Living in the 'liveable' city:

Housing, Neighbourhood, and Transport Preferences in New Zealand cities

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Abstract

This thesis investigates preferences for housing, neighbourhoods, and transport in Auckland, New Zealand, supplemented by a comparison with similar research in Wellington and Hamilton. The topic is significant for New Zealand as there is an increasingly urban population, and the interconnected areas of urban form and transport can help the country reduce carbon emissions and provide a healthier, more enjoyable lifestyle for its people. The influence of residents' preferences and their relationship with urban form on achieving compact city development is investigated.

Historical and current planning rules and policies provide context for an analysis of how urban planning, preferences, and location and travel choices interact. Auckland's housing and transport policies show a pattern of path dependency: decisions favouring greenfield development, sprawling low-density suburbs, and car-centred transport have driven subsequent investments and influenced the ease of using alternative transport modes. Such rules have also reduced the availability of housing in accessible, medium- to high-density neighbourhoods and may have contributed to the rising costs of this type of housing.

A stated choice survey of 3,285 Auckland households was conducted to investigate the extent to which there is an unmet demand for compact development and alternatives to car travel.

Using the survey results, a multinomial latent class model was developed to examine the preferences of households and the trade-offs they may be willing to make when choosing where to live. This type of model allows for identification of preference groups as a means of understanding the heterogeneity of preferences across the population. There was an unmet demand for accessible, medium-density housing, with some households willing to trade off dwelling size and neighbourhood type for higher accessibility or lower prices. The study also found that more people currently drive than would prefer to, with long journey times, safety concerns, unreliable services, and a lack of infrastructure acting as barriers to active and public transport. Households preferring low density are more likely to occupy their preferred dwelling type and be able to use their preferred transport mode. In contrast, those preferring high accessibility or driven by price are more likely to experience a mismatch between their preferred and current dwelling type, and are less likely to be able to use their preferred transport mode.

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Contents

List of Figures

List of Tables

1. Introduction

Within the context of urbanisation, the trajectory of urban area development has significant implications for carbon emissions, quality of life, energy use, commuting costs, and health. Global urban populations are expected to increase by 2-3 billion this century, constituting 60% of the overall global population by 2030 and at least two-thirds by 2050. Taking into account both direct and indirect emissions, urban areas consume 67%-76% of global energy and generate approximately 71-76% of global energy-related carbon emissions (Seto et al., 2014, p. 90). Urban energy consumption is projected to triple by 2050, and an estimated 60% of this growth will be due to urban sprawl, surpassing the impacts of GDP and population growth (Creutzig, Baiocchi, Bierkandt, Pichler, & Seto, 2015; New Climate Economy, 2014). Energy intensities related to transport and buildings, agglomeration effects, infrastructure costs, and social equity (employment, housing, and transport) are all affected by urban form (Floater, Rode, Robert, et al., 2014) which, along with economic activity, transport costs, and geographic factors, is estimated to explain 37% of urban direct energy use and 88% of urban transport energy use (Creutzig et al., 2015, p. 6283).

Sprawled development imposes huge public and private costs by raising levels of air pollution, discouraging walking and cycling, reducing accessibility to primary services such as education and health care, reducing land availability for agriculture and ecosystem services, and increasing expenditure on transport and grid infrastructure. For example, even with significantly lower fuel prices, transport costs in Houston with a sprawling urban footprint are estimated to be around 14% of the city's GDP contribution compared to 4% in the relatively compact city of Copenhagen and typically around 7% in many Western European cities (Floater, Rode, Robert, et al., 2014, p. 34). Household carbon footprints (HCFs) are also influenced by urban form and density, with vehicle fuel use and CO_2 generally higher in sprawling, less dense areas – transport carbon footprints are 50% higher in large suburbs than city cores and HCFs are 25% higher in extensive suburbs than urban areas (Jones & Kammen, 2014). In relation to density, per capita emissions in U.S. cities increase until population densities of approximately 12 people per ha (p/ha), after which HCFs decline logarithmically, levelling off around 30tCO_2 per household (35% below average) at densities over 193 p/ha (Jones & Kammen, 2014). In 2013, Auckland and Wellington had population-weighted densities of 43.1 people/ha and 37.8 people/ha

respectively (Goodyear & Fabian, 2014; Nunns, 2014), although the population-weighted density of Wellington City was 57.4 people/ha (Adams & Chapman, 2016).

Sprawl also contributes to social and equity impacts such as loss of peri-urban spaces, greater heat island impacts (Stone, Hess, & Frumkin, 2010), and social exclusion, while crowding and raw density can have negative effects on residential satisfaction (Torshizian & Grimes, 2014). Density in particular can have a multi-directional influence on different elements of urban social sustainability, where dense urban forms and their associated housing types tend to have negative outcomes in relation to neighbourhood dissatisfaction, but access to services is generally better with higher density (Bramley & Power, 2009). Furthermore, sprawling 'single function' residential or commercial zones can be more difficult to serve with public transport and may require more roads and parking spaces for private vehicles (World Health Organisation, 2011a, p. 20). Overall, urban sprawl is estimated to cost the US economy around 2.6% of GDP, and at least doubles land used per housing unit, increases costs of providing utilities and public services by 10-30%, and increases travel costs by 20-50% (New Climate Economy, 2014; Gouldson et al., 2015; World Health Organisation, 2011b). New Zealand research also shows that areas of higher density generally have lower infrastructure provision costs per capita (Adams & Chapman, 2016). Without a broad, structural shift in the model of urban development, benefits from improvements in building energy efficiency, waste management, and transit are likely to be overtaken by population and economic growth within seven years (New Climate Economy, 2014). This conclusion is reinforced for coastal cities, which are subject to sea level rise; their model of urban form will have to adapt rapidly, and there is an important opportunity to reconsider density and carbon emissions as they rebuild.

In light of these issues, compact urban growth – along with connected infrastructure and coordinated governance – has the potential to improve long-term productivity of urban areas and yield various environmental and social benefits. For developing cities in particular, compact urban growth and effective transport planning can encourage higher population densities, improve quality of life, and help avoid lock-in to pathways of high carbon emissions. This is especially important for low-income cities, where rapid population growth and less access to electricity mean urban centres may have relatively high levels of greenhouse gas emissions compared to developed cities with energy-efficient medium to high-density housing (World Health Organisation, 2011a).

Compact cities are often characterised by higher density development with functionally and socially mixed neighbourhoods, and walkable urban environments,

often complemented by green spaces to maintain liveability. It is widely accepted that compact, connected cities are more economically productive, socially inclusive, resilient, healthier, and energy efficient than poorly-managed, sprawling cities (New Climate Economy, 2014; World Health Organisation, 2011b), although this could be partly explained by other factors such as education and governance. Well-functioning cities with mixed land uses and higher densities provide greater access to and choices of housing, offer better protection of the natural environment and cultural values, enable transport system diversity, and better mitigate climate risk (Chapman, Howden-Chapman, & Capon, 2016; New Zealand Productivity Commission, 2016, p. 13). Density and land use mix also determine proximity to destinations, which can save time, money, and stress, and enhance the attractiveness of higher density living (New Zealand Centre for Sustainable Cities, 2015; Nunns, 2015; Saelens, Sallis, & Frank, 2003). In addition to urban form characteristics, transport systems in compact urban settings improve access to jobs, education, and economic opportunities for poorer groups, who are disproportionately affected by inefficient transport (WBGU, 2016; X. Zhao et al., 2016).

Given the contribution of cities to energy consumption and carbon emissions, climate mitigation potential is a particularly important issue for urban development. Compact urban form and sustainable transport systems, supported by increases in gasoline prices and characterised by high connectivity and accessibility, could potentially reduce global energy use by up to 26% and greenhouse gas intensities by up to 50% in the medium- to long-term (Creutzig et al., 2015; X. Zhao et al., 2016). Furthermore, urban form changes that provide for fewer vehicle trips, more frequent non-motorised travel, and shorter motorised trips have the potential to reduce travel distances by 10%, thus reducing greenhouse gas emissions by 11% (Cervero & Kockelman, 1997; Jones & Kammen, 2014; P. Zhao, Chapman, Randal, & Howden-Chapman, 2013). Beyond the environmental benefits, such changes could potentially reduce household expenditures by about 20%, while global urban infrastructure requirements could be lowered by more than USD$3 trillion by 2030 (New Climate Economy, 2014).

