Transport demand implications of changing population age and ethnic diversity in Auckland: A thought piece

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Introduction

This report offers a thought piece that highlights aspects of the extent and scale of changes in population ageing and ethnicity patterns that may have an impact on travel and transport infrastructure requirements in a future Auckland. It summarises current international and New Zealand research on demographic change, provides some summary forecasts in terms of changing age and ethnic profiles in Auckland and identifies potential issues and causal factors in relation to travel demand (who is travelling how, when and why).

The report has three main sections. Section 1 presents an introduction to trends in Auckland's population growth, ageing, migration, and ethnic diversity. This material provides the context for the transport impact discussion that follows. Section 2 presents the travel demand implications of an ageing population drawn from international and some domestic research findings. Section 3, similarly, presents the travel demand implication related to both changing migration dynamics and increasing ethnic diversity (superdiversity). Sections one and two identify areas requiring further research in an Auckland setting and raise a number of questions for consideration arising from this report.

1. Auckland's Population Trends

1.1 Growth Trends

Over the 24 years to June 2015, Auckland's population grew by 64%. However, growth has been volatile and has changed year-on-year. For example, it was extremely high between 2001 and 2006 and has been high again since 2013. It was also relatively high across the mid and late-1990s. In each of these periods, the main cause of growth was net migration (including both new internationals and New Zealand return migrants). In other years, there was relatively low population growth, with the majority of growth accounted for by natural increase (the excess of births over deaths).

Looking ahead, Statistics New Zealand's medium-case projections show significant growth but may underestimate that growth in the longer-term. Independent projections run by Professor Jackson suggest there will be slower growth in the first two decades of the 2013-2068 projection period than projected by Statistics New Zealand, and faster growth thereafter.[1] Other independent projections produce differing results again. This raises some questions about whether planners and other users of projections are working from the same premises and hold the same understandings of what population projections do/don't tell us.

Without doubt, Auckland's growth will not be even. Statistics New Zealand projections indicate that between 2013 and 2028, Auckland will grow by around 27%, and between 2028 and 2043, by around 18%. Moreover, growth within Auckland will not be even. Nine local board areas will grow by substantially greater rates across both periods, although growth will slow in the 2028-2043 period. Between 2013 and 2028, Upper Harbour Board, Waitematā and Franklin will grow by around 49, 46 and 42% respectively. At the other end of the scale will be Great Barrier, Manurewa, Kaipatiki and Waitākere which will grow by around 3, 10, 13 and 15% respectively. The same three 'leaders' will grow by around 28-29% between 2028 and 2043, while Manurewa is projected to have the slowest growth (<2%) followed by Great Barrier and Waitākere (3 and 8% respectively).

These differential growth patterns will be underscored by changing population share. Albert-Eden, for example, is projected to decline from 3rd largest local board area in 2013 to 5th largest by 2043. Facing more significant decline in share, Kaipatiki will decline from 5th to 13th, and Manurewa from 6th to 15th. Waitematā on the other hand will rise from 8th to 3rd largest, Maungakiekie-Tāmaki from 12th to 7th largest, and Franklin from 13th to 6th.

1.2 Ageing trends

The proportion of the population aged 65 and over in Auckland is steadily increasing and is expected to reach 320,000 by 2031, with 40,000 being 85 and over (Statistics NZ, n.d.). When compared to many other parts of the country, especially urban areas, Auckland will remain relatively youthful. However, the city will be home to some 27% of the country's older population (65+ years).
In 2013, half of Auckland's population over the age of 65 years lived in just seven local board areas: Hibiscus and Bays (9.8%), Howick (9.8%), Ōrākei (7.3%), Henderson-Massey (7.0%), Kaipatiki (5.8%), Whau (5.7%) and Franklin (5.5%). There has been minimal change in this situation since 2006, although

[1] The difference relates to different methodologies for projecting the impact of migration. Statistics New Zealand applies a fixed migration number distributed across the migration age-sex profile, the number reducing as a percentage as the population grows. Jackson applies the age-sex profile of migration directly to numbers by age; this method generates the number of migrants the region is likely to see.

population share at this age has fallen slightly in Ōrākei, Henderson-Massey, Kaipatiki and Whau, and risen in the other three.

The line-up differs slightly for the oldest-old. The single-largest number of those aged 85 years and over lives in Hibiscus and Bays, but Ōrākei is home to the second greatest number and Howick third. The oldest-old are also more likely to live in Albert-Eden and Devonport-Takapuna than Henderson-Massey, Whau, or Kaipatiki.

The local board areas with the structurally oldest populations (as measured by percentage of population aged 65+ years), however, are Great Barrier (22.0%), Waiheke (18.6%), and Hibiscus and Bays (17.8%). Rodney and Devonport-Takapuna follow closely, with 15.8 and 15.3% respectively. Devonport-Takapuna, Hibiscus and Bays, and Ōrākei have the greatest proportions aged 85+ years.

These distributional differences—on the one hand, where the majority of elderly live, and on the other, the board areas with the structurally oldest populations—have different service implications and should not be confused. Greater numbers mean the need for greater service options, but also the opportunity to concentrate those services in fewer areas, while structurally older populations need similar services – but not necessarily in the same number. The local board area with the greatest proportion over the age of 65 years (Great Barrier, 22%) has substantially fewer older people (210 persons) than the area with the greatest number but only the third oldest population (Hibiscus and Bays, 16,000 people aged 65+ years, 17.8% of the total Hibiscus and Bays population). Similarly the area with the second greatest number aged 65+ years, Howick, has only 12.6% at those ages. It is critically important to differentiate between numbers and structures when considering future travel demand implications.

1.3 Migration trends

Natural increase has been the main driver of population growth over the longer term. While migration is popularly thought of as the main driver of Auckland's growth, over the past 20 years, natural increase accounted for the slightly greater contribution (58%).[2] However, It is the periodicity or *volatility* of the migration flows that tell the main story. Over the 1996-2001 period, Auckland experienced an estimated net migration gain of almost 42,000, the number more than doubling in the following period (2001-2006) to 89,059, but then reducing to just 9,139 during the period 2006-2011. Since then, the four year period 2011-2015 has seen that number increase again to 52,261, the vast majority of it since 2013. This growth has occurred during a period (2014-2015) when overall arrivals and net gains for the country have been at an historic high, with Auckland a major beneficiary. Given past volatility, and the current peak in arrivals, it is extremely hard to forecast trends in the medium or long term.

The breakdown of net migration into its overseas and internal components is not straightforward, even for Auckland.[3] As with overall growth, Auckland experiences considerable turbulence in terms of

[2] That said, a proportion of the natural increase is attributable to the births of migrants, so the split is plausibly around 50:50.

[3] Permanent/Long Term (PLT) migration data are not a good indicator of migration at subnational level because first, many people nominate Auckland (or other centres) as their destination on their arrival card but do not actually know where they will finally settle, and second, PLT data are cumulative (covering the number of migrants arriving/departing to/from a region or TA over a full year), while census data give a better cross-sectional snapshot of where they are actually living. The most rigorous migration composition data are those based on the Census question 'where did you live five years ago'? To these data are applied some additional estimation techniques, to apportion those who do not adequately state where they lived five years ago, and to derive a figure for those overseas at the time of the census.

its overseas and internal migration. In the two periods 1996-2001 and 2008-2013, similar net gains from internal migration were experienced (+2,365 and 1,705), while in the middle period (2001-2006) internal migration was quite strongly negative (-11,737). In the very high overall growth period 2001-2006, the net gain from overseas migration (+100,796) was 2.5 times that of the 1996-2001 period and 10 times that of the 2008-2013 period.

While Auckland thus experiences significant migration-driven growth, the ebbing and flowing of the migration wave is of 'shock' proportions and profoundly complicates the problem of accommodating – and anticipating – that growth. As evidenced in the media, this volatility regularly causes various agencies to question Statistics New Zealand's population projections, which periodically seem too low or too high in comparison to actual (estimated) growth. The issue is not if Auckland will get the projected number, **but when**. Consequently, anticipating and planning for substantial growth is critical, while at the same time recognising that its migration component will fluctuate.

1.4 Ethnicity trends

Contribution to growth by ethnicity will differ markedly. Projections by major ethnic group indicate that between 2013 and 2038, those of Asian-origin will contribute around 60% of Auckland's growth while the European-origin and Pacific populations will each contribute around 21%, and Māori 14%. (Note that these proportions sum to more than 100% due to New Zealand's multiple ethnic group enumeration methodology). Those of Asian-origin will account for over five in every ten new Aucklanders, those of European and Pacific Island origin for around two each, and Māori one.

Contribution to growth by ethnicity will differ markedly at local board area. The vast majority of growth in the Kaipatiki and Ōtara-Papatoetoe local board areas is projected to be by those of Asian origin, offsetting the underlying decline in the European/Pākehā population. Four local board areas will see residents of Asian origin account for over 80% of growth (Puketāpapa, Whau, Howick, Devonport-Takapuna) and a further seven areas between 56 and 68%. Manurewa is projected to see the majority of its growth (around 61%) from Māori.

One potential outcome will be 'white flight' from six local board areas: Kaipatiki; Ōtara-Papatoetoe; Howick; Māngere-Ōtāhuhu; Puketāpapa; and Manurewa. By 2038, the European/Pākehā population is also projected to be relatively small in several local board areas.

These trends have implications for tangata whenua. While Auckland's Māori population is projected to grow by almost 60% by 2038 and the current numerical domination by the European-origin population to decline, from 5.2:1 (European: Māori) to around 3.7:1, the Asian and Pacific Island populations are projected to rise *vis-à-vis* Māori. Māori in Auckland are currently outnumbered by 2.1:1 by Asian and 1.3:1 by Pacific Island people. These ratios are projected to increase to 2.7:1 and 1.4: 1 by 2038 and, as indicated, they differ markedly at local board area.

A political connotation behind these relatively simple demographic trends with respect to Māori is that transport demand, alongside other equitable service delivery commitments for Māori, exists through the Treaty framework and in the status of Māori as Tangata Whenua. This includes the capacity of Māori to participate in decision-making, and to have any specific transport requirements in relation to social interaction (such as access to marae) and social and educational services considered.

1.5 Where next with regard to population growth?

Population growth raises important questions for transport planners, including:

- How do transport planners ensure appropriate and equitable infrastructure and services given quite different growth projections and the growth or decline of local board population share?
- How can transport planners anticipate the volatility in population growth fuelled by both migration and age-related changes?

Public transport, private vehicle and active transport infrastructure audits (by location and demographic profile) could be useful for filling data gaps with respect to Auckland's transport infrastructure information. Car ownership, driver license and access rates could also collectively help to paint a more complete and nuanced picture. An examination of international best practice in other comparable city locations is also warranted (i.e. those cities facing rapid and diverse population growth).

Quantitative data-driven audits can be limited, however, because they fail to account for differences within groups and location. Any further research would benefit by focusing on the experiences of those who might (or might not) use the range of transport modes available.

2. Travel demand implications of ageing

2.1. Introduction

As discussed in the preceding section, the proportion of Auckland's population aged 65 and over is steadily increasing (Statistics NZ, n.d.). This age cohort (compared with previous over 65 cohorts) is generally healthy, independent, highly mobile, and strong consumers of the transport system. Consequently, it is expected that this growing demographic and its characteristics will have a significant impact on travel demand, infrastructural requirements, traffic safety and public transport services, but it is less clear what that impact will be.

This section has five parts. First, international trends in transport and mobility are presented. The empirical research is drawn from studies in a number of developed countries that have contributed significantly to our knowledge about mobility and travel behaviour in old age. Where possible we consider the extent to which the results apply in a local setting, notwithstanding the geographical and socio-cultural differences in New Zealand. The extant studies on older adults emphasise the importance of ensuring continued access to services, continued opportunities for community engagement and connection, and the importance of maintaining mobility in contributing to wellbeing more broadly (Office for Senior Citizens, 2014). The second part draws on local research and considers those factors influencing the travel patterns of the ageing population in Auckland. It is noted that there are few relevant studies of New Zealand, let alone the Auckland context. The third part considers the travel characteristics and needs of Auckland's ageing population while the fourth briefly considers the specific transport needs and behaviours of Auckland's youthful population. The final part considers gaps in knowledge and opportunities for future research.

