because the NZ Europeans had a better income level, which enabled them to travel more often and longer than other groups. This is consistent with Carruthers *et al*. [28]. However, the question may arise why do the PI people travel more often than Maoris? Despite the fact that Maoris have better income than PI. Explanation for this finding is that PI had the higher percentage of children in their population than Maori. This made the PI adults travel more for escorting children to their activities. In addition, the PI had a high percentage of people who were not in labour force. The people not in the labour force include those involved in childcare or family responsibilities. According to Gossen and Purvis [29], a person, especially a woman, who is not working and lives in a household with children will travel more often than a working person.

Table 3: Mode share of trip legs in 2010.

	Walking	Car/van driver	Car/van passenger	Cyclist	Public Transport	Other (inc. Motorcycle)
NZ European and other European	16%	54%	23%	1%	3%	3%
Maori ethnicity	18%	39%	35%	1%	3%	4%
Pacific Islander	15%	43%	37%	0%	2%	2%
Asian	16%	48%	30%	0%	5%	1%

Source: [27]

In relation to mode share, Maori people walk more than the people of other ethnic groups (see Table 3). This may be due to the large number of children in their population composition. Children mostly walk as playing in the parks and going to the school are often done by foot. But it also depends on the location of their housing. If they live in a location where public amenities, such as school and parks, are near then they are more likely to walk. Even though Pacific people (PI) have a large number of children, they have the lowest modal share for walking among all ethnic groups. This is probably because they live in deprived areas, where access to public services is often poor, so they have to travel longer to obtain these services. Based on the census in 2006, the majority of PI's residential concentration was in three deprived suburbs of Manukau City (27.9%) – Otara, Mangere and Manukau. The children have to travel long distances for going to school in their case, which would make their parents drop them off by private cars in addition to walking them to school. Data from Community Perception of Personal Transport Choices survey confirms this assumption. PI respondents mentioned that walking is unsafe and using a private car can make their trips hassle-free [30]. This assumption is also supported by the data on car/van users. Pacific Islander has the highest percentage of car/van use as a passenger, compared to other ethnic groups. This makes sense because they have a high percentage of children (age group 0–14) in their population.

NZ European ethnic group had the highest percentage of people who drove their car/van. More than half of the NZ European population in Auckland used a car/van as its driver. While for the Asians, this figure was nearly half of their population. The PI and Maori were next with 43% and 39% respectively. Similar to travel volume, income could be a determinant factor here. A higher income level means a person has the higher ability to own and drive a car. It is consistent that NZ European as a group with the highest income will have the highest percentage of people who use car. In addition, the level of car use can also be explained in the light of population composition. The NZ European and Asian populations had the highest representation in the 30–59 year age cohort. This group is a productive age cohort and financially well-established so they have the ability to own and use a car. In addition, the population composition over 16 years of age for the Asian group was the largest among all ethnic groups. In New Zealand, the legal age to have a driving license is 16 years. Therefore, the possibility for them to drive a car is higher than the Maori and the PI.

With regard to public transport, all ethnic groups showed a very low percentage of use (between 2% and 5%). PI had the lowest and Asian had the highest percentage of public transport use. Consistent with the previous explanation that many of the Asian people were students, this can also be used to explain why more Asian people were using public transport. In a survey conducted by the Ministry of Transport [31], around 35% of public transport use was for educational purpose, the highest among all purposes. A survey in 2007 by ARTA and two universities, The University of Auckland and Auckland University of Technology (AUT), shows that 54% of the students used public transport [32]. Khan and Mohammadzadeh's [26] survey concurs with ARTA's findings. It means the Asians as a group, that has a high number of students, would use public transport more often.

Generally, the use of bicycle is very low in Auckland. Only 1% of NZ European and Maori opt for cycling and almost zero percentage of PI and Asian people use this mode. The distance between residential house and the CBD is one of many explanations that can be offered here. Lifestyle and culture can also be used to explain the phenomenon. In developing countries, especially in Sub-Saharian Africa, using bicycle has negative images. An image of rurality as well as poverty makes people from these countries put bicycle at the bottom of the modal hierarchy, and sometimes attach less value than walking [33].

7 Discussion and conclusion

New Zealand has been a popular destination for immigrants for a long time making the population of the country diverse. If the current trends continue, the ethnic minorities will contribute a lot to the future growth in travel demand. The data analysis has shown that the car use by all ethnic groups is high. This trend is contrary to some research in the US that found ethnic minorities tend to use public transport quite a lot for their daily activities (see section 3). In this study, it was found that minorities use car as a passenger to a great extent. This is probably due to the presence of high number of children in minorities, especially

Maori and Pacific ethnic groups. This shows that the age composition of ethnic groups influences travel behaviour. On the other hand, NZ European has the highest percentage of people who use a car as a driver, travel more often and longer than any other groups. The high level of income enables this group to afford and drive a car, and allocate more funds for travel expenses, leading to more trips and longer travel. The finding is in line with some other research that found income level affects travel behaviour. The findings of this paper show ethnic demographic characteristics, especially economic factors and age composition, affect people's travel behaviour.

The economic background of minorities, especially of the Asians, is a very important factor to consider. China and India, two major Asian countries contributing to almost 60% Asian population in Auckland, are experiencing rapid economic growth. It means young people who come to Auckland as students from these two countries will be likely to get a better financial support from their parents. They can afford to buy a car, especially because car prices in New Zealand are cheaper than their home countries and also because the desire to own and drive a car is very high among young people [34, 35]. It means the car ownership is likely to grow faster in the future leading to more congestion on the roads.

With the greater use of private car as a main mode of transport among minorities, the population projection that predicts the increase in the population of minorities in future, and the tendency of immigrant minorities to come to Auckland as students, initiatives can be taken focussing on public transport improvement to attract people to use it. The transport planners can benefit from understanding the travel behaviour and needs of these important and growing groups in New Zealand population in general and Auckland population in particular.

Understanding the differences in travel behaviour and the possible explanations for these differences can help travel demand modelling, and finding policies best suited to meeting the travel needs of all population groups. As Auckland becomes more diverse over the next few decades, a significant portion of growth in travel demand will undoubtedly come from minority populations. Therefore, differences in travel behaviour, such as those outlined in this paper have wide-reaching consequences for short and long-term travel demand forecasting, planning, and policy development.

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