According to the German Advisory Council on Global Change, a sustainable city has a population density of more than 150 people/ha; at least 40% of ground floor spaces are allocated for ‘economic’ use; 20-50% of residential use is allocated for low-cost housing; less than 10% of dwellings are single family homes; and no more than 30% of land is made available for roads and traffic use. Such a city also needs to be walking- and cycling-friendly and affordable for all (WBGU, 2016). Other factors that make a successful city include: planning frameworks responsive to changing values,

preferences, technology, and demographics; a development capacity sufficient for housing and other land uses to meet demand; the coordination of infrastructure investments with land supply and population growth; integration of land use with infrastructure provision and public amenities; and protection of the natural environment (NZPC, 2016). Through higher density development, greater land use diversity, and improved destination accessibility, the goal of this type of development is not only to contain sprawl, but to manage urban growth in a way that encourages dense, transit-oriented, liveable urban forms that reduce car use and dependency (Gouldson et al., 2015).

The urban spatial change process involves urban development and redevelopment activities, urban planning and design, household residential location choice, urban governance, transport demand and supply, industrial and commercial firms' location choice, technical improvements in building, and transport technology (P. Zhao et al., 2013). Given the complexity of urban systems, compact city development requires simultaneous consideration of a range of issues, processes, and outcomes. In this way, Chapman et al. (2016) argue that cities need to be seen as complex systems with a variety of characteristics, within a coevolutionary framework in which urban systems coevolve alongside natural systems, infrastructure, technology, and institutions. Hence, cities are 'socio-ecological-technical' wholes (Chapman et al., 2016, p. 6) comprising interconnected parts, within which exist nested integrated entities (e.g. public transport networks) that produce emergent properties such as economic productivity and identity. Co-benefits express the importance of the interplay between elements of an urban system – for example, housing intensification makes public transport more economically viable, improving access and well-being – and highlight the interdependence between the structural city form and the social aspects such as the perception and use of urban spaces (WBGU, 2016).

Mitigation interventions related to urban form have the highest potential during early phases of urban development (Creutzig et al., 2015), but the path-dependent nature of urban development also means that individual changes may be ineffective until other steps are taken. Therefore, it is important to link diverse measures (e.g. promotion of compact, mixed-use development and higher vehicle taxes that raise the cost of car ownership) and complementary policies to ensure that compact urban development is effective. Policies which can support higher density, compact form and improved capacity for development include: mixed-use zoning, careful introduction of urban growth boundaries, shifting from minimum to maximum parking requirements, investing in diverse transport systems, congestion charges, traffic

calming, redeveloping brownfield areas, and promoting increased inner-city living (Chapman et al., 2016; Dunbar & McDermott, 2011; New Climate Economy, 2014; Floater, Rode, Friedel, & Robert, 2014; McCahill & Garrick, 2012). Transport planning that pursues safety, accessibility, time savings, emission reductions, and minimising negative environmental and health impacts, can also be a catalyst for sustainable urban development (WBGU, 2016).

Compact urban growth will also require accommodating some urban expansion. New developments that are proximate to existing developed land and serviced by infrastructure can ensure that expansion is compact, but if expansion is excessively restricted, the result could be development that 'leapfrogs' over urban growth boundaries or the growth of informal settlements on the urban fringe due to high housing prices (Floater, Rode, Robert, et al., 2014, p. 36). A lack of central government involvement in urban planning processes also leads to unbalanced decisions with wider influences, while too much intensification and a lack of green space can cause the heat-island effect and increase air pollution (NZPC, 2016; Stone et al., 2010; WBGU, 2016). The extent of these effects is a question of scale; for example, New Zealand cities are very 'green' by world standards whereas U.S. cities can experience the external costs of urban development to a far greater degree while also imposing some external environmental, social and economic costs on other countries.

Hence, coordinated governance is vitally important in the urban change process. More than two-thirds of OECD cities have a municipal body coordinating programmes of public investment in infrastructure, and these cities tend to be denser, have higher GDP, and attract more skilled people (New Climate Economy, 2014). For example, while land use planning in Northern Europe is regionally coordinated and generally restricts low-density, car-oriented sprawl, traditional zoning in the United States has contributed to sprawl and car dependency through the separation of residential from commercial or business districts (Floater, Rode, Friedel, & Robert, 2014). In particular, city planners need to know the best places to allow the building of new amenities, roads, or public transport infrastructure, while government officials may be interested in the causes and potential adverse effects of income-based clustering (Maré & Coleman, 2011). However, due to changes in the urban environment, lifestyles, and preferences, it is not possible to have a constant optimum in urban form. Hence, urban development must offer a framework that can tolerate changes, additions, and enhancements (WBGU, 2016).

As stated earlier, residential location choices and preferences are crucial elements of urban development and the shift towards compact cities. These aspects have been the focus of an increasing amount of research that to some extent helps explain housing choice patterns and determine trends in demand. Housing and neighbourhood preferences are informed by attitudinal and built environment variables such as locality, dwelling size, individual lifestyle or life-stage, and access to transport and urban amenities (Allen, 2015; Kim, Pagliara, & Preston, 2005; Wildish, 2015; Yeoman & Akehurst, 2015). These and other attributes (e.g. safety, parking, and green space) are also important in choosing a house or residential location, where people make trade-offs between certain attributes to decide on a dwelling most closely aligned with their preferences. Residential self-selection and dissonance are other factors that can influence how people make housing choices and the direction of causality between preferences and choices. Patterns of agglomeration result from millions of individual choices, each weighing a range of factors or preferences. In this way, individual choices shape the city, and in turn, the emerging shape of the city – who locates where, the cost and type of housing, commuting time and modes – influences later choices (NZPC, 2016).

There is a common preference in OECD countries for living in detached housing, particularly taking affordability into account, although it seems most people support mixed-use and denser development at least in principle (New Zealand Centre for Sustainable Cities, 2015; Dunbar & McDermott, 2011). In New Zealand, a traditional preference for standalone suburban houses, described as a 'quarter acre pavlova paradise' (Mitchell, 1972; Wildish, 2015), remains prevalent and has been reinforced by the 'leaky homes' episode and failures in the developer-driven retail investor apartment market (Auckland Council, 2016b). Developing cities also display strong consumer preferences for car ownership and suburban lifestyles, where car use is driven by status and safety concerns, and a lack of viable alternatives. Triggered by these preferences and a combination of global socio-economic forces, increasing affluence, cultural traditions, land use planning, and a prioritisation of personal space over accessibility, suburbs and peripheral development grew faster than the urban core in 66 of 78 OECD metro regions from 1995 to 2005 (Rode et al., 2014, p. 20; Schubert, Wolbring, & Gill, 2013). Of course, this form of development also ignores many external costs, including carbon emissions, air pollution, health impacts, traffic congestion, and infrastructure costs. These issues can be addressed when governance consists, in part, of ensuring that residents are more conscious of these

external effects, and internalise them where feasible, or find other ways to minimise them.

There is evidence to suggest, however, that people are becoming more willing to accept attached dwellings or non-preferred locations, especially when dwelling size increases (Yeoman & Akehurst, 2015). Although this relationship is sensitive to price, it points to a potential mismatch between current supply of housing typologies and the housing people would choose if it were available. More specifically, there seems to be an insufficient supply of compact housing (including apartments) to meet the changing preferences and needs of the population, and an over-supply of large dwellings. Similarly, changing preferences regarding residential location, housing options, and transport modes may also be translating into an unmet demand for transport choices (Nunns, 2015; Parker, 2015; Preval, Chapman, & Howden-Chapman, 2010) where increasing numbers of people want to move away from cars but are unable to do so due to long journey times, safety concerns, insufficient infrastructure, and public transport unreliability. Due to mismatches between residential preference and choice, the disparity in travel patterns associated with different land uses can be underestimated (Bagley & Mokhtarian, 2002), while demographic, socio-economic, and socio-cultural changes are making it more difficult to explain and predict residential preferences (Jansen, 2014). The small amount of new housing that is constructed relative to the existing housing stock also means that a minority of buyers, developers and policies will determine the type of new housing and, as they are occupied, what preferences are revealed (Vasanen, 2012).