2.2 International trends

The international research and literature on the implications of ageing for transport demand presents mixed messages. Three particular, albeit contradictory findings are of interest. Some studies predict ageing will increase car use, some suggest it will reduce car travel and increase public transport patronage, and some suggest active transport modes such as walking will increase where housing and infrastructure reaches an appropriate density threshold.

a) Car usage

International research shows broadly that people aged 65 or over are generally healthier and more mobile, with higher car reliance than their parents before them (Siren and Haustein, 2013). These trends are reflected in higher levels of driver licensing rates and car access among this age group (Hjorthol *et al.*, 2010). Research examining the travel behaviours of Danish "baby boomers" also shows that this group is more likely to keep their driving licenses into older age (Siren and Haustein, 2013).

Increased access to cars compared with previous generations is evident in numerous international studies. For example, in a Canadian study in Quebec, older people were found to generally live outside core urban areas, to be more car-dependent and make more daily trips in Quebec City (Miranda-Moreno and Lee-Gosselin, 2008). Research exploring the mobility effects of an aging society in the Netherlands (Arentze *et al.,* 2008) showed that increased trips are often due to changes in shopping patterns with increased shopping, social and leisure activities. The most frequent car-based activity was found to be daily shopping, followed by outdoor activities. Although this was the case for both women and men, women reported a higher frequency of shopping trips (see also Van den Berg *et al.*, 2011; Newbold *et al.*, 2005; OECD, 2001). This highlights the importance of considering the relationship between ageing and gender.

A better understanding the role of older women in shaping future transport demands is vital. Older women are the fastest growing segment among drivers with more varied out-of-home activity patterns than men (Coughlin, 2009). When asked why they choose to drive, women are less likely than men to identify with the pleasure of driving and more likely to describe socially-oriented reasons for driving that centre on connecting with family and friends (Rosenbloom and Herbel, 2009; Siren and Hakamies-Blomqvist, 2005). Relatedly, support and care for children and grandchildren is also cited by women aged 60 and over as a reason for driving. The increasing number of women who care for both aging parents and their (grand)children (often described in the literature as the "sandwich generation"; see Rosenbloom and Herbel, 2009) might also influence women's car usage in their old age (Coughlin, 2009).

Levels of car use in high population density settings are shown to vary for different age groups. While younger adults often substitute their car use with other modes of transport, older adults do not appear to do so. Instead, some studies have shown they are more likely to increase car use and travel longer distances – often to mitigate concerns about safety when using public transport (Figueroa *et al.,* 2014). However, it should also be noted that other studies have shown that following retirement, people often decrease their private car use compared with people of other age groups (Páez *et al.*, 2007). Perhaps relatedly, Golob and Hensher (2007) showed that older women will often stop driving (becoming a passenger instead) due to perceived deterioration of driving skills (perceptual, judgment and response problems in traffic flow), fear of involvement in crashes, and greater vulnerability to traffic injuries and trauma.

In addition to changes in car use, there is also the question of the wider impact of older car drivers on the whole traffic system with a hypothesis that as ageing drivers increase in number, there may be unanticipated changes in driving habits, such as an overall trend toward slower driving (Hakamies-Blomqvist, 1999).

b) Public transport use

International public transport findings point to three considerations: older people graduate into public transport over time and may eventually become captive to the public system; public transport use is greater where population, housing and high quality infrastructure are more dense; and proximity, cost, and comfort all affect uptake of public transport.

In a study of trip chaining[4] activity in Sydney, Golob and Hensher (2007) found that people aged 65 and over often shift from being a car driver to a car passenger (either through loss of license or choice) before finally becoming a passenger in public transport. The research also showed a curtailment of travel activity, especially for women and those who are single. Underpinning these results is a clear preference for older adults to maintain car driving for as long as possible. The reduction in mobility when private transport is no longer available has potentially significant implications for levels of social isolation. Interestingly, Siren and Haustein's (2013) study of Danish "baby boomers" showed although 32% of respondents thought it was "not at all likely" that they would still be driving by the time they reached 80 years of age, 25% of respondents thought it was "very likely" or "likely". The results also revealed gendered differences with more men than women expecting to still be driving when they were 80. Expectations of future driving and/or public transport use could also have implications for social isolation. The cancellation of a driving licence could potentially lead to older people becoming "captive public transport users" with limited mobility and freedom (Siren and Haustein, 2013).

[4] Trip chaining is generally defined as a sequence of trips or stops during travel between two locations (for example, stopping for groceries between home and work).

The residential location of the ageing population is important as there is a positive relationship between higher population density and improved public transportation supply and use. Increased density has been found to decrease the likelihood that an older person will drive. That said, Broome *et al*. (2009) find that older people may have difficulty accessing public transport during the initial stage of mode shifting from, for example, private car to bus or train. The difficulties arise as people identify that public transport is not door-to-door and time, safety, and mobility decisions need to be made in order to use public transport effectively. Nor is proximity of public transport to older people's homes the only issue, but also the level of comfort on the public transport such as low floors for ease of access, comfortable and safe seating, appropriate non-patronising behaviours from the transport operators and travelling publics, and cost-effective fare structures.

c) Active modes

International research shows that dense areas and good infrastructural conditions facilitate walking, cycling and out-of-home activities for older adults. Therefore, having places to go within walking distance increases the number of non-leisure trips such as shopping, going to the post office and bank (Haustein, 2012). Intentions to use active forms of mobility appear to be influenced by car access as well as socio-economic level; those who are fairly affluent and mobile are more likely to view cycling and walking positively. The extent to which modes of mobility and socio-economic status are correlated in an Auckland setting is worthy of investigation, especially given location-specific population change across Auckland.

2.3. Factors influencing the travel patterns of the ageing population in Auckland

The previous section considered international research. This section turns to transport-related research carried out locally, the results of which suggest that three conditions appear to have an impact on travel patterns: declining income and associated transport subsidisation; the residential location of over 65 year olds; and health-related longevity and its impact on living situations.

a) Employment/income

The retirement age with eligibility for superannuation is currently 65 years in New Zealand. Consequently, lower employment rates and income levels are expected after 65. Between 2004 and 2007, 64% of people aged 75 and older earned $20,000 or less a year in New Zealand (O'Fallon and Sullivan, 2009). The evidence shows reduced mobility demands for this age group, with low income retirees more likely to be sensitive to petrol prices resulting in less frequent car use (Currie *et al.*, 2006).

A range of indirect financial support is available to those of retirement age in New Zealand. The main provisions currently in place are the SuperGold Card, which provides free off-peak (between 9am and 3pm, after 6.30pm, and all day on weekends and public holidays) bus and train travel in Auckland; and the Total Mobility Scheme, which subsidises taxi services to older people with Auckland Transport contributing a maximum of $40 per trip to eligible people. In 2015, there were over 662,000 SuperGold cardholders nation-wide with this number increasing at an average of 29,000 cards per year (Ministry of Transport, n.d.). On average, a SuperGold cardholder makes 16 trips per year (Ministry of Transport, 2015). In Auckland in 2015, there were nearly 179,000 SuperGold cardholders, which is increasing at 3.8% per annum (data provided by AT public transport operations).

There are significant differences in trip purpose for older people compared with the general adult population. According to the 1997/1998 New Zealand Travel Survey and the 2001 Census (Auckland, Wellington and Christchurch), the general adult population (age group 25-59) make 21% of their total trips for work or education purposes compared with only 2% for those aged 65 and over (O'Fallon and

Sullivan, 2003).[5] This reflects the reality that only 2% of the 65 plus age group are in full-time employment, compared with 62% of those aged between 25 and 59 (O'Fallon and Sullivan, 2003). The trip purposes of older people instead revolve around social interactions, going to the shops, healthcare services, and leisure activities which can often be carried out off-peak. Currie and Stanley (2008) theorise that public transport used in this way can provide opportunities for social interaction, creating social networks, trust, reciprocity and social capital. More recent analysis shows that travel volume among older adults in increasing (New Zealand Household Travel Survey 2004-2007; O'Fallon and Sullivan, 2009) resulting in a higher share of the total traffic volume when compared with results from the 1997/98 travel survey. The data clearly indicates a trend of increased mobility (both by car and public transport) of the older adult population.

b) Residential location

The residential location of the elderly has a profound impact on their travel patterns and mode of choice. Figure 1 shows that the majority of the elderly population in Auckland will, in the future, be living in the middle and outer suburbs. The outer suburbs are currently less well served by efficient public transport making it less likely that older people will use public transport. The Office for Senior Citizens (2014) argues that less comprehensive and accessible public transport services in an area leave the elderly feeling socially isolated and disconnected from vital services such as health care. Ultimately, this impacts on the wellbeing of older adults.

Research identifies a range of possible solutions to this problem including: regular feeder, Demand Responsive Transport (DRT) and UBER services to link trunk public transport networks; provision of shopping, health care services, leisure and other services in new developments; clustering land uses into activity nodes to maximise public transport, walking and cycling options (Frith *et al.*, 2012); developing a better network of paths for pedestrians, powered wheelchairs, scooters and bicycles including pedestrian crossings to encourage the use of these transport modes when possible; and locating any new town or neighbourhood centres near existing railway and bus terminals to make public transport convenient and easily accessible.

[5] It should be noted that the proportion of those aged 65 plus who are involved in paid work has increased significantly in recent years.

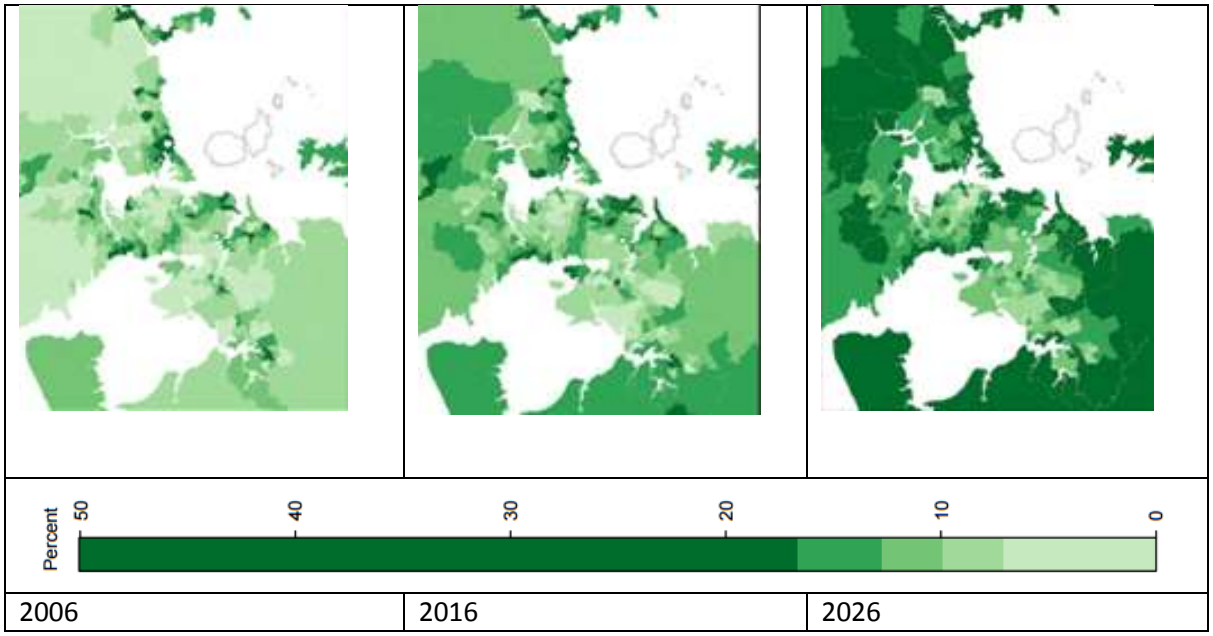


Figure 1 Percentage of population aged 65 years and over for the Auckland region
(Source: Statistics New Zealand, n.d.)

c) Socio-health conditions and car sharing opportunities

In New Zealand, improved general health has increased age expectancy for both men (from 79.8 in 1960 to 90.4 in 2014) and women (from 84.5 in 1960 to 92.9 in 2014). This has generated a need to consider mobility requirements over a longer period (Statistics New Zealand, n.d.). In addition, older people are increasingly likely to live alone or with a small number of people in a multi-unit dwelling or a retirement home in a low density environment. These new living patterns will provide opportunities for car sharing or carpooling projects in urban areas.

2.4. Travel characteristics and needs of the ageing population in Auckland

Three behavioural responses evident in the local literature reflect the travel characteristics of 65+ Aucklanders: less overall volume of travel; a preponderance of off-peak and daytime travel; and an influence from perceived personal safety on travel behaviours. These responses in turn have a direct impact on older people's needs and aspirations both in relation to public transport use and more active forms of travel.

a) Travel volume

Older adults travel less in overall distance, and the number of trip legs and the number of overall trips per day are fewer, compared to any other age group (O'Fallon and Sullivan, 2003; Frith *et al.*, 2012). People over the age of 65 are also more likely to stay at home on any given day compared to other adults (O'Fallon and Sullivan, 2003). People's driving activity peaks when they are in their 40s and 50s and decreases after this age. Age-related travel patterns are also reflected in driver licencing rates, with approximately 60% of the 75+ age group holding a licence compared with 90% of the 25-59 age group (Frith *et al.*, 2012).

b) Travel time

Older adults generally travel (59% of all trips) at off-peak times (9:30am - 3:00pm), whereas only 39% of the 25-59 age groups trips are made during these times (O'Fallon and Sullivan, 2003). Evening travel is also significantly lower for the 65+ age group when compared with other age groups. Research that explores the influence of the GoldCard on these travel patterns would be useful.

c) Mode effects of perceived personal safety

Older adults are more likely than their younger neighbours to feel unsafe in their community after dark. Auckland results from the NZ General Social Survey showed just 58% of people aged 65 or older report feeling either safe or very safe in their own neighbourhood at night. During the day, this pattern is reversed with this age group more likely than other age groups to report feeling very safe during the day (47% compared with an average of 42% for the other age groups combined). Due to safety and security concerns, the elderly in Auckland are less likely to use buses and active modes of transport (O'Fallon and Sullivan, 2003). This situation becomes more acute when the elderly are living alone. Furthermore, the majority of the 65+ age group's trips appear to be made in a car as a passenger due to lower licencing rates among the elderly and fewer cars per person and household. Therefore, over 65+ people become more dependent on family, friends and service providers to provide mobility (Frith *et al.*, 2012).

d) Public transport needs & aspirations

The above variables clearly show that the elderly have complex mobility needs and patterns. Most have restricted/low income, may no longer be able to drive, are uncomfortable about the prospect of walking (or are unable to walk) long distances to a train station or bus stop, require reliability of public transport but flexibility within time restrictions, may require assistance if travelling alone, and make life and housing decisions based on mobility and access to transport (Cheyne and Imran, 2010). This alters the public transport supply factors for older adults in the following ways:

- Minimum walking distances are required between pick-up and drop-off points;
- Simple booking/purchasing requirements and clear, easy to understand information about services offered is necessary;
- Comfort and cleanliness of public transport and confidence in the driver is important; and
- Shared transport facilities can provide company and support (Cheyne and Imran, 2010).

Many elderly list safety as a factor for not using public transport. Things such as better access, more security, rest rooms, and places to rest while waiting, readable signage and courteous employees are necessary (Frith *et al.*, 2012). Even with all of these improvements, public transport may not be able to fulfil need, especially in the absence of feeder or DRT to connect low density outer suburbs where older people generally live. The main accidents suffered by elderly on public transport are caused by tripping or slipping on floor surfaces, often occurring during wet weather or when the driver is accelerating or braking (Frith, Mara and Langford, 2012). More work needs to be done to reduce the public transport related barriers to increasing patronage by the elderly.

Some more specific needs of this age group (adapted from Currie *et al.*, 2006) include:

- *Door-to-door services*. The distances to public transport stops need to be reasonable for older people to comfortably walk. Paratransit (small minibuses, taxis and private cars/UBER) can be used to access public transport stops or in areas where demand is low. In much the same way as bike racks on buses are provided, spaces may need to be provided for mobility scooters.
- *On demand services*. Older people generally prefer to travel during off-peak times which are also the time when public transport services are less frequent. Therefore, many elderly need flexible or demand responsive services (DRT) for the first and last mile of their journey

combined with the traditional fixed route services (such as a shuttle to and from the busway or rail station). Government subsidised taxi schemes and UBER are becoming more popular in New Zealand and around the world due to affordable fares. New Zealand currently has a Total Mobility Scheme in place (Ministry of Transport, 2015a) which provides people who have serious mobility constraints with discounted taxi fares vouchers. The Office for Senior Citizens, in collaboration with NZTA, list a number of options: community transport, mobility scooters, walking and cycling, public transport and taxis and shuttle buses, for travel and emphasise 'planning ahead' to ensure optimum use of these services. The document also stresses the role of the community, especially family and friends, in transporting older people.

- *Higher comfort and safety*. The main issue is finding ways to make it easier for older adults to board public transport services, especially as they are more likely than the rest of the population to have higher rates of disabilities and wheelchair use. Reserved seating also benefits older people. Physical barriers also need to be minimised such as steep and long flights of stairs, and the lack of seating at stations. Smaller than normal buses with low floors and wheelchair access via ramps are preferred. These services could be provided on routes through residential areas (especially those with a high density of older people) and sites with social and leisure activities. Drivers on these services also need to be available to help passengers board as required (Frith *et al.*, 2012).
- *Fare subsidies*: As outlined above, the provision of affordable public transport is vital.
- *Information and education*. Education needs to be provided to the elderly, assisting them in learning about public transport alternatives, and their use. Educating other passengers on public transport etiquette might also be important. Drivers also need to be educated on how to cater for older passengers, with safety programs put in place by the operators to support older passengers and their needs (Kingham, 2013). It can be difficult for drivers to be courteous to older passengers, at the same time as meeting reliability standards on the congested roads of Auckland. Therefore, it would be helpful to increase the overall length and duration of operation of bus lanes in Auckland, to meet the needs of older as well as regular passengers.

e) Active transport needs and aspirations

Walking is an important mobility mode as most journeys (including car and public transport trips) start and end with walking. In New Zealand, the provision of district plans ensures footpaths are constructed at an appropriate width for walkers. However, older adults' decisions to walk or use a scooter are contingent on more than the availability of concrete and appropriately wide footpaths.
According to Statistics New Zealand, approximately 3% of the New Zealand population use a mobility aid for travel, mainly older adults. The *Measuring Accessible Journeys* report prepared for CSS Disability Action (Burdett, 2013) recommends giving priority to infrastructure maintenance to prioritise accessibility for disabled and older people.

In 2009, NZTA (2009) prepared the *Pedestrian Planning and Design Guide*, with the aim of promoting walking and cycling. The guide reports that over 50% of people aged 65 and over consider themselves as having some form of impairment which needs to be accommodated in walking infrastructure. The guide sets out the characteristics of older pedestrians and their importance for transport infrastructure as shown in Figure 2. Most of the recommendations of the 2009 guide have been accommodated in the NZTA (2015) report which presents guidelines for transport facilities for blind and vision impaired pedestrians. This document provides standardisation in design, installation and performance standards of pedestrian facilities throughout New Zealand.

Burdett (2016) highlights a serious gap between professionals responsible for delivering accessible journeys and users who do not believe that accessible transport is easily available. Graham and Burdett (2016) find a Non-Motorised Users (NMU) audit can rectify this gap and promote

"connectedness, attractiveness, safety and accessibility" for users and "accessible journeys" as a key to integrated transport planning. Therefore, it is important to conduct an NMU audit from an older adults' perspective, at least when public transport routes are reviewed or in association with a road safety audit. This suggestion compliments the Auckland Transport Code of Practise which states "the new hierarchy will ensure that the needs of pedestrians will always be considered in all of our transport projects irrespective of their size and/or importance within the overall network" (Auckland Transport, 2014: Introduction).

Characteristics of older pedestrians

Characteristic	Resulting in	Impacting on
Reduced range of joint motion	Slower walking speed.	• Crossing times. • Mean journey length.
Vision problems, such as reduced acuity and poor central vision	Reduced ability to scan the environment.	• Ability to detect and avoid objects. • Sign legibility. • Kerb detection. • Crossing locations. • Trip hazards. • Maps.
Limited attention span, memory and cognitive abilities	Needing more time to make decisions, difficulties in unfamiliar environments, lack of understanding of traffic signals.	• Positive direction signage. • 'Legibility' of streetscape. • Consistency of provision.
Reduced tolerance for adverse temperature and environments	Preference for sheltered conditions.	• Route location and exposure.
Decreased agility, balance and stability	Difficulties in changing level.	• Provision of steps/ramps. • Kerb height. • Gradients. • Handrails. • Surface quality.
Increased fear for personal safety and security	Fear of using all or part of a route.	• Lighting. • Surveillance. • Lateral separation from cars. • Provision of footpath. • Traffic speed and density.
Slower reflexes	Inability to avoid dangerous situations quickly.	• Crossing opportunities.
Reduced stamina	Shorter journeys between rests.	• Resting places. • Shelter.
Reduced manual dexterity and co-ordination	Reduced ability to operate complex mechanisms.	• Pedestrian-activated traffic signals.

[10, 13, 66, 122, 127, 139]

Figure 2: Characteristics of older pedestrians
(Source: NZTA 2009, p. Appendix 1)

2.5. The specific needs of young people

Due to an ageing population, this report has focused specifically on older adults resident in Auckland. However, given Auckland is structurally one of the youngest cities in the country, it is worth commenting on the specific needs of young people with respect to their mobility and transport needs.

Internationally, youth licensing rates, number of kilometres travelled each year and rates of car ownership are in decline (Hopkins *et al*., 2014). Similar patterns can be seen in New Zealand. Driver licensing is a key challenge for many young people. Research from the Ministry of Transport (2015b) shows that rates of licensing have been in steady decline since 1989 – 48% of those aged 15-24 had a license in the period 1989/1990 compared with just 34% in the period 2011-2014. There are also gendered differences with respect to driving experience. The percentage of young women who have never driven increased from 61% in 1989/1990 to 72% in the time period 2011/2014. The difference

for young men was much greater, rising from 39% in the earlier time period to 63% in the later time period. The travel patterns of 'Generation Y' in particular reveal an increased preference for alternative modes of transport besides private vehicles. A range of factors contribute to this change in pattern including rising fuel prices, a graduated licensing system, technology, and environmental and health concerns (Rive *et al.* 2015).

Despite reducing rates of driver licensing among young people, Begg *et al*. (2009) identify a number of factors considered important for young people getting their licenses. Factors considered "very important" by young people included the freedom to go where you want and the ability to drive to or from a job. Factors considered "important" included socialising with friends, helping out parents and providing a form of identification. Certainly, the lack of a driver licence for young people who have left school can act as a barrier to getting a job, accessing social services and connecting with others in the community. The decision to drive when unlicensed or only partially licensed also leaves young people at greater risk of accidents and becoming part of the justice system if caught driving illegally. Human-centred Design-led research is currently being carried out in South Auckland by the Auckland Co-design Lab to explore driver licensing among young people with a view to increasing driver-licensing rates.

The decline in driver licensing can result in the increased use of public transport and other active modes of transport. Ministry of Transport data (2015b) shows that 44% of people aged between 13 and 17 used public transport at least once in a single month (and 40% of *them* had used public transport on 20 days or more). With respect to cycling in a given one month period, 23% of males aged 13-17 had used this mode of transport compared with 39% of females.

Young people aged between 15 and 24 are least likely of all age groups to travel (whether as a driver or passenger) by private vehicle. When considering transport mode share, just 69% of 15-24 year olds drove or were passengers in a private vehicle compared with between 83% of those aged between 25 and 64 years. This age group was also most likely to use public transport – 10% compared with 2.5% for other working age adults (Ministry of Transport, 2015b). Additional research to determine whether these nation-wide patterns apply equally to Auckland is warranted.

Recently completed research investigating the way transport access impacts on the lives of people aged 15-24 in South Auckland suggests that there are locational and socioeconomic disadvantages which combine to "produce transport poverty and transport related social exclusion" (Fergusson *et al*., 2016). The authors suggest that a lack of mobility compromises young people's capacity to reliably access training and employment opportunities. The report highlights different travel patterns emerging within South Auckland, including a higher proportion of young people driving or being a passenger in a car compared with the rest of Auckland, fewer young people travelling to work by bus and more people travelling to work by train. The higher use of trains is attributed to the Southern train line travelling through South Auckland. Complementary research carried out in other areas across Auckland could provide important insights for better understanding potential transport disadvantage resulting from location and demographic profiles.