The rest of the thesis is structured as follows. Chapter 2 outlines the historical and current New Zealand and Auckland context in terms of housing, neighbourhoods, and transport. For Auckland, population changes, travel patterns, house prices and ownership, preferences, and urban planning policies are described in more detail.

Chapter 3 reviews international and New Zealand literature regarding preference formation and choice behaviour, methods of studying preferences, residential self-selection, causality, and dissonance, and the influence of housing and neighbourhoods on travel. This chapter forms the basis for the development of research questions, which are outlined at the beginning of Chapter 4.

Chapter 4 describes the conceptual framework and methodological approach of this thesis, including the theoretical background of housing research, survey design, and development of the latent class multinomial logit model.

The most important results of the study are described in Chapter 5. First is an outline of sociodemographics, house and neighbourhood problems, and transport preferences, frequencies, and barriers. Second, is an examination of which dwelling and neighbourhood factors are important in dwelling choice and how these factors correlate with each other. Lastly, and of particular importance, is a comparison of household preferences in Auckland, Wellington, and Hamilton, including outcomes of the stated choice experiment and results of the latent class model analysis.

Chapter 6 discusses the results of this study in more detail, with a specific focus on how preferences for housing, neighbourhoods, and transport differ between cities and how they align with the concept and characteristics of compact urban development. The relevance of this thesis for policy is also discussed, as well as the limitations of the study and potential for future research. This thesis ends with a conclusion of the key ideas and findings.

2. New Zealand Housing, Neighbourhoods, and Transport

Historically, urban development in New Zealand comprised sprawling low-density suburbs, with population growth absorbed through the expansion of greenfield developments. This occurred partly due to car-centred transport and a lack of environmental concern, while strong preferences for standalone homes also played a significant role (NZPC, 2016, p. 82). However, there has been a gradual shift in planning policy towards more compact urban development. The Auckland Regional Growth Strategy 1999 promoted urban limits and densification policies to manage growth without further degradation of the natural environment, while other councils are promoting intensification through residential density targets, urban growth boundaries, and zoning for medium-density housing (NZPC, 2016).

Housing research in New Zealand has found a strong preference for detached housing, with approximately 80% of people preferring standalone houses and 60-70% saying apartments would be their least preferred option (Preval et al., 2010; Randal & Hamer-Adams, 2015). Residents of detached housing also tend to have a lesser intention to move, a pattern which may reflect the overall preference for standalone dwellings (Kim et al., 2005), while concerns about intensification include a loss of privacy, lack of natural light, increased traffic, parking pressures, and safety (Auckland Council, 2016b). An overall opposition to development which disturbs an established suburban pattern may be due to the endowment effect (Thaler, 1980), one explanation of which is that people tend to be loss-averse and prefer avoiding losses than acquiring gains (New Zealand Productivity Commission, 2015). Although a preference for standalone dwellings is very different from an opposition to development, both can provide insight into the relationship between changing housing and neighbourhood preferences and future urban development.

However, in apparent contrast to such findings, recent New Zealand research has found that New Zealanders do desire the advantages of access to amenities. Sixty-seven percent prefer to live within walking or cycling distance of work, schools, shops, parks, and transit stops, and only 53% prefer a larger house further from the city (Randal & Hamer-Adams, 2015). About three-quarters (73%) of New Zealand's urban population also agree or strongly agree with mixed-use, higher density development in principle despite most people being opposed to high rise apartments in their own neighbourhood (NZCSC, 2015; Randal & Hamer-Adams, 2015).

This contradiction between supporting access to amenities and mixed use neighbourhoods, and preferred housing type, may be explained by the scarcity and generally poor quality of mixed-use developments (Preval et al., 2010). This is particularly important in relation to neighbourhood resilience and health outcomes (Pearson, Barnard, Pearce, Kingham, & Howden-Chapman, 2014) given many peoples' association of high-density living with poor quality 'shoe-box' apartments in the central city (Allen, 2015; Dunbar & McDermott, 2011). There also appears to be entrenched market resistance to multi-unit housing associated with cultural preferences and historical experience. Some evidence also points to a general opposition to metropolitan urban limits among developers (Dunbar & McDermott, 2011; Preval et al., 2010), and a tendency on the part of developers to offer greenfield housing.

Although inner-city apartment living is a relatively new phenomenon in New Zealand, Carroll, Witten, and Kearns (2011) argue that it will continue to grow with rising transport costs and congestion. Hence, the growing popularity of low-rise apartments and medium-density housing represents a potential disjuncture between present supply and likely demand for higher density typologies, particularly in suburban Auckland. The data does not rule out a growing demand for low-rise but higher density housing typologies, especially where these are affordable. This trend is likely related to changing lifestyle expectations, with the majority of people linking urban amenities to quality of life aspects such as accessibility and convenience, and the increasing demand for more walkable neighbourhoods (Allen, 2015; Wildish, 2015). For example, 26% of people would prefer a more walkable neighbourhood than where they currently live (Badland et al., 2012, p. 1473). Due to the strong impact of life stage on housing and location preferences (Preval et al., 2010), other differences exist between age groups and household types. Smaller, medium-density dwellings closer to the city are more popular for 18-24 year olds, young professionals, and the elderly (Kim et al., 2005; Scott et al., 2015), and for those for whom travel costs are important in determining where to live. In addition, high-income earners and those with educational qualifications tend to cluster in inner suburbs – particularly in Auckland and Christchurch – while the opposite is true for lower-income households with less educational qualifications (NZPC, 2016).

The majority of people also think councils, rather than market forces, should have the key role in defining the limits and form of the city, while half think urban limits are necessary to support sustainable development (Preval et al., 2010; Randal & Hamer-Adams, 2015). So despite the general preference for a 'quarter acre pavlova paradise'

(Mitchell, 1972; Wildish, 2015) and resistance to higher density housing for families (Scott et al., 2015), there is a growing preference for compact development among younger and older age groups, and this is supported by an appreciation of the role compact cities play in sustainable urban development (Randal & Hamer-Adams, 2015).

How people make decisions regarding housing depends somewhat on the trade-offs they make between locality and dwelling characteristics. Warmth/cleanliness, security, safety, proximity to work and school, affordability, place attachment, green space, and accessibility of public transport are some of the most important housing attributes which influence both preference formation and the choice process (Allen, 2015; Wildish, 2015). For example, in relation to criteria for selecting a house, Maré and Coleman (2011) and Saville-Smith and James (2010) found that the most common responses related to having more space (a larger house as well as a larger section) and lower financial cost. Recent movers also reported seeking improvements in access to education, employment, and family, and reductions in transport costs. Overall, individuals tend to prefer a residential location with a combination of shorter commuting time, lower transport costs, lower density, higher quality of local schools, and lower price (Kim et al., 2005). Of course, not all of these attributes are attainable at the same time.

In light of these preferences, particularly those related to affordability, rising house prices represent a major, or in some cases critical, barrier to households being able to choose their most desired residential location. A deterioration in housing affordability over the last 25 years is due in part to land use policies that prevent intensification of suburbs surrounding the city centre, and the failure of development capacity to keep pace with demand in New Zealand cities (NZPC, 2016). New Zealand house prices increased 80% in real terms between 2002 and 2008, and in the year to September 2014, nominal house prices rose by 6.4% nationally and 10.3% in Auckland (Murphy, 2015, p. 6). Despite rapidly rising land prices, the average size of new dwellings has also increased by more than 50% between 1989 and 2014, while more than half of the new builds in 2014 were valued in the upper quartile of all housing stock (NZPC, 2015). With a continuing lack of new, high quality, well-designed neighbourhoods, Scott et al. (2015) argue that without integration into regional and national housing policy objectives, house prices in such developments will continue to rise as a function of the housing market. For Auckland, although housing affordability is particularly significant, it is just one aspect of the complex relationship between residential preferences and choice behaviour.