2.6 Where next with regard to population demographics and transport?

First, the complex and often contradictory results identified in this report raise a number of important issues and questions for transport planners and point to areas where more research is needed for both younger and older cohorts of Auckland's mobile publics. Transport planning needs to be attentive to demands and constraints for all groups. Second, for older adults, as has been indicated, transport planning must not sit in isolation from other planning with respect to the ageing population; any transport plans must be considered in the context of Auckland's 'ageing well' policy (if indeed there is

such a policy) and policy considering changing population demand. Auckland Council's Seniors Advisory Panel is a freely available resource to support the work of policy and planners.

More specific questions arising from the research include:

- What is the impact of intensification on travel demand (on different modes) and perceptions of safety of the ageing population in Auckland? How can planners and public transport professionals work together to ensure intensified land use better serves older adults?
- What value might be gained from promoting public transport, or supplying a "restricted" SuperGold card (similar to a restricted license) at the age of 60, so that people become familiar with their travel options earlier rather than later?
- If it is likely that gender differences exist between ageing men's and women's travel behaviour and patterns in Auckland, what steps need to be taken to confirm and accommodate these differences?

Community-based research that focuses on the past, present and imagined future travel demand and behaviour of both older adults and younger people is warranted. Such research could adopt a 'Human-centred design-led' approach which places the customer or consumer at the centre of inquiry. This approach creates space for people's travel behaviour and experience to emerge. It also fosters understanding of the cultural as well as practical meanings attached to both cars and public transport by a demographically differentiated population. Given specific concentrations of older adults in some Auckland areas and younger populations in others, any research should be able to speak to locational differences.

Given Auckland's relatively youthful population, further examination of young people's transport needs and behaviours is important, particularly as it impacts on participation in education, training and employment. Although as noted some research is currently underway or has recently been completed, these projects are based in South Auckland and the city would also benefit from a broader geographic focus.

3. Travel demand implications of an ethnically diverse population

3.1. Introduction

This section follows the same structure as Section 2, looking first at evidence from international literature and then at the ethnicity-related factors that influence travel patterns and the characteristics and needs of local travellers. It concludes by considering what the results might mean for transport planners. In Auckland and what research might be required to help fill information gaps. It is widely assumed that minority ethnic populations use public transport more than locally born populations. However, there is limited information on the transport behaviours and demand of minority ethnic communities and even less knowledge concerning whether trends are specific to particular ethnicities in Auckland.

For the purposes of this Section, the terms minority ethnic population, migrants and immigrants are used interchangeably to mean non-Māori and non-European/Pākehā population groups. This means that what is reported here is disproportionally influenced by what is known of the travel patterns and needs of 'Asian' New Zealanders including those of Chinese, Indian, and South East Asian ethnicities broadly defined. Little is known or reported in relation to Pasifika, Middle Eastern or African ethnicities.

A further limitation of this material is that it does not distinguish between kinds of population movements. In the context of superdiversity, differences *within* groups are likely to be as significant as difference *between* large homogenising ethnic categories. For example, Chinese migrants entering New Zealand on a business visa will have different needs and access with regard to transport use when compared with Chinese migrants arriving in New Zealand under the family reunification visa category. Because very little is known about the nuanced responses of ethnic minority populations in relation to transport need and demand, considerable work needs to underpin any potential work programme seeking to address things highlighted by these very broad claims identified in the next subsections.

3.2. International trends

A person's cultural background is typically an important determinant of their consumption practices (Wang and Lo, 2007; Lucas, 2012). For example, Wang and Lo (2007) show that in Toronto, Chinese immigrants prefer to shop at ethnic-specific stores rather than nearby supermarkets. Such culturally driven behaviours have implications for travel demand and there is evidence that immigrants have particular transport behaviours that differ from host populations. In addition, evidence suggest that the presence of immigrants increases the demand for all modes of transportation (Blumenberg, 2009).These are discussed in the following section.

a) Car usage

Research has shown that some immigrants' cultural perceptions of the car as a status symbol, coupled with lack of English proficiency with which to understand the public transport system, have increased car travel in urban areas of California (Blumenberg, 2008) and Scotland (Hine and Mitchell, 2003) (see also Rajé, 2004), with car dependence growing over time (Blumenberg, 2009).

Other studies have shown, however, that some immigrant populations have a considerably lower car ownership rate and usage than native-born populations, including in the USA (Chatman and Klein, 2013), Australia (Klocker and Head, 2013) and Norway (Uteng 2009). These conflicting results raise questions about the Auckland context in which private vehicle ownership rates are historically high.

b) Public transport use

The international literature consistently indicates that ethnicity is an important determinant of public transport usage even in highly motorised Western countries. Uteng (2009) finds that public transport makes up 32% of the daily trips undertaken by immigrants from non-Western backgrounds, compared to 8% for the locals in Norway. Similar results were found by Blumenberg and Smart (2010) in the USA where immigrants are 2.8 times more likely to commute by public transport than locals.

However, statistics may vary between cities based upon migrants' countries of origin and associated cultural practices (Heisz and Schellenberg, 2004). For example, Asian migrants living in Western societies are more likely to use public transport than other immigrants (Shimazaki *et al*., 1994). Research has also shown the intersection of cultural practices and gender. Migrant women who fulfil traditional household roles are less likely to hold a driver's license compared with migrant men (Blumenberg, 2009), and more likely to make domestic related off-peak trips and rely on public transport (Asumah and Johnston-Anumonwo, 2002).

Migrant travel behaviour is constantly changing and is often subject to the process of transportation assimilation (Blumenberg and Smart, 2010). New immigrants initially have higher rates of public transport usage than well-settled immigrants (Lo *et al*., 2011). Research indicates that immigrants use – and are projected to continue to use – public transport at a higher rate in the first five years of their arrival than the local population. However, if public transport does not fulfil their travel needs, their public travel demand decreases, becoming more like that of the local population. For example, migrants who have been resident in Montreal for fewer than 10 years are 1.9 times more likely to use public transport than those born in Montreal, while long term migrants are only 1.1 times more likely (Heisz and Schellenberg, 2004). Immigrant communities represent a significant opportunity to encourage public transport use, given immigrants' more frequent public transport use in their country of origin. These results underline the importance of recognizing the heterogeneity of ethnic minority groups and the circumstances in which they might or might not use a particular mode of transport.

c) Active modes

In some countries, new migrants are more likely to use bicycles than locals. For example, in the US context, Smart (2010) finds that migrants from Asia are twice as likely to cycle as native-born Americans, regardless of similar socio-economic and density variables. This is often due to past travel habits in their countries of origin (Hook and Replogle, 1996), strong "immigrant effects"[6] (Smart, 2010), and cycling courses that target recent migrants (Pucher *et al*., 2011). Blumenberg (2008) notes, however, that over time, immigrant effects diminish with immigrants slowly assuming the transport practices of the locally-born population.

A very different travel pattern emerges, however, in the Netherlands where Harms *et al*. (2016) demonstrate that there is low cycle use by migrants, even in those cities with large proportions of migrants, despite the high cycling rates in the country overall. This is especially obvious in a comparison between migrants and residents born locally.

In the US setting, immigrants have been found to be disproportionally represented in pedestrian and cyclist crashes due to mismatches in safety culture between countries of origin and the new country (Chen *et al*. 2011).

3.3. Factors influencing the travel patterns of the ethnically diverse populations of Auckland

The extent to which international research applies to the local New Zealand context in unclear and there is relatively little local evidence available for comparison. This suggests that some Auckland

[6] "Immigrant effects" include contextual factors beyond socioeconomic, demographic and locational variables.

specific research will be needed if international patterns and trends are to be interpreted in the Auckland context accurately and appropriately.

a) Employment/income

The minority ethnic populations of Auckland exhibit a degree of income polarisation. According to the 2013 Census, the Chinese population, which comprises a high proportion of students, of Auckland have low socioeconomic status with a median income of $16,000, which is significantly below the Auckland median of $28,100. This is likely because only 52% of Chinese over the age of 15 were employed in 2013 – 10% below the national average. One key reason for low employment rates may be that 28% of working-age Chinese were engaged in either full-time or part-time study (compared with 15% of the total New Zealand population). There was also considerable income disparity *within* the Chinese population. Specifically, 47% of foreign-born Chinese earned less than $10,000 per annum, while the median personal income of New Zealand-born Chinese was comparable to the national median. Again, this is likely due to a large proportion of students.

In contrast to the Chinese, over half of the Indian population earn more or equivalent to the national median income of $24,400. There are two likely reasons. First, Indians are more likely to work in professional, technical, sales and managerial positions, and second, 73% of the Indian population over the age of 15 are employed (5% higher than the regional average).

Low income ethnic groups are more likely to be sensitive to the cost of the transport system in Auckland. In a study of social media comments by the Chinese community on public transport in Auckland, Imran *et al.* (2015) report that the most common complaint is that the fare structure is expensive and free transfers are not available to passengers. These issues make public transport poor value compared with driving.

The choice of transport modes in Auckland may also be based on the employment locations and job types generally available to minority ethnic populations in Auckland. Figure 3 shows that only 15% of total jobs are accessible by reasonable (45 minutes) public transport travel. Although this proportion is expected to increase, those minority ethnic populations who are most reliant on part-time jobs and might need to travel during off-peak times potentially face additional difficulties in accessing jobs by public transport.

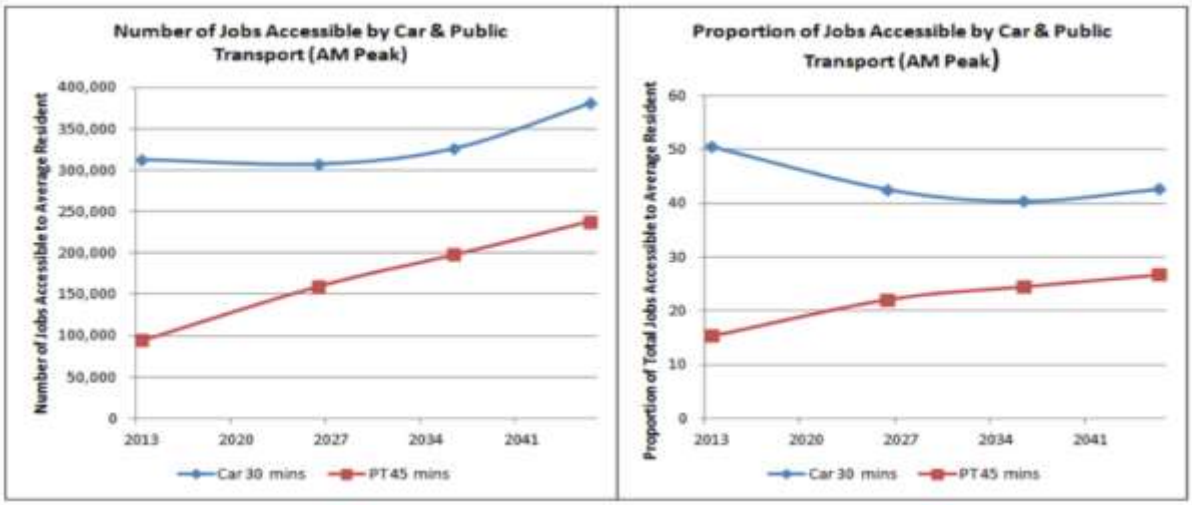


Figure 3: Accessibility of jobs by car and public transport in Auckland
(Source: Auckland Transport alignment project)

Figure 4 shows the location of projected employment growth in Auckland over the next 30 years. It is expected that employment growth will be highly concentrated in a few locations, mainly within five kilometres of the Central Business District (CBD). As outlined in greater detail in the following section, many minority ethnic populations currently live close to these employment growth centres. As a consequence, they are arguably more likely to use public transport to access these centres.

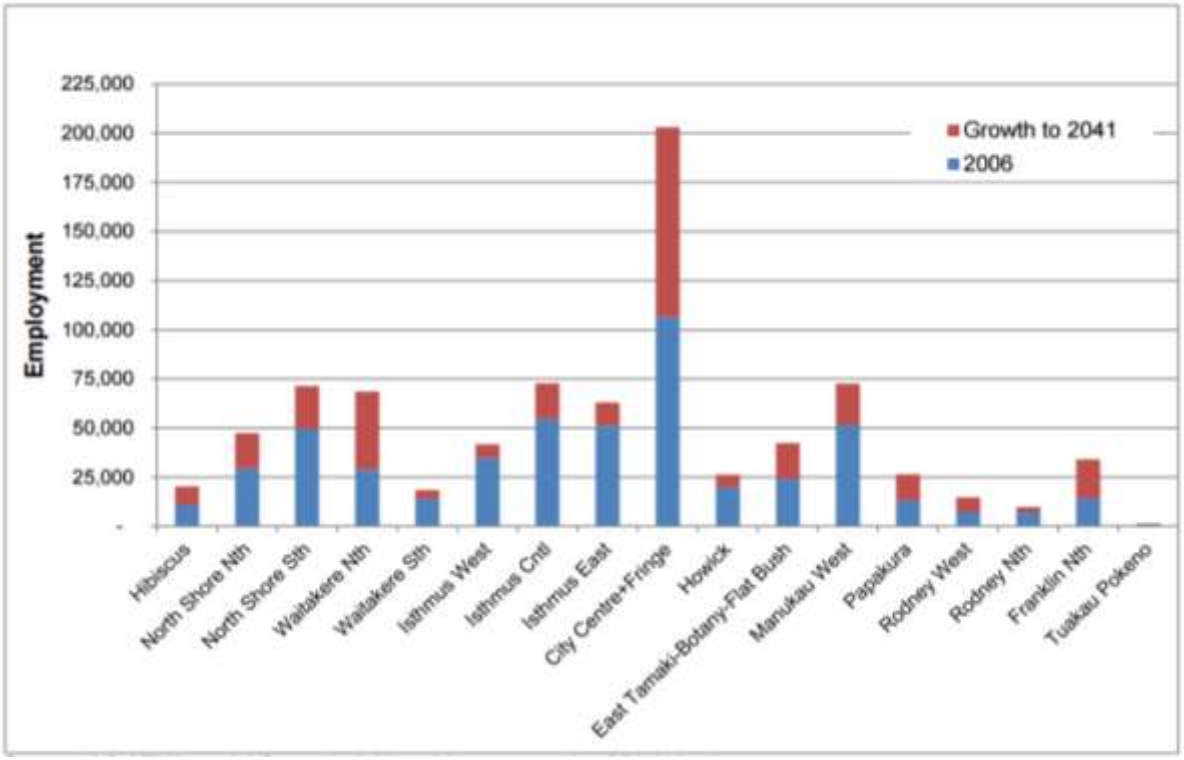


Figure 4: Projected growth in employment sector 2006-2041
(Source: Auckland Council ATM2 model scenario 1, assuming the CRL is in place).

b) Residential location

The residential location of minority ethnic communities has a profound impact on their travel patterns and mode of choice. Figure 5 below shows that the majority of the Asian and Middle Eastern/Latin American/African (MELAA) population lived in the inner to middle suburbs at the time of the 2013 census. The areas with particularly high concentration of Asians and MELAA include the CBD and Mt Eden in the city centre, Avondale in the west, Howick and Pakuranga in the east, Papatoetoe in the south and Takapuna and Birkenhead in the north. Most of these areas are in the rail network, Northern Express and B.Lines catchments that provide comparatively efficient transport services within Auckland. This is reflected in the higher public transport patronage for journey to work trips exhibited in these areas.

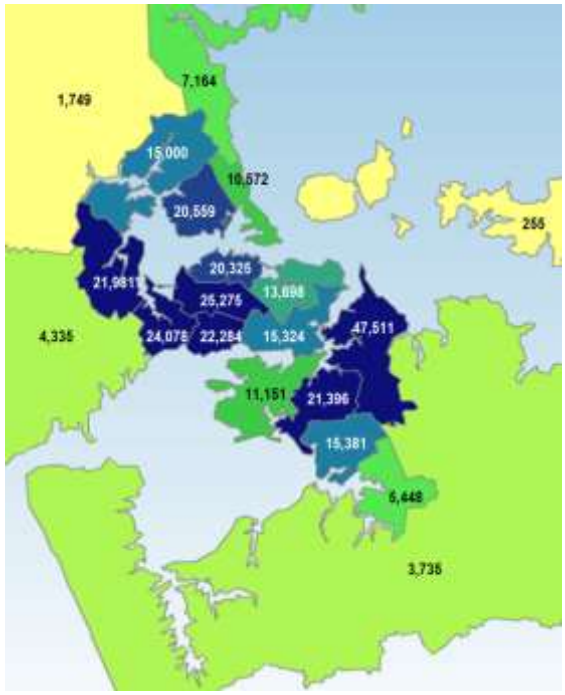
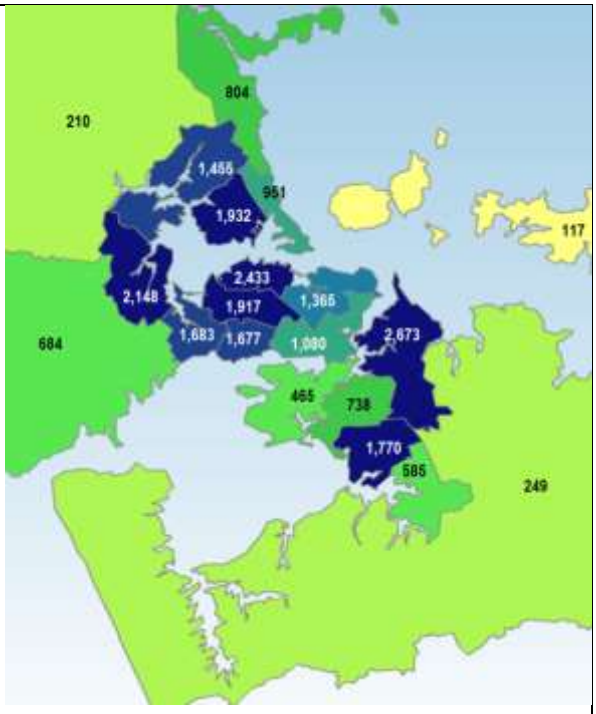
	
Asian population in Auckland (2013 Census)	Middle Eastern/Latin American/African population in Auckland (2013 Census)
*Data shows Asian ethnicities live in Local Board Area	*Data shows MELAA ethnicities live in Local Board Area

Figure 5: Graphic representations of Asian and MELAA populations in Auckland
(Source: http://www.censusauckland.co.nz/)

For example, nearly 15% of people use public transport in the Albert-Eden and Waitematā Board areas compared with the metropolitan average in the 2013 Census of just 8%. High Asian population concentrations in the Whau, Kaipatiki and Maungakiekie-Tāmaki Board areas also contributed to the 12% of trips being made using public transport (Richard Paling Consultant, 2014). These figures suggest that the ethnic diversity of Auckland provides an opportunity to transform an automobile dependent city to a much more public transport friendly city. This could be achieved by further improving the feeder network to trunk services in those suburbs (Imran and Matthews, 2015) with high minority ethnic populations.

Based on a strong relationship between a range of variables[7] and public transport use, Lee and Chen (2016) propose seven locations with the greatest potential to increase public transport use. These locations all have high proportions of Asian migrants and include: Central City West (60% Asian population), Mt Eden (26%), Mt Albert (23%), Eden Terrace (28%) and Sunnynook (38%).

[7] These variables included: not having children; higher education levels; currently studying; being unmarried; working 20 to 40 hours per week; and being aged between 20 and 39 years.

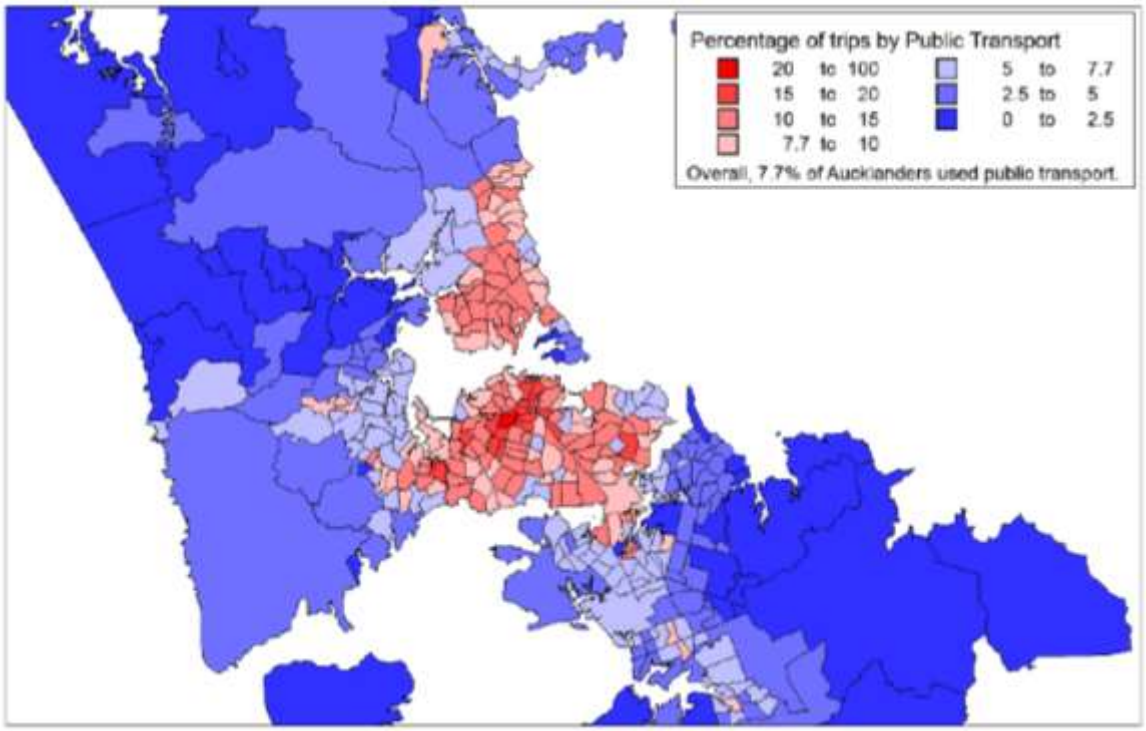


Figure 6: Share of journey to work public transport trip making by origin
(Source: Richard Paling Consulting report available at MoT website)

c) Socio-cultural meanings of transport

Besides efficient travel from one point to another, socio-cultural factors such as habits, feelings, emotions, and social norms, together with their related embodied behaviours (driving skills, for example), influence transport practices. Fitt (2015) argues that in a New Zealand setting, everyday transport practices are influenced, in sometimes contradictory ways, by cultural norms and social meaning and these have impacts on transport usage and people's perceptions of other drivers. Fitt (2015) found, for example, that Asian drivers in New Zealand are often described as either driving too hesitantly or alternatively as "having flash cars and going too fast". Such research points to implications for future road safety strategies in the context of increasing cultural and ethnic diversity.

Imran *et al.* (2016) argue that both positive and negative experiences of particular public transport modes influence immigrants' perceptions of public transport in Auckland. Migrants who have been exposed to efficient and effective public transport systems in cities such as London, Paris, Hong Kong, and Singapore are more likely to use public transport in Auckland than people who have experienced poor public transport systems overseas.

The high proportions of international students in Auckland means the migrant profile in the city is youthful – the average age of the Chinese and Middle Eastern communities is mid to late 20s. These comparatively young ethnic groups are highly mobile and tend to change both residence and employment on a frequent basis. In addition, many have young families and this also has implications for travel demand. The specific travel demands of the ethnic populations in Auckland require additional research.

3.4. Travel characteristics and needs of the ethnic population in Auckland

a) Vehicle access

As already noted, the social meaning of transport modes is important to the minority ethnic populations, ultimately affecting vehicle access, if not the usage. For example, the Chinese population

in New Zealand exhibit comparable or higher car access rates to the national average (see Figure 7). Given the high proportion of Chinese residing in Auckland, it is not unreasonable to assume that these figures are at least somewhat indicative of access rates in Auckland. The explanation for these differences has not yet been explored, either for Chinese or other migrant groups. Additional research examining vehicle access and ownership in Auckland would be valuable.