Transport preferences and frequencies are another critical aspect of the development of compact, resilient cities. Across all regions of New Zealand, 20.3% of people living in cities travel several times a day, 15.9% travel once a day, 15.8% travel two or three times a week, and 25.6% travel less than two or three times a month (Wooliscroft, 2015). People are now travelling about one hour every day on average, most of which is as the driver (52%) or passenger (27%) of a private vehicle (Ministry of Transport, 2015, pp. 12-13). In terms of time spent travelling per person per day, people are driving for 32 minutes, walking for about 8 minutes, and using public transport for only 4 minutes. The driver is also the sole occupant in 67% of trips in cars, vans, and utility vehicles; older people (those over 55) are driving further later into life than they did 20 years ago; and approximately three-quarters of households own either one or two cars (Ministry of Transport, 2015). These patterns are in contrast to travel behaviours across the European Union in particular, where 68% of people walk every day compared to 40.6% of New Zealanders, 16.6% use public transport every day versus 6.1%, and 12% cycle every day versus 3.8% (Wooliscroft, 2015). Auckland is of particular interest in this regard, as the car-dominated monoculture of the transport system has reduced flexibility and resilience and created congestion as a result of the exhaustion of land used for motorway expansion (Chapman et al., 2016).

Despite the general dominance of the car, vehicle kilometres travelled (VKT) have fallen by 8% since 2004 (Lyons et al., 2014), and there are significant differences in mode share between age groups and areas of New Zealand. For example, the national average for having used public transport in the last year is 34%, but this proportion is much higher in Auckland (48%) and Wellington (66%) and slightly above average in Christchurch (37%), while 18% of 13-17 year olds used public transport on 20 or more days per month, more than any other age group. Regular public transport users are also more likely to walk, with approximately half walking for at least 10 minutes per day, 33% walking for 20 minutes or more, and 25% walking for more than 30 minutes (Ministry of Transport, 2015). Similar to the tension between supporting compact development and preferred housing type, there is evidence to suggest that New Zealanders may prefer alternatives to the private car. When asked which measures should be used to improve travel within cities, the two most common answers related to improved and cheaper public transport and the next two related to improvements in active transport. There was also a clear majority for restricting the use of certain vehicles (Wooliscroft, 2015).

		Auckland	Wellington City	Hamilton City
Population		1,415,550	190,959	141,612
Population growth rate (since 2006)		8.5%	6.4%	9.3%
Median income		$29,600	$37,900	$27,700
Transport shares (travel to work)	Driving/passenger	66.1%	41.9%	69.1%
	Public transport	6.7%	16.8%	2.4%
	Walk/jog	4.1%	17.3%	5.3%
	Cycling	1.0%	3.5%	3.1%

Table 2.1. Characteristics of Auckland, Wellington, and Hamilton – 2013 census data. Source: Statistics New Zealand.

2.1 Auckland context

2.1.1 Population, housing, and transport

In 1956, Auckland had a population of 399,000, of whom 36% lived outside the Central urban zone[1]. By 1976, the population had increased to 743,000 and the percent of residents living outside the central zone had risen to 61%. In 2006, 33% of Auckland residents lived in the Central zone, 31% lived in the Southern zone, 20% lived in the Northern zone, and 16% lived in the Western zone. The central business district (CBD) alone experienced a 92% population increase between 1991 and 2006 (Carroll et al., 2011). At the same time, 55% of employment was concentrated in the Central urban zone, while the Southern, Northern, and Western zones were responsible for 19%, 17%, and 9% of employment respectively. Eighty percent of the employed Central Auckland residents worked in the central area, but only 30% of Northern, 43% of Western, and 36% of Southern residents worked centrally. The remaining workers were mainly employed in the zones in which they lived, suggesting that most people avoided cross-suburb commutes (Maré, Coleman, & Pinkerton, 2011). Auckland is the most ethnically diverse region in the country, experiencing a 300% increase in its Asian population and a 20% decline in Europeans (Goodyear & Fabian, 2014), while the 65+ age group is also expected to grow from 11.4% to 17.4% over 2013-2033 (Auckland Council, 2016b). At the most recent 2013 census, Auckland had a population of approximately 1,415,550, an increase of 110,589, or 8.5%, since 2006 (Statistics New Zealand, 2013), and it is expected to reach 2 million by 2033 (Auckland Council, 2016b).

[1] Defined by Statistics New Zealand as Auckland City, excluding the Hauraki Gulf islands.

Although most people do not live in the central city, the perception that Auckland is a sprawling city is not entirely justified. In fact, due to a decade of infill development and intensification, Auckland's population-weighted density is the third highest in Australasia, exceeding comparably sized Australian cities such as Perth and Brisbane. Between 2001 and 2013, Auckland's population-weighted density rose by one-third from 32.4 people/ha to 43.1 people/ha and dwelling density increased from 0.855 to 1.02 dwellings/ha (Goodyear & Fabian, 2014; Nunns, 2014). The neighbourhood in which the average Auckland resident lives was also approximately 33% denser in 2013 than 2001. However, despite rapid construction of apartments during the early 2000's, approximately 70% of dwelling development in Auckland between 2001 and 2013 was located in areas more than 10km from the city centre (NZPC, 2016). By comparison, over half of new dwellings built in Wellington between 2001 and 2006 were within 5km of the city centre. Intensification in Auckland's city centre has not spilled over into surrounding suburbs, as Auckland Central East and Central West remain the most dense area units with over 50 dwellings/ha (Goodyear & Fabian, 2014, p. 10).

Another perspective is given by examining the number and type of dwellings in Auckland. In 1976, there were 225,000 dwellings in the Auckland urban area, of which 43% were in the Central zone. By 2006, this number had increased to 400,000, and of the 175,000 new dwellings, 30% were located in the Southern zone, 25% each in the Northern and Central zones, and 20% in the Western zone. Since 75% of new dwellings have been built outside Central Auckland, Maré et al. (2011) argue that it is unsurprising that 77% of Auckland's population growth since 1976 has taken place outside the central city. However, over this period, Auckland's development was not uniform. Between 1976 and 1986, for example, the number of dwellings in the Central area increased by 4,200, only 10% of the city-wide increase. Given preferences, property prices, and transport costs, developers built very few dwellings in central Auckland and it seemed people generally wanted to move away from the central city. In contrast, between 1996 and 2006, 30% of new dwellings were built in central Auckland and the population increase there was 27% of the total increase in population. Due to increased demand for central city residence, developers clearly thought it worthwhile to expand central Auckland's housing stock (Maré et al., 2011).

The Auckland Regional Growth Strategy suggested that 50% of population growth from 1996-2046 would need to be accommodated in multi-unit housing (Dunbar & McDermott, 2011; Auckland Regional Growth Forum, 1999, p. 38), a vision that may well be achieved. Over half the consents for new apartments between June 1991 and

June 2014 have been in the Auckland region, and the share of new building consents for joined units and multi-units rose from 20% in 2001 to 25% in 2013 and 45% in 2015 (Auckland Council, 2016b). Hence, there has been a 58.4% increase in the number of apartments from 2006 to 2013 and there are now over 15,000, three-quarters of which are in the Waitemata local board area. Apartments now constitute about 15% of occupied joined dwellings, and nearly one in four (24.8%) occupied private dwellings in 2013 were attached compared to one in five in 2001, the highest percentage in the country. Furthermore, nearly 40% of joined dwellings had two or three storeys and 14.4% had four or more. Of those apartments where household composition was stated, 36.3% were single person, 29.3% were couples, and 13.3% were flatmates (Goodyear & Fabian, 2014). As of 2013, there were 473, 448 occupied dwellings and 33,360 unoccupied dwellings in the Auckland region (Statistics New Zealand, 2013).

Lastly, it is important to note the rapidly changing nature of Auckland's transport system. Although most people drive to work (see Table 2.1.), and motorway expansion has created congestion and reduced flexibility (Chapman et al., 2016), a greater proportion of Auckland residents have used public transport in the past year (48%) than the national average (Ministry of Transport, 2015). Public transport ridership is increasing, rising by 4.9% overall since December 2015. Use of the Rapid Transit Network is also growing, increasing by 16.2%, within which the Busway was up 10.7% and the Rail network was up 17.6%. Ferry trips were also up 4.5%, continuing the trend of steady growth ("December-2016 Ridership," 2017; Auckland Transport, 2017).

2.1.2 House prices and ownership

House prices and ownership rates are another important aspect of Auckland's residential development. From January 1992 to June 2015, average Auckland house prices tripled – excluding general price inflation – at a compound growth rate of 4.8% p.a. Since the last peak in April 2007, average 'real' house values have risen 34% compared to a 6% decline in average house price for the rest of New Zealand (Parker, 2015), while in the year to September 2014, nominal house prices in Auckland rose by 10.3%. In October 2014, average house prices were $731,302, 51% above the national average (Murphy, 2015), and by June 2015 had increased to $787,000, up 28% from a year earlier. House prices have also increased 60% faster than average incomes between 1998 and 2014, and the median house price is now 10 times the median household income in metropolitan Auckland (Auckland Council, 2016b). As a result, homeowners are now spending about 15% of income on housing, with low-

income households in Auckland far more likely to spend over 30% of their income on housing than higher-income households (NZPC, 2016). Rents in Auckland increased 123% from 1993-2012 and are higher than anywhere else in New Zealand. The median weekly rent in 2013 was $350, $70 more than the New Zealand average (Statistics New Zealand, 2013), while 36.8% of households renting pay over $400 per week compared to 26.7% in Wellington and 15.4% in Christchurch (Goodyear & Fabian, 2014). These changes are exacerbated by the fact that renting households generally have lower incomes, with 23.1% of renting households in Auckland earning over $100,000 compared to 44.9% of those who owned their dwelling or had it in a family trust (Goodyear & Fabian, 2014).

These trends are due to demand pressures such as population growth, migration, low interest rates, and tax incentives, as well as supply drivers including planning constraints, design requirements, and fragmented land ownership (Parker, 2015; Preval, Randal, Chapman, Moores, & Howden-Chapman, 2016). There is also a strong zoning boundary effect on land prices, partly related to the existence of the Metropolitan Urban Limit (MUL), which has driven up land and house prices through the restriction of land supply for housing (NZPC, 2015, 2016). Such growth limits may theoretically be helpful for monocentric cities experiencing traffic congestion, and may have other merits, but are likely to have negative welfare impacts in polycentric 'real world' cities such as Auckland. Land values are also higher close to the CBD, which is consistent with increased agglomeration effects (Grimes & Liang, 2007). In addition to the MUL, building height limits can create higher housing and transport costs as a result of development capacity constraints, and increase congestion due to the fact the people have to live further away from important destinations (Nunns, 2016).

The gap in home ownership levels between Auckland and elsewhere in New Zealand has been increasing since 2001, with most current figures suggesting that approximately 62% of households in Auckland own their own home or hold it in a family trust, a 12% decrease since 1986 and slightly lower than the New Zealand average of 65% (Auckland Council, 2016b; Statistics New Zealand, 2013). It is also important to note the differences in ownership rates between ethnicities, where 54% of European households own the dwelling they live in, 35% of Asians, 24% of Maori, 22% of Middle Eastern/Latin American/African (MELAA), and 17% of those from Pacific Islands. Home ownership percentages also rise steeply with income, with 78% ownership for those earning over $100,000 compared to 36% for those earning less than $20,000 (Parker, 2015). In the lowest income quintile, home ownership declined

16.6% between 2006 and 2013 while crowding increased 30.5% (Goodyear & Fabian, 2014).

2.1.3 Housing and neighbourhood preferences

As explained earlier, there is a potential mismatch between the current supply of dwelling typologies and the housing Aucklanders would choose if it were available. Although 87% of people live in standalone houses, only 52% prefer this type of dwelling. Furthermore, while attached houses (townhouses) and apartments are occupied by only 10% and 3% of people respectively, preferences for these dwelling types are estimated to be much higher (25% for attached houses, 15% for low-rise apartments, and 8% for high-rise apartments) (Yeoman & Akehurst, 2015). Sixty percent of dwellings in central Auckland are apartments, while standalone dwellings make up the majority of housing in every other area. Hence, according to Yeoman and Akehurst (2015), there is an over-supply of apartments in central Auckland, and for every other area, an under-supply of units and apartments and an over-supply of detached houses relative to individuals' choices.

In their study prepared for Auckland Council, Yeoman and Akehurst (2015) examined the preferences, choices, and trade-offs involved in the housing decision-making process. Overall, 'local environment' features were the most important factors driving housing choice, more so than 'property' and 'dwelling' features. A safe neighbourhood was very important to 87%, while natural light (77%), easy to heat (73%), and secure (71%) were the other specific attributes that were very important. Outdoor space (56% very important), standalone houses (53%), and easy access to shops (41%) were other somewhat important attributes. In terms of transport, 38% rated access to public transport as very important, but the ability to cycle to work or study was very important to only 11%. It is also interesting to note that 59% of respondents selected their current location as the first choice for preferred residential location, a result that was strongest in East Auckland, North Shore, and Central Auckland. Although this result represents a majority, it also suggests that a significant proportion of people would prefer to move to a different area, particularly those who live in South and West Auckland. In a similar vein, 47% chose a housing option within the location they initially preferred, and 40% selected a final choice with lower average prices. Lastly, 51% of respondents said the final housing option reflected the actual choice they would make, 31% said it did not, and 19% were unsure. Of particular importance is the finding that 64% of those who chose apartments in buildings of five or more storeys confirmed their choice matched the actual choices they would make, a significantly higher proportion compared to the overall average. People were also four

times more likely to choose an apartment if the number of bedrooms increased by one, and although the base was low, it prompts the question; to what extent are people willing to trade-off their preferred dwelling type for a larger dwelling?

2.1.4 Plans and policies

In light of population changes, development patterns, house price increases, and preferences, Auckland Council's plans will have a significant influence on how urban form and housing develop in the future. Of particular importance are the Auckland Plan and the Auckland Unitary Plan, while the Housing Accords and Special Housing Areas Act (HASHAA) may also affect the extent to which central government becomes further involved in Auckland's housing issues. The current Auckland Council was formed in 2010 from the amalgamation of the four existing cities (Auckland, Manukau, Waitakere, and North Shore), three District Councils (Papakura, Rodney, and Franklin), and the Auckland Regional Council (Murphy, 2015), and is responsible for the Auckland Plan and Proposed Auckland Unitary Plan (PAUP). These plans set out the council's planning policies and goals for future development and determine where and how many houses can be built.

The final Auckland Plan was published in March 2012 and promotes urban intensification as part of a strategy for making Auckland the 'world's most liveable city' (Auckland Council, 2012, p. 10). This is in contrast to the central government's emphasis on land being released for residential development (Murphy, 2015) and, more recently, the provision of a $1 billion fund for greenfield infrastructure development (English & Smith, 2016). This vision is partly based on a transition to a quality, compact city, on the basis that 'denser cities have greater productivity and economic growth,' 'it makes greater use of existing infrastructure,' 'improved public transport is more viable,' 'negative environmental effects can be reduced,' and 'it creates greater social and cultural vitality' (Auckland Council, 2012, p. 42). Setting out the trajectory of housing supply, the Auckland Plan envisages that 60-70% of new housing will be developed within the existing Metropolitan Urban Limit (MUL) and that 30-40% of new development will take place within a new Rural Urban Boundary (RUB) that is set to replace the MUL (Auckland Council, 2012) should the Unitary Plan be accepted. However, the plan also allows for up to 40% of new housing to be developed on greenfield sites (Murphy, 2015) and did not go very far in identifying implementation pathways (Early, Howden-Chapman, & Russell, 2015, p. 21).