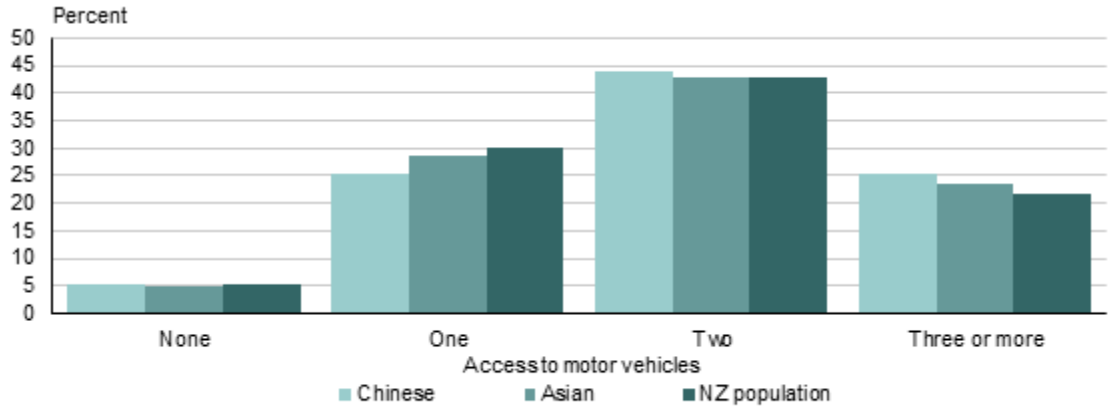


Figure 7 Access to motor vehicles at a national scale
(Statistics New Zealand, 2014a)

b) Travel volume

Syam (2014) found a significant difference between travel characteristics, attitude and perceptions of transport modes among different ethnic communities in Auckland. Those identifying with an Asian ethnicity appear to travel less than people of other ethnicities (Europeans, Māori and Pasifika) both in terms of the number of trips and the distance travelled. While the reasons for this lower volume of trips is unknown, it has potential impact on both public transport usage and active modes of transport such as cycling. If travel volume is ethnically associated then reasons need to be sought.

Projections of distance likely to be travelled complement Auckland's strategic transport model outputs (see Figure 8). The model outputs show an expected increase in daily vehicle kilometre travelled over the next 30 years, although it is expected that the morning peak travel distance travelled will remain relatively stable over that time. These figures highlight the importance of considering off-peak vehicle kilometre travelled and potential of alternative modes in Auckland. It is unknown what proportion of this travel will be carried out by those identifying with an ethnic minority group.

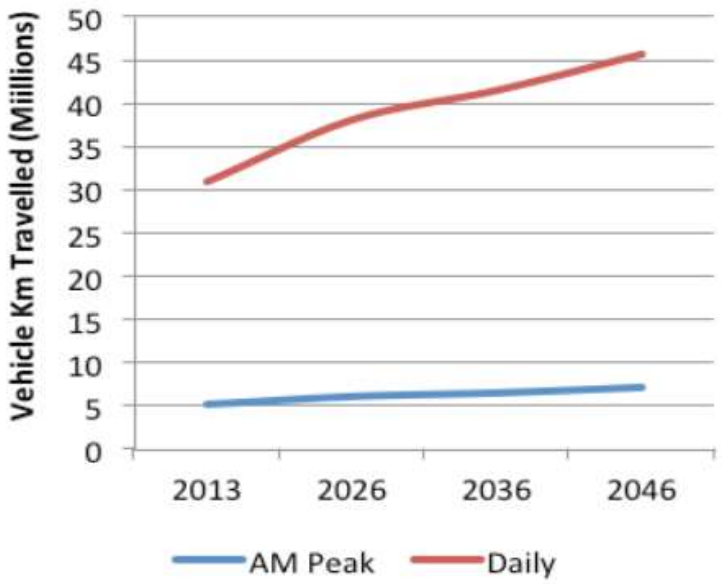


Figure 8: Auckland projected travel demand
(Source: Auckland strategic transport model output cited in the Alignment Project report)

c) Travel time

Little is known about the travel time of ethnic minority groups; we don't yet know when the preferred mode and time of travel might be. However, as noted above, many minority ethnic populations are engaged in part-time jobs and study in the Auckland area. These roles support the need for off-peak travel. This is a clear opportunity to foster sustainable modes of transport among ethnic minority groups.

Perhaps relatedly, and as evidenced in Figures 4, 5 and 6 above, many migrants live in suburbs that have positive characteristics with respect to prospective residential and employment growth and public transport access, including better trunk public transport services and shorter trips. Again, this represents an opportunity to develop practices around alternative modes of transport to the private car. This is especially likely if first or last mile feeder networks and the greater integration of public transport with active modes are provided. More specific research is required in this area.

d) Mode

Minority ethnic communities are more likely than local residents to use public transport and active modes of transport (especially walking) in Auckland. For example, public transport accounted for 8.5% of commuter trips by the Chinese, compared to 7.4% for the total population of Auckland (Statistics New Zealand, 2014b).

Most tertiary institutions along with many secondary schools in Auckland are aggressively seeking international students and would like to improve public transport and active transport access to their campus or schools. A large proportion of international students come from Asian and Middle Eastern countries and have particular needs due to income, residential location, and access to social networks and even customer services when it comes to being able to conveniently use public transport. These needs are often different from mainstream commuters who are more likely to travel at peak time. Given international students are worth more than $1.6 billion to the Auckland economy (ATEED, n.d.), improving Auckland's public transport system so that it might better cater for these students and their campus connections is vital. Addressing the lack of land use/transport integration (Albany busway

station and Albany Massey Campus, CRL and Auckland University campus) in Auckland's transport investment is a related concern that requires a creative solution.

e) Public transport needs and aspirations

Overall, Auckland residents' needs with respect to basic public transport service factors, such as reliability, frequency, availability and fare structure, are very similar, regardless of the resident's ethnic or cultural background (Imran *et al.* 2015; 2016). This indicates that fundamental improvements are required of the public transport system in Auckland. This is particularly important if Auckland Transport is to double its public transport mode share in the next 30 years as it would like.

Imran *et al.* (2015; 2016) suggest there is significant potential to grow public transport use, if public transport service factors are addressed including, giving priority to those suburbs where minority ethnic populations live.

f) Active transport needs & aspirations

Most public transport trips generate walking trips. Walking is also an important mode of transport for those minority ethnic groups who do not own a car or have limited access to one. Ethnic populations are more likely to view walking as money-saving, a way to get exercise and to get children to school. While factors such as unsafe walkways, speeding cars, and lack of safe crossings may deter minority ethnic communities from walking, they are likely to deter all publics to a degree. The questions to address with respect to active transport include both how to get it right for locals but also how to see active transport barriers from the perspective of new migrants who will have little or no knowledge of how things 'work' in a new and unfamiliar context.

3.5 Where next with regard to increasing ethnic diversity and superdiversity?

As noted throughout this report, Auckland is facing rapid population growth and increasing ethnic diversity. However, also as noted, ethnic diversity is complex and there is great diversity *within* ethnic groups. This level of complexity makes projections of future behaviour by ethnic group extremely.

What has become clear is that relatively little is known about immigrant and minority ethnic community travel patterns in Auckland, especially when compared with local population travel patterns more broadly. In addition, as ethnicity and age combine, it is possible that new forms of transport poverty and transport related social exclusion could develop. This raises important questions for transport planners including:

- How can transport planning policies benefit from engaging with the plurality of cultures, values and customs that are the basis for travel by the ethnic population in Auckland?
- How should Auckland Transport develop ethnic sensitive policies to increase public transport patronage in Auckland?
- How might Auckland Transport support the socio-cultural practices of Auckland migrant communities?
- How might Auckland Transport respond to the development of ethnoburbs (residential concentrations of particular groups), ethnic precincts (co-location of businesses involving a particular minority ethnic community) and places of worship?
- How will services and facilities (and representation) be provided given differential growth by ethnic group at the local board level?

In addition to these higher level questions, more specific research questions arise, especially in light of the inconclusive evidence from international research with respect to minority ethnic and

immigrant travel behaviours. In the Auckland setting, it would be useful to explore the extent and nature of:

- New migrants' willingness to use available public transport networks in their everyday life and the public transport network's alignment with new migrants' needs
- The travel needs of minority ethnic communities as they differ from the needs of other Auckland residents
- The intersection between ethnicity and other socio-cultural characteristics such as gender and age in relation to transport
- Ethnic concentrations in residential areas (ethno-burbs) and/or the co-location of businesses from particular ethnic groups in ethnic precincts and the implications for transport demand and use of either or both of these scenarios
- Minority ethnic populations' propensity and capacity to adopt walking and cycling as viable modes of transport in Auckland
- Differing social and cultural meanings associated with private (private car, cycling) and public (buses, trains) transport use, for both immigrants and those who are born locally
- Differences in the mobility related attitudes, values, travel patterns and travel needs of Auckland's ethnically diverse population
- The activities and expectations of immigrant and minority ethnic community populations when it comes to travel options and services and the implications of this for travel demand in Auckland.

What is important to note is the lack of information when considering the combination of intersecting variables such as ethnic identification, age and residential location. Working alongside minority ethnic communities is vital as transport policy is developed and public transport networks and facilities are created that appropriately respond to minority ethnic travellers' needs (with respect to a range of variables including residential location, employment and study status, affordable fare structures, life stage etc.). With this in mind, development of more robust projection models of the future travel patterns of immigrants and minority ethnic communities using census and National Household Travel Survey Data to study the heterogeneity of existing travel behaviours and volumes would be valuable.

Given the large numbers of international students resident in Auckland, research examining their special transport needs is also warranted. A key part of such a project should be an assessment of how well Auckland's public transport system and customer services cater for those needs; the benefits to Auckland from public transport offering an improved set of services to international students; and the major opportunities for Auckland's public transport system in supporting international students. An exploration of existing AT initiatives and how they might best be used to support international students could also be valuable. For example, would providing complimentary Auckland Transport HOP cards to new migrants and students be an effective mechanism to create interest and improve the public transport experiences of new migrants?

Auckland Council's Pacific Peoples and Ethnic Peoples Advisory Panels are existing resources that are both well-connected to their respective communities and cognisant of the strategic direction of council more broadly. Future research could leverage the wealth of experience, knowledge and connectedness that the panels hold by partnering with them in a collaborative (potentially co-designed) project.

An examination of equitable service delivery for Māori as Tangata Whenua should also be integrated into any future research, policy or planning. Possible areas of investigation include: different transport needs and behaviours in geographical areas of co-existence with new migrant communities; specific transport demands in relation to social interaction (access to marae, for example) and social and

educational services. Auckland Council's Te Waka Angamua is well connected to iwi across Tamaki-Makaurau and would be an important collaborative partner.

4. Conclusion

The empirical evidence presented in this short report raise a number of questions to consider in relation to Auckland's future transport planning. It also highlights areas where more research is needed. Overall, while some things are known or can be inferred from international studies and there are some limited findings from existing Auckland studies there is much that is not known about the impacts on transport of demographic and behavioural change in relation to transport options in the Auckland context.

References

Arentze, T., Timmermanns, H., Jorritsma, P., Kalter, M., & Schoemakers, A. (2008). More grey hair—but for whom? Scenario-based simulations of elderly activity travel patterns in 2020.*Transportation, 35*, 613–627.

Asumah, S.N., & Johnston-Anumonwo, I. (Eds.). (2002). *Diversity, multiculturalism and social justice*. New York, NY: Global Academic Publishing.

ATEED (n.d). Submission to Minister of Transport. Retrieved from: http://www.transport.govt.nz/assets/Uploads/Air/Documents/AirNZ-China-ATEED-submission.pdf

Auckland Transport. (2014). *Auckland Transport Code of Practice 2015*. Retrieved from: https://at.govt.nz/about-us/auckland-transport-code-of-practice/

Begg, D., Langley, J., Brookland, R., McDowell, A., & Ameratunga, S. (2009). The opinion of newly licensed drivers in New Zealand on the minimum car licensing age and reasons for getting a license. *The New Zealand Medical Journal, 122*, 63-77.

Blumenberg, E. (2008). Immigrants and transport barriers to employment: The case of Southeast Asian welfare recipients in California. *Transport Policy, 15*(1), 33-42.

Blumenberg, E. (2009). Moving in and moving around: Immigrants, travel behaviour, and implications for transport policy. *Transportation Letters, 1*(2), 169-180.

Blumenberg, E., & Smart, M. (2010). Getting by with a little help from my friends … and family: Immigrants and carpooling. *Transportation, 37*(3), 429-446.

Broome, K., McKenna, K., Fleming, J., & Worrall, L. (2009). Bus use and older people: A literature review applying the person-environment-occupation model in macro practice. *Scandinavian Journal of Occupational Therapy, 16*(1). DOI: 10.1080/11038120802326222

Burdett, B. (2016, March). Mind the gap: Views on transport accessibility among transport professionals and the public of New Zealand. *Proceedings of IPENZ Transportation Group Conference*. Auckland, New Zealand.