In addition to the Auckland Plan, the Auckland Unitary Plan (AUP) will have significant implications for Auckland's urban development and housing. Published in March

2013, the Draft Unitary Plan underwent public consultation and the subsequent Proposed Unitary Plan was announced in September 2013 (Murphy, 2015). An independent hearings panel (IHP) has since heard submissions on the proposed plan and, in August 2016, gave Auckland Council a set of recommendations they believe should be included in the final Unitary Plan. The Unitary Plan became operative in part on 15th November 2016, with appeals still to take place. The IHPs recommendations focus urban growth on centres, transport nodes, and corridors to achieve a quality, compact city – a prerequisite for the success of public transport and efficient functioning of the city. Some methods for achieving this vision and increasing residential, commercial, and industrial capacity include: enabling development of new or existing rural towns; removing density controls in residential zones; providing for affordable housing with a mix of dwelling types, adaptation of existing stock, and doubled enabled supply; removing or reducing on-site parking requirements; and, expanding the RUB to include 30% more land for 'future urban development' (Independent Hearings Panel, 2016, pp. 7-8). The hearings panel argue that the policy for the location of the RUB should remain in the Regional Policy Statement but that the location itself should be able to be changed by a plan change at the district plan level. It is also important that complementary investments be made in transport systems, water, electricity, and other services.

In relation to housing, provisions of the initial Proposed Unitary Plan greatly *reduced* the number of dwellings that can be built within the existing MUL over the next 30 years, with the maximum number that would have be outside the MUL increasing from 40% to 67.5% (Early et al., 2015). However, the IHP has recommended that 64% of feasible enabled residential capacity should be located within existing urban areas – comprising 146,000 residential dwellings, 39,000 Housing New Zealand homes, and 85,000 dwellings in centres and mixed-use areas – and 36% (138,000 dwellings) in new urban areas, a proportion more in line with the vision of the Auckland Plan (IHP, 2016). Overall, the Unitary Plan aims to double feasible enabled residential capacity to exceed 400,000 new dwellings over the next 30 years and includes rules that would allow higher density housing in suburbs. Estimates of residential demand over the next 7 years include a current shortfall of 40,000 dwellings and annual demand for about 13,000 dwellings (total demand of approximately 131,000) (Early et al., 2015; IHP, 2016; Preval et al., 2016). The provision of 422,000 dwellings by 2041 aims to accommodate between 700,000 to 1 million new residents whilst ensuring sufficient capacity for the next 7 years. The IHP also recommends that through the Unitary Plan, Auckland Council should err towards over-enabling as there

is a high level of uncertainty in long-term estimates of demand and supply and the implications of an under-supply are far more severe (e.g. house price escalation, over-crowding, extended community distance) (IHP, 2016).

Despite Auckland Council accepting most of the IHP's recommendations and the general positive response to the Unitary Plan being passed (Orsman, 2016; Panel, 2016), there were some notable rejections of recommendations, albeit for good reasons.

IHP Recommendation	**Reasons for rejection**
Hearing Topic 011 (Rural environment): 'the deletion of objectives and policies for rural subdivision that; i) prevent inappropriate subdivision; ii) promote significant enhancement of indigenous biodiversity; and, iii) facilitate the transfer of titles only into the Countryside living zone.'	• Recommendations would enable inappropriate subdivision, and; • Do not support the concept of a compact city that includes retention and protection of rural areas.
Hearing Topic 012 (Infrastructure, energy and transport): (a) 'the deletion of policies which encourage land use and transport integration…'	• Recommended policy framework does not adequately address land use and transport integration.
Hearing Topic 013 (Urban growth): (a) 'the deletion of objectives and policies that seek to focus growth within the existing metropolitan urban limit.' (b) 'Amendments to the policy that guides the location of the Rural Urban Boundary.' (c) 'The enablement of commercial activities within centres and corridors.'	• Lack of a specific objective means there is little guidance for where future growth should be enabled. • Focusing intensification within the existing urban area delivers the benefits of a quality compact urban form. • Recommended policy does not include either providing a quality compact urban form or the importance of land use and transport integration.
Hearing Topic 043/044 (Transport): (a) 'amendment of the parking rates for the Metropolitan Centre, Town Centre, Local Centre, Mixed Use and Terraced Housing, and Apartment Buildings zones to remove maximum and minimum parking rates for all activities within these zones with the	• Not including minimum parking rates for retail and commercial activities would result in a more efficient use of land, better urban design outcomes, and greater support for the public transport network.

exception of retail and commercial service activities.'	• Including maximum parking rates would result in better management of oversupply of parking and associated adverse effects (e.g. congestion).
Hearing Topic 050-054 (City centre and business zones): (c) 'the deletion of the minimum dwelling size standard in the City Centre and business zones.' Hearing Topic 059-063 (Residential zones): (c) 'the deletion of the minimum dwelling size standard.'	• Intensive living environments require living spaces that meet the day-to-day needs of residents. • This will assist to maintain the social wellbeing of the community and thereby support further intensification as these areas become more desirable.

Table 2.2. Summary of relevant rejected Independent Hearings Panel recommendations (Auckland Council, 2016a).

There have also been a number of drawbacks throughout the Unitary Plan process. Intensification plans that would have rezoned some suburbs to allow terraced housing and apartments were scaled back due to community resistance and opposition to building heights, with some evidence suggesting that 86% of local people were against the provisions (NZPC, 2015; Auckland Council, 2013a; 2013b). Redevelopment opportunities in inner suburbs therefore seem set to remain low under the Unitary Plan, and there is fear that central government may override the Unitary Plan if there is non-compliance with the goal of housing provision (Early et al., 2015; Parker, 2015). There are also arguments that the government is intent on curbing opportunities for political involvement, with the Independent Hearings Panel used as a way to sort out decisions in a centralised, expedited and final manner (Early et al., 2015). However, despite these challenges, Preval et al. (2016) point out that the Unitary Plan encourages sustainability and connectedness in all medium to large developments by requiring developers to provide for walking, cycling, and public transport within neighbourhoods and to connect them to other communities. Overall, Auckland Council is taking positive steps to reshape their development trajectory, despite resistance from particular groups of residents and central government pressure for peripheral urban development (Murphy, 2015).

The Housing Accords and Special Housing Areas Act (HASHAA) is another important piece of legislation to consider, and although the purpose of the Act is to 'enhance housing affordability by facilitating an increase in land and housing supply...' (HASHAA Section 4:4, Reprint 2015), it may have some implications for whether

housing is provided which aligns with current preferences. Introduced in 2013, the HASHAA was a response to increasing public and official concerns about housing affordability and escalating residential land prices (Early et al., 2015). The Act proposes that central government, in consultation with local authorities, can identify regions where Special Housing Areas can be created. It also enables the government to take a more direct role in the consenting of residential developments and allows for local planning process to be overridden (Murphy, 2015). However, the objective of the HASHAA is not aligned with Auckland Council's vision for a quality compact city, as it emphasises – though does not mandate – greenfield development and provides no criteria for ensuring that SHA housing is affordable to low-income households (Early et al., 2015; Murphy, 2015). With regard to Special Housing Areas, Parker (2015) estimates that if all predicted additional dwellings were built in SHAs, Auckland's population-weighted density would increase by approximately 4%. These developments are likely to have only minor positive effects in terms of climate change, through slightly increased density and lower commuting CO_2 emissions, not ambitious when compared with the requirements of the December 2015 (COP21) Paris agreement on climate change. Expected development of the SHAs is also likely to result in a slightly lower proportion of active commuters (4.3%) compared to the Auckland-wide average (6.6%), according to Preval et al. (2016).

3. Literature Review

3.1 Choice behaviour and preference formation

Choices and preferences are interrelated and inform each other, but where 'choice' refers to what people do in the housing environment, 'preference' reflects an aspirational and longer-term orientation (Wildish, 2015). Preference formation and choice behaviour are part of a two-directional relationship, whereby choices are both influenced by, and influence, individual preferences. For example, after making a choice to move to a location with good public transport and experiencing the associated benefits, attitudes towards public transport may become more positive, thus influencing a person's preferred residential location and transport mode (Van Wee, 2009).