Burdett, B. (2013). Measuring accessible journeys: Pilot project summary report quality assurance statement. Retrieved from http://www.ccsdisabilityaction.org.nz/images/measuring%20accessible%20journeys%20tdg%20%20final%20report.pdf

Chatman, D.G., & Klein, N.J. (2013). Why do immigrants drive less? Confirmations, complications, and new hypotheses from a qualitative study in New Jersey, USA. *Transport Policy, 30*, 336-344.

Chen, C., Lin, H., & Loo, B. (2011). Exploring the impacts of safety culture on immigrants' vulnerability in non-motorized crashes: A cross-sectional study. *Journal of Urban Health, 89*(1), 138-152.

Cheyne, C., & Imran, M. (2010). *Attitudes and behaviour in relation to public transport in New Zealand's non-metropolitan regions* [Report No. 419]. Retrieved from http://www.nzta.govt.nz/assets/resources/research/reports/419/docs/419.pdf

Coughlin, F. (2009).Longevity, lifestyle, and anticipating the new demands of aging on the transportation system. *Public Works Management Policy, 13* (4), 301-311.

Currie, G., & Stanley, J. (2008). Investigating links between social capital and public transport. *Transport Reviews*, *28*(4), 529–547.

Currie, G., Imran, M., & Senbergs, Z. (2006). *Identification of potential market change factors for public transport* [Report 1 - literature review]. Melbourne, Australia: Monash University.

Fergusson, E., Terruhn, J., Gilbertson, A., Ovenden, K., & Wildish, B. (2016). *Youth mobilities in the Southern Initiative: Transport practices and experiences of 15-24 year olds*. Auckland, New Zealand: Research and Evaluation Unit, Auckland Council.

Figueroa, M., Nielsen, T., & Siren, A. (2014) Comparing urban form correlations of the travel patterns of older and younger adults. *Transport Policy*, *35*, 10-20.

Fitt, H. (2015). *The influences of social meanings on everyday transport practices* [Unpublished doctoral thesis]. University of Canterbury, New Zealand.

Frith, W., Mara, K., & Langford, J. (2012). *Demand for transport services: Impact on networks of older persons' travel as the population of New Zealand ages* [Report No. 481]. Retrieved from http://www.nzta.govt.nz/assets/resources/research/reports/481/docs/481.pdf

Golob, F., Hensher, D. (2007). The trip chaining activity of Sydney residents: A cross-section assessment by age group with a focus on seniors. *Journal of Transport Geography, 15*(4), 298–312.

Graham, C., & Burdett, B. (2016, March). Non-motorised User Audit- A practical guide. *Proceedings of IPENZ Transportation Group Conference.* Auckland, New Zealand.

Hakamies-Blomqvist, L. (1999, November). Safety of older persons in traffic in transportation in an aging society: A decade of experience. Proceedings of the Transportation in an Aging Society Conference. Bethesda, Maryland: Transportation Research Board. Retrieved from: http://onlinepubs.trb.org/onlinepubs/conf/reports/cp_27.pdf

Harms, L., Bertolini L., & Brommelstroet, M. (2016). Performance of municipal cycling policies in medium-sized cities in the Netherlands since 2000. *Transport Reviews*, *36*(1), 134-162.

Haustein, S. (2012). Mobility behaviour of the elderly: An attitude-based segmentation approach for a heterogeneous target group. *Transportation*, *39*(6), 1079–1103.

Heisz, A., & Schellenberg, G. (2004). Public transit among immigrants. *Canadian Journal of Urban Research, 13*(1), 170-191.

Hine, J., & Mitchell, F. (2003). *Transport disadvantage and social exclusion: Exclusionary mechanisms in transport in urban Scotland*. Hants, England: Ashgate Publishing.

Hjorthol, J., Levin, L., & Siren, A. (2010). Mobility in different generations of older persons: The development of daily travel in different cohorts in Denmark, Norway and Sweden. *Journal of Transport Geography, 18*, 624–633.

Hook, W., & Replogle, M. (1996). Motorization and non-motorized transport in Asia: Transport system evolution in China, Japan and Indonesia. *Land Use Policy*, *13*, 69–84.

Hopkins, D., Williams, J., & Mandic, S. (2014, March). *Changing youth mobility practices: A transformative pathway towards transport efficiency?* Paper presented at the Energy Conference. Wellington New Zealand: National Energy Research Institute.

Imran, M. & Matthews, L. (2015). Short-term public transport solutions in Auckland, New Zealand. *Case Studies on Transport Policy*, *3*(1), 55-65.

Imran, M., Abusidou, S., & Pearce, J. (2016). Middle Eastern communities' public transport needs and aspirations in Auckland. *Proceedings of IPENZ Transportation Group Conference*. Auckland, New Zealand. Available at: http://static1.squarespace.com/static/5591f57ee4b07952c1a4d8bd/t/56c280859f7266120125c135/1455587462857/Muhammad%2C+Imran+-+Paper+54+-+Middle+Eastern+Communities%27+Public+Transport+Needs+and+Aspirations+in+Auckland.pdf

Imran, M., Yin, J., & Pearce, J. (2015). Chinese communities experiences of public transport in Auckland. *Proceedings of IPENZ Transportation Group Conference*. Auckland, New Zealand. Available at: http://conf.hardingconsultants.co.nz/workspace/uploads/paper-muhammad-imran-chin-54f39395e4f50.pdf

Kingham, S. (2013). Research on transport solutions for the ageing society: The New Zealand example. *Proceedings of IPENZ Transportation Group Conference*. Auckland, New Zealand. Available at: http://ir.canterbury.ac.nz/bitstream/handle/10092/8800/12647053_Transport%20for%20the%20Aged%20NZ%20-%20Simon%20Kingham.pdf?sequence=1&isAllowed=y

Klocker, N., & Head, L. (2013). Diversifying ethnicity in Australia's population and environment debates. *Australian Geographer, 44*(1), 41-62.

Lee, A., & Chen, J. (2016). Propensity to use public transport: Who uses it and what that tells us about Auckland. *Proceedings of IPENZ Transportation Group Conference*. Auckland, New Zealand. Available at: http://static1.squarespace.com/static/5591f57ee4b07952c1a4d8bd/t/56c18c438259b5cdaf93f28f/1455524935286/Lee%2C+Alison+-+Paper+30+-+Propensity+to+use+public+transport.pdf

Lo, L., Shalaby, A., & Alshalalfah, B. (2011). Relationship between immigrant settlement patterns and transit use in the Greater Toronto area. *Journal of Urban Planning and Development, 137*(4), 470-476.

Lucas, K. (2012). Transport and social exclusion: Where are we now? *Transport Policy, 20*(0), 105-113.

Ministry of Transport (in collaboration with NZTA and Auckland Transport). (2016). *Auckland Transport Alignment Project* [Foundation Report]. Auckland, New Zealand.

Ministry of Transport. (2015a). The total mobility scheme. Retrieved from http://www.transport.govt.nz/land/the-total-mobility-scheme/

Ministry of Transport. (2015b). *25 years of New Zealand travel: New Zealand household travel 1989–2014.* Wellington, New Zealand: Ministry of Transport.

Ministry of Transport. (n.d.). SuperGold Card public transport funding. Retrieved from http://www.transport.govt.nz/land/supergoldcardtransportfunding/

Miranda-Moreno, L., & Lee-Gosselin, M. (2008). A week in the life of baby boomers: How do they see the spatial–temporal organization of their activities and travel? *Transportation, 35*(5), 629–653.

Newbold, K., Scott, D., Spinney, J., Kanaroglou, P., & Paez, A. (2005). Travel behaviour within Canada's older population: A cohort analysis. *Journal of Transport Geography, 13*(4), 340–351.

NZTA. (2009). *Pedestrian planning and design guide*. Wellington, New Zealand. Retrieved from: https://www.nzta.govt.nz/resources/pedestrian-planning-guide/

NZTA. (2015). *RTS 14 – Guidelines for facilities for blind and vision impaired pedestrians.* Retrieved from: https://www.nzta.govt.nz/assets/resources/road-traffic-standards/docs/rts-14.pdf

OECD. (2001). *Ageing and transport: Mobility needs and safety issues* [Report from the Organization of Economic Cooperation and Development]. Paris, France: OECD.

O'Fallon, C., & Sullivan, C. (2003). Older people's travel patterns and transport sustainability in New Zealand cities. *26th Australasian Transport Research Forum.* Wellington, New Zealand.

O'Fallon, C., & Sullivan, C. (2009). *Trends in older people's travel patterns: Analysing changes in older New Zealanders' travel patterns using the Ongoing New Zealand Household Travel Survey* [Report No. 369]. Retrieved from: http://www.nzta.govt.nz/assets/resources/research/reports/369/docs/369.pdf

Office for Senior Citizens. (2014). *2014 Report on the positive ageing strategy*. Wellington, New Zealand: Office for Senior Citizens. Retrieved from https://www.msd.govt.nz/documents/what-we-can-do/seniorcitizens/positive-ageing/msd-17470-2014-ageing-strategy-report-final.pdf

Paez, A., Scott, D. Kanaroglou, P., & Newbold, K. (2007). Elderly mobility: Demographic and spatial analysis of trip making in the Hamilton CMA, Canada. *Urban Studies, 44*(1), 123–146.

Pucher, J., Buehler, R., & Seinen, M. (2011). Bicycling renaissance in North America? An update and re-appraisal of cycling trends and policies. *Transportation Research Part A*, *45*, 451-475.

Rajé, F. (2004). *Transport, demand management, and social inclusion: The need for ethnic perspectives*. New York, NY: Ashgate.

Richard Paling Consulting. (2014). Journey to work patterns in Auckland region. Available at http://www.transport.govt.nz/assets/Uploads/Research/Documents/Richard-Paling-report-Transport-Patterns-in-the-Auckland-Region.pdf

Rive, G., Thomas, J., Jones, C., Frith, B., & Chang, J. (2015). *Public transport and the next generation* [NZ Transport Agency research report 569]. Wellington, New Zealand: NZTA.

Rosenbloom, S., & Herbel, S. (2009).The safety and mobility patterns of older women: Do current patterns tell the future? *Public Works Management Policy, 13*, 338–353.

Shimazaki, T., Hokao, K., & Mohamed, S.S. (1994). Comparative study of transportation modal choice in Asian countries. *Transportation Research Record* (1441).

Siren, A., & Hakamies-Blomqvist, L. (2005). Sense and sensibility: A narrative study of older women's car driving. *Transportation Research Part F: Traffic Psychology and Behaviour, 8*, 213–228.

Siren, A., & Haustein, S. (2013). 'Baby boomers' mobility patterns and preferences: What are the implications for future transport?' *Transport Policy, 29*, 136–144.

Smart, M. (2010). US immigrants and bicycling: Two-wheeled in Autopia. *Transport Policy*, *17*, 153-159.

Statistics New Zealand. (2014a). 2013 Census ethnic group profiles: Chinese. Retrieved from http://www.stats.govt.nz/Census/2013-census/profile-and-summary-reports/ethnic-profiles.aspx?request_value=24737&parent_id=24726&tabname=#24737

Statistics New Zealand. (2014b). 2013 Census QuickStats about a place: Auckland Region. Retrieved from: http://www.stats.govt.nz/Census/2013-census/profile-and-summary-reports/ethnic-profiles.aspx?request_value=24737&tabname=Motorvehicles,andphones,fax,andInternet

Statistics New Zealand. (n.d.). *Mapping trends in the Auckland region.* Retrieved from http://www.stats.govt.nz/browse_for_stats/Maps_and_geography/Geographic-areas/mapping-trends-in-the-auckland-region/65-population.aspx

Statistics New Zealand. (n.d.a). *How long will I live?* Retrieved from http://www.stats.govt.nz/browse_for_stats/health/life_expectancy/how-long-will-I-live.aspx

Syam, A. (2014). *Cultural values: A new approach to explain people's travel behaviour and attitudes towards transport mode* [Unpublished doctoral thesis]. University of Auckland, New Zealand.

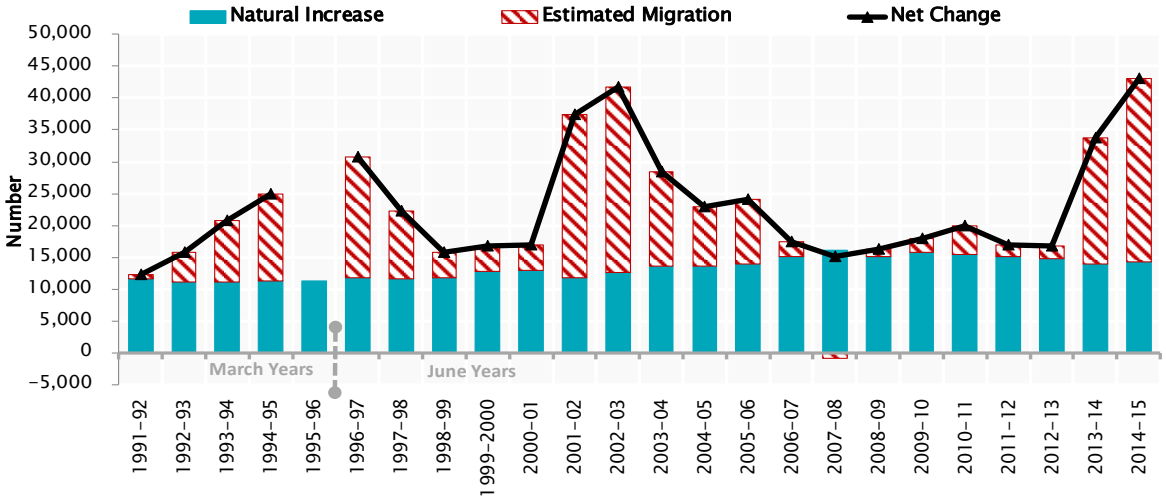
Uteng, T.P. (2009). Gender, ethnicity, and constrained mobility: Insights into the resultant social exclusion. *Environment and Planning A, 41*(5), 1055.

Van denBerg, P., Arentze, T., & Timmermans, H. (2011). Estimating social travel demand of senior citizens in the Netherlands. *Journal of Transport Geography, 19*(2), 323–331.

Wang, L., & Lo, L. (2007). Immigrant grocery-shopping behavior: Ethnic identity versus accessibility. *Environment and Planning A, 39*(3), 684-699.

Appendix A

A1.Population change by major component (net migration, natural increase), Auckland Region 1991-2015



*Changes in timing and method of estimating Resident Population between 1995 and 1996 mean that only natural increase can be shown for that year

Source: Compiled from Statistics New Zealand Data sets;

Table reference: VSB011AA, VSB016AA Last updated: 18 August 2014

Table reference: VSD008AA, VSD018AA; Last updated: 18 August 2014

Age Group and Sex, for the Census Night Population Count, 1986 and 1991

Infoshare, Table Reference: DPE051AA and DPE052AA, Last Updated 22 Oct 2013

Estimated Subnational Population (RC,TA) by Age and Sex at 30 June 1996, 2001 and 2006

(a) 1991-1995 Estimated Defacto; 1996-2013 Estimated Usually Resident Population (URP)

Based on 2013 boundaries

COMPONENTS OF CHANGE, 1992-2013 Auckland REGION

Auckland REGION		Births	Deaths	Estimated Resident Population[(a)]	Natural Increase	Estimated Migration	Net Change
March Year	1991			953,980			
	1991-92	18,505	6,931	966,300	11,574	+746	+12,320
	1992-93	18,080	6,909	982,000	11,171	+4,529	+15,700
	1993-94	18,103	7,007	1,002,700	11,096	+9,604	+20,700
	1994-95	18,396	7,138	1,027,700	11,258	+13,742	+25,000
June Year	1995-96	18,504	7,221	1,116,000	11,283		
	1996-97	18,986	7,265	1,146,700	11,721	+18,979	+30,700
	1997-98	18,736	7,178	1,169,000	11,558	+10,742	+22,300
	1998-99	18,678	6,927	1,184,800	11,751	+4,049	+15,800
	1999-2000	19,901	7,179	1,201,500	12,722	+3,978	+16,700
	2000-01	19,588	6,718	1,218,400	12,870	+4,030	+16,900
	2001-02	18,897	7,177	1,255,800	11,720	+25,680	+37,400
	2002-03	19,817	7,120	1,297,600	12,697	+29,103	+41,800
	2003-04	20,789	7,168	1,326,000	13,621	+14,779	+28,400
	2004-05	20,832	7,181	1,348,900	13,651	+9,249	+22,900
	2005-06	20,906	6,954	1,373,000	13,952	+10,148	+24,100
	2006-07	22,172	7,129	1,390,400	15,043	+2,357	+17,400
	2007-08	23,419	7,378	1,405,500	16,041	-941	+15,100
	2008-09	22,366	7,283	1,421,700	15,083	+1,117	+16,200
	2009-10	23,279	7,434	1,439,600	15,845	+2,055	+17,900
	2010-11	22,799	7,350	1,459,600	15,449	+4,551	+20,000
	2011-12	22,820	7,715	1,476,500	15,105	+1,795	+16,900
	2012-13	22,313	7,617	1,493,200	14,696	+2,004	+16,700
	2013-14	21,786	7,768	1,526,900	14,018	+19,682	+33,700
	2014-15	22,351	8,131	1,569,900	14,220	+28,780	+43,000

A2: Estimated Net Migration by major component (Overseas, Internal), Auckland Region 1996-2013

Auckland Region		Internal In Migrants	Internal Out Migrants	Estimated Internal Migration	Overseas Arrivals	Overseas Departures	Estimated Overseas Migration	Estimated Net Migration
	1996 – 2001	+74,085	-71,720	+2,365	+148,247	-108,734	+39,513	+41,878
	2001 – 2006	+68,003	-79,741	-11,737	+193,025	-92,228	+100,796	+89,059
	2008 -2013	+66,645	-64,940	+1,705	+153,738	-143,921	+9,817	+11,522

Source: Jackson & Pawar (2013)/Statistics New Zealand various sources

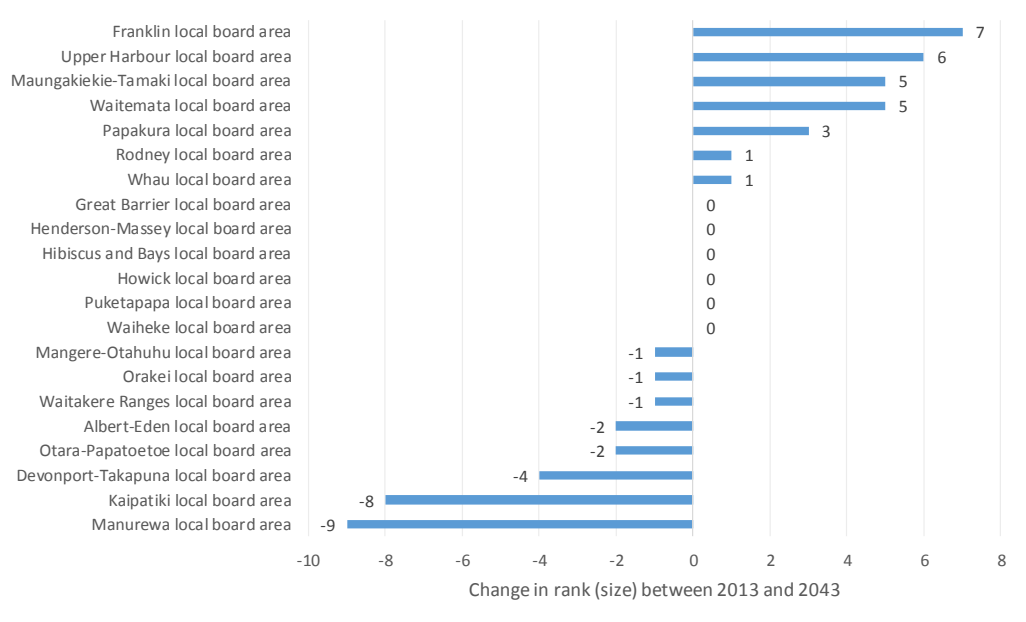
Appendix B

B1: Projected local board change in population size and rank between 2013 and 2043

	Size		Projected change	Rank (largest = 1)		Change
	2013	2043	(%)	2013	2043	in Rank
Howick local board area	135000	192500	42.6	1	1	0
Henderson-Massey local board area	113500	177100	56.0	2	2	0
Albert-Eden local board area	100000	137300	37.3	3	5	-2
Hibiscus and Bays local board area	94000	146600	56.0	4	4	0
Kaipatiki local board area	87000	106300	22.2	5	13	-8
Manurewa local board area	87000	97500	12.1	6	15	-9
Orakei local board area	83700	118500	41.6	7	8	-1
Waitemata local board area	81300	151800	86.7	8	3	5
Otara-Papatoetoe local board area	80300	109100	35.9	9	11	-2
Whau local board area	76700	118500	54.5	10	9	1
Mangere-Otahuhu local board area	75300	106400	41.3	11	12	-1
Maungakiekie-Tamaki local board area	73700	119400	62.0	12	7	5
Franklin local board area	68300	125200	83.3	13	6	7
Devonport-Takapuna local board area	58500	76500	30.8	14	18	-4
Rodney local board area	57300	99300	73.3	15	14	1
Upper Harbour local board area	56800	109600	93.0	16	10	6
Puketapapa local board area	56300	80800	43.5	17	17	0
Waitakere Ranges local board area	50700	62800	23.9	18	19	-1
Papakura local board area	48200	81300	68.7	19	16	3
Waiheke local board area	8630	11800	36.7	20	20	0
Great Barrier local board area	950	1010	6.3	21	21	0
Grand Total	1493180	2229310	49.3	...	...	...

Source: Jackson/Stats New Zealand (2015) Subnational population projections, by age and sex, 2013(base)-2043

B2: Projected local board change in population size and rank between 2013 and 2043



Source: Jackson/Stats New Zealand (2015) Subnational population projections, by age and sex, 2013(base)-2043

Appendix C

C1: Projected local board change (number) by major ethnic group 2013-2038, and projected contribution to change (%)

	Projected Change in Number* 2013-2038					Projected Contribution to Change (%)*			
	European or Other (incl. New Zealander)	Maori	Pacific	Asian	Total People (Headcount)	European or Other (incl. New Zealander)	Maori	Pacific	Asian
Albert-Eden local board area	5800	4360	240	23800	32500	17.8	13.4	0.7	73.2
Devonport-Takapuna local board area	-300	1660	1730	13100	15800	-1.9	10.5	10.9	82.9
Franklin local board area	34000	9130	4670	8980	47900	71.0	19.1	9.7	18.7
Great Barrier local board area	0	90	50	30	50	0.0	180.0	100.0	60.0
Henderson-Massey local board area	6300	10650	17900	35000	53400	11.8	19.9	33.5	65.5
Hibiscus and Bays local board area	29900	7870	2850	12620	44800	66.7	17.6	6.4	28.2
Howick local board area	-3000	8740	7500	41200	49800	-6.0	17.6	15.1	82.7
Kaipatiki local board area	-7900	1550	3350	24800	16700	-47.3	9.3	20.1	148.5
Mangere-Otahuhu local board area	-3650	3150	22300	10150	26700	-13.7	11.8	83.5	38.0
Manurewa local board area	-15900	9800	31400	-500	10600	-150.0	92.5	296.2	-4.7
Maungakiekie-Tamaki local board area	8700	6250	8250	23700	38400	22.7	16.3	21.5	61.7
Orakei local board area	11400	4390	1670	17750	30400	37.5	14.4	5.5	58.4
Otara-Papatoetoe local board area	-10170	1000	13000	25500	24700	-41.2	4.0	52.6	103.2
Papakura local board area	4500	11450	11580	12610	27500	16.4	41.6	42.1	45.9
Puketapapa local board area	-5800	2280	5700	20500	21300	-27.2	10.7	26.8	96.2
Rodney local board area	24500	4570	2910	9700	35500	69.0	12.9	8.2	27.3
Upper Harbour local board area	14400	3320	1900	26400	44800	32.1	7.4	4.2	58.9
Waiheke local board area	2220	540	400	350	2720	81.6	19.9	14.7	12.9
Waitakere Ranges local board area	6700	4150	3770	5380	11000	60.9	37.7	34.3	48.9
Waitemata local board area	18300	2190	-1090	36700	59900	30.6	3.7	-1.8	61.3
Whau local board area	0	4080	6150	32300	35300	0.0	11.6	17.4	91.5
Auckland	120100	101100	146100	380100	629800	19.1	16.1	23.2	60.4
Total New Zealand	294500	381700	254400	606600	1057000	27.9	36.1	24.1	57.4

Source: Jackson/Stats NZ (2015) Subnational ethnic population projections, characteristics, 2013(base)-2038

**Enumeration is based on multiple ethnic group responses, with the result that numbers and percentages sum to more than 100% of the underlying headcount.*