Traditional modelling approaches tend to describe housing choice behaviour and preferences only in terms of housing attributes, and exclude context dependencies. Preferences for alternative housing are also generally assumed to be independent of the existence or attributes of any alternative available to an individual (Timmermans & Van Noortwijk, 1995). However, more recent research takes into account other complexities associated with choice behaviour such as lifestyles and life-course stages, attitudes, perceptions, and values, sociodemographic variables and other external factors, and the relationship between preferences and housing supply and demand. Housing and residential location decisions are now presumed to be interdependent, with households making choices and trade-offs that will vary depending on constraints and underlying preferences, both of which are likely to change over time (Yates & Mackay, 2006). These trade-offs are generally made by taking into account a variety of factors, including housing characteristics, the accessibility of amenities, potential travel costs, neighbourhood structure, and the cost of the dwelling (Maré et al., 2011). This 'compensatory' decision process encompasses the influences of preferences, availability and market conditions, government regulations, and internal and external personal factors, resulting in 'satisficing' rather than 'optimal' choice outcomes (Coolen & Hoekstra, 2001; Jansen, Coolen, & Goetgeluk, 2011; Schwanen & Mokhtarian, 2004; Wildish, 2015). A common trade-off is between dwelling size and preferred location, and evidence from New Zealand suggests that households may be more willing to live in a non-preferred area if the house is larger (Yeoman & Akehurst, 2015). Furthermore, in relation to accessibility, there is often the assumption that each household makes a joint choice

of location and travel activity pattern, where relevant attributes receive different emphasis in the decision process (Eliasson, 2010; Ewing & Cervero, 2010). However, other factors such as housing attributes are also likely to matter, meaning a household may have to choose a 'functional' residential location (i.e. one that meets their needs) rather than one that fulfils all dwelling, neighbourhood, and transport preferences. Mulder (1996) also questions whether housing choices are continuous (the constant evaluation of a housing situation) or if these decisions are made during different periods or at discrete points, triggered by goals, stress or dissatisfaction, and attempts to match housing with individual needs or wishes.

There is a perception that compact urban development contradicts consumer preferences for detached private housing. However, housing preferences are diverse and can change rapidly. For example, North American households generally prefer single-family homes but they also value smart growth features such as convenient access to local amenities and shorter commutes, and many households would choose more compact housing options if given suitable incentives. Smart growth or 'good densification' can therefore both address different housing preferences and be liveable, cohesive, and spacious (X. Zhao et al., 2016, p. 16). Preferences for different dwelling types or locations are also likely to vary according to household structure (Yates & Mackay, 2006), while incomes may influence housing choices both directly and indirectly. For example, a study estimating a land use-transportation model for the Stockholm region found that, all else being equal, single-adult households prefer rented apartments and 2-adult households prefer houses, while couples with two or more children especially avoid rented apartments (Eliasson, 2010). Another study in Utah found that renters are more sensitive to accessibility attributes, while homeowners are more concerned about the new residence itself. Renters are also more willing to trade space for access to public transport, jobs, urban facilities, and pedestrian-friendly street design (Liao, Farber, & Ewing, 2014). Higher incomes are also associated with preferences for bigger dwellings and outdoor space, as well as greater demand for public amenity. As such, there is typically a trade-off in the decision process between more private space and the benefits of public amenity (NZPC, 2015), although larger apartments can offer both attributes.

Lifestyles and life-course stages are other factors that influence preferences and choices. Relocation, for example, is assumed to be a sensitive time when people are motivated to pay attention to information and hence more likely to test alternative housing typologies and transport modes (Bamberg, 2006). Lifestyle, indicating preferences for certain ways of living, is also an important driver of the decision of

where to live. Embedded lifestyle differences lead to differences in considerations, criteria, and preferences for residential location. A study of Portland, Oregon residents by Walker and Li (2007) found three lifestyle groups: suburban, auto, and school-oriented (Class1); transit-oriented but want a suburban setting (Class 2); and urban (high density) and accessibility-oriented (Class 3). Class 3 also showed some preferences for off-street parking and shorter travel times to work by car. Households in Class 1 tend to be affluent, more established, professional families, Class 2 households tend to be younger and less affluent, and households in Class 3 tend to be older, non-family professionals who display a 'wanting to have it all' attitude (2007, p. 98). However, it was acknowledged by the authors that life stages alone are not sufficient to fully capture behaviour or lifestyle preferences.

Different groups of people make different choices, based on personal preferences and values, and these choices generally have to be made in terms of the availability, cost, and accessibility of supply (Van Ham, 2012). The supply context is particularly important because preferences, new supply, and actual demand are mutually evolving, with preferences driving potential demand, rising demand encouraging new supply, and visible new supply potentially spurring greater demand (Myers & Gearin, 2001). In addition, city planning can influence choices. Density restrictions may prevent or limit the construction of smaller, less expensive dwellings close to city centres, restricting the choices of those who want to buy such dwellings and potentially forcing them to buy or rent a dwelling that is larger or less accessible than their initial preference (Liao et al., 2014).

Another line of research investigates the influence of values on choices and preferences. 'Subjective' factors such as attitudes and environmental awareness influence residential location decisions (Liao et al., 2014). For example, Jansen (2014) found that individuals who consider self-direction important often live more centrally and prefer an existing dwelling in a neighbourhood with various types of residents and a mix of residential and/or commercial land uses. By comparison, those who attach more importance to security generally live further from the central city and prefer newly built dwellings in a neighbourhood with mainly housing and similar types of residents. These results provide some indication that residents may prefer particular dwellings or neighbourhood characteristics because they reflect values and goals that are important to them. Although housing choice will always reflect the joint influences of preferences, market conditions, regulations, and availability (Jansen, 2014), values expressed in attitudes and perceptions also help determine an individual's preference for, or utility derived from, an alternative (Bohte, Maat, & van

Wee, 2009). It is important to consider which attributes are emphasised and the language that is used in presenting alternative housing options. The way in which higher density living in particular is framed can influence stated preferences; hence, choices and stated views may or may not match core values (Dunbar & McDermott, 2011).

Although residential preferences and housing choices are different, Vasanen (2012) argues that congruence between the two is shown by the fact that living in a certain type of residential environment does not seem to have a significant influence in shaping preferences over time, particularly for those moving to central urban areas. It is important to study the formative factors in decision making because individual preferences may be attenuated through conflict or transformed by compromise in order to meet partner and/or group goals. In other words, households' residential location and travel behaviour may be more significantly influenced by the ease with which aspects of daily life come together in a practical sense, rather than preferences (Jarvis, 2003).

In light of the interactions and differences between choices and preferences, a stated choice experiment is an insightful and appropriate method of investigating housing, neighbourhood, and transport preferences, as it can help determine how trade-offs are made between attribute levels in different alternatives in the choice set (Hoyos, 2010). Another key factor is that revealed preferences have significant limitations when certain scenarios are poorly represented in the market (e.g. medium-density housing in the city and inner suburbs).

3.2 Stated versus revealed preferences and choice models

Research into housing preferences tends to focus on either stated or revealed preferences, with most current literature concentrating on the former. Stated preferences are based on intended or hypothetical choices whereas revealed preferences refer to the outcome of an actual housing choice (Coolen & Hoekstra, 2001; Vasanen, 2012). Most discrete choice research, particularly when focused on housing and neighbourhoods, uses stated rather than revealed preferences as a number of limitations have been identified with the latter. While clearly some form of residential preference is shown through choice, other potentially conflicting latent preferences are ignored (Storper & Manville, 2006; Vasanen, 2012). Collinearity between explanatory variables and contextual factors, the potential for unconscious trade-offs, and the fact that residential choice may have occurred years earlier also mean revealed preferences may not represent actual preferences (Bohte et al., 2009;

Earnhart, 1998; Molin, Oppewal, & Timmermans, 1996). Stated preferences are, therefore, more attentive to current housing preferences, desires, and aspirations (Mulder, 1996; Timmermans, Molin, & van Noortwijk, 1994). Furthermore, stated preference methods avoid correlation problems, ensure adequate variation in the data, offer better insight into trade-offs between variables, collect multiple responses for each person, avoid measurement error in the dependent variables, and generate additional observations for attributes or attribute values that are uncommon in revealed data (Clover, 2013; Earnhart, 1998; Kim et al., 2005). However, stated preference approaches are not without their weaknesses. Obtaining unbiased opinions is often difficult, stated preferences can be problematic to study if people alter their preferences to fit within the possibilities of a realistic choice set, and the complex nature of individual preference formation means results may not accurately describe how decisions are actually made (Vasanen, 2012; Wildish, 2015).

Given the challenges associated with preferences, a variety of methods have been developed to model how and why people make certain decisions, including the multinomial logit model (MNL) and latent class model (LCM). Stated choice methods such as these are based on both the utility derived from properties of things or characteristics of the good, rather than the goods themselves (Louviere, Hensher, & Swait, 2000), and the principle that observed choices reflect the combined influences of market conditions and availability, and preferences (Timmermans et al., 1994). The appropriateness of a particular method depends on assumptions regarding the form of the data and structure of the underlying behaviour, which can be addressed through regression specification (i.e. which variables are included and to what extent) and estimation (Crane, 2000). In order to be most efficient, stated choice methods must consider a variety of factors, including the number of choice situations, attribute levels, parameter estimates, independence from irrelevant alternatives, and model design (Clover, 2013). They also encounter a number of challenges, such as the need for large samples and questionnaires, the possibility of unrealistic choice behaviour due to hypothetical bias, and the potential for respondents to use choice heuristics or rules of thumb that weaken the choice model as a means of estimating willingness-to-pay. Hypothetical bias is identified by Clover (2013) as a significant factor, where there are differences in responses to tasks involving hypothetical economic commitments and those made to comparable tasks with real economic commitments. However, stated choice methods have the advantage of being able to predict choice probabilities and attribute values for new housing alternatives without *ad hoc* and

untestable assumptions regarding the relationship between preference and choice (Molin et al., 1996).

Multinomial logit models are used to model relationships between a polytomous response variable and a set of explanatory variables (So & Kuhfeld, 1995), and is derived from an assumption of stochastic preferences and the principle of utility-maximising behaviour (i.e. choosing the alternative which yields the highest preference) (Molin et al., 1996). For example, in the context of transport, the MNL model assumes that individuals have unobservable latent preferences for different transport modes and that they choose the mode providing the highest utility (Schwanen & Mokhtarian, 2005). Limitations of the MNL model include the assumption of independence from irrelevant alternatives (IIA), panel data which does not take into account unobserved effects, and taste variation, although these can be addressed, to an extent, through the use of mixed MNL models which allow for unrestricted patterns of substitution and correlation in unobserved factors (Clover, 2013). Another form of stated choice model is the latent class model (LCM) or latent class analysis (LCA) approach, a method used for analysing the relationships among manifest data when some variables are unobserved (Eshghi, Haughton, Legrand, Skaletsky, & Woolford, 2011). Latent class analysis is a fundamental tool for identifying heterogeneous subgroups of consumers and can account for preference heterogeneity by allowing the data to be segmented into a number of exclusive and exhaustive subsets – the latent classes (Eshghi et al., 2011; Liao et al., 2014). LCMs approximate continuous distributions with discrete ones, and posit that individual behaviour depends on both observable attributes and latent heterogeneity that varies with factors unobserved by the analyst. As such, LCMs do not require the analyst to assume anything about the distribution of parameters across people (Greene & Hensher, 2003).

Stated choice studies aim to determine the influence of the design attributes upon the observed choices made by sampled respondents. However, this type of study is limited in that unless the number of person-specific observations is extremely large, it is necessary to pool responses from multiple respondents in order to produce statistically reliable parameter estimates. As such, choice tasks or experiments are often incorporated where people are asked to select one or more of their preferred alternatives from a finite set. These alternatives are defined by a number of attribute dimensions, each of which is further described by pre-specified levels from some underlying experimental design used to construct choice sets so that attributes are uncorrelated and yield uncounfounded parameter estimates (Hoyos, 2010; Rose &

Bliemer, 2009). This type of stated preference survey is used for discrete choice models and is required when the alternatives being studied do not exist in the market and there is no information about non-chosen alternatives (Clover, 2013). Based on Lancaster's consumer theory (1966), the theory of demand, and welfare theory (Hoyos, 2010), choice experiments are popular because they enable researchers to model quasi-real marketplace choices and thus to simulate real market decisions and predict market demand. Designing an efficient choice experiment involves selecting alternatives that provide maximum information on the parameters of a probabilistic choice model, and it is critical that they are incentive compatible (i.e. people have a good reason to participate) and elicit truthful responses (Clover, 2013; Rose & Bliemer, 2009). Therefore, the primary question for those generating experiment designs for stated choice studies is 'how best to allocate the attribute levels to the design matrix' (Rose & Bliemer, 2009, p. 588). This question can only be answered by considering whether the experiment should be labelled or unlabelled, attribute level balance (each attribute level appears a similar number of times for each attribute), the number of attribute levels, the attribute level range, design types (full factorial, fractional factorial, orthogonal), and the number of choice situations. For example, Clover (2013) argues that orthogonal designs – which demonstrate attribute level balance and estimate all parameters independently – are optimal because they ensure no multicollinearity and have smaller variances in parameter estimates. Supporting questions also provide sociodemographic data that acts as covariates, provide information about error components, decision strategies, and level of understanding, and verify that the choice experiment is understandable.

3.3 Residential self-selection, causality, and dissonance

In addition to contextual factors, lifestyles, and attitudes, another aspect of the relationship between housing preferences and choices that has received increasing attention in the literature is the process of residential self-selection. Particularly important in relation to travel behaviour, self-selection refers to the process by which people with prior transport preferences select themselves into neighbourhoods which support those preferences, rather than travel patterns being determined by land use configurations and where people happen to live (Bagley & Mokhtarian, 2002; Van Wee, 2009; Zhou & Kockelman, 2007). As such, the effect of the built environment on travel can be over-estimated, particularly if preferences are excluded as an explanatory factor (Bohte et al., 2009; Ewing & Cervero, 2010; Van Wee, 2009; Van Wee, Holwerda, & Van Baren, 2002; Zhou & Kockelman, 2007). Self-selection is also important in the sense that residents favouring compact, walkable, transit-friendly

neighbourhoods are more clustered in locations that provide such qualities (Liao et al., 2014). Lastly, the presence of self-selection confounds the direction of causality, where differences in observed travel behaviour between households within different neighbourhoods cannot be attributed to urban form alone (Krizek, 2003), but may rather be due to interactions with other variables (Cao, Mokhtarian, & Handy, 2009). For example, if individuals choose to live in neighbourhoods because of characteristics related to walkability, it can be difficult to correctly determine the direction of causality between attitudes and/or preferences, the built environment, and the individual's travel. In addition, dense neighbourhoods also tend to be characterised by mixed-use development and higher connectivity. This 'spatial collinearity' makes it difficult to determine the independent contribution of urban form variables in transport mode choice (Saelens et al., 2003). Finding causation requires separating the effects of attitudes and preferences from the physical environment on transport, health, and environmental outcomes. Preferences may also change over time to become more similar to the built environment one lives in, making it more difficult to demonstrate an independent relationship with built form (Frank, Saelens, Powell, & Chapman, 2007).

Although residential self-selection processes are important for explaining travel patterns, neighbourhood structure often has an autonomous influence (Aditjandra, Cao, & Mulley, 2012; Schwanen & Mokhtarian, 2005), with most empirical studies finding that land use changes can lead to changes in travel demand and infrastructure systems (P. Zhao et al., 2013). For example, Cao, Mokhtarian, and Handy (2007) found that changes in accessibility, level of socialising, and the number of leisure businesses in close proximity to residence are all negatively associated with changes in driving, implying a causal link between the built environment and driving behaviour. Different types of studies and models show different things about self-selection and which factors have the most influence on travel behaviour and location choice. However, most of the literature shows that self-selection attenuates the apparent effect of the built environment on travel (X. J. Cao et al., 2009; Ewing & Cervero, 2010).

Modal preferences can play a significant role in residential choice. This is particularly true for those who prefer public transport but less important for car-oriented people (Van Wee et al., 2002). The key question here then, is; does neighbourhood form prompt different travel patterns, or do people with prior transport preferences select themselves into neighbourhoods that support those preferences? (Bagley & Mokhtarian, 2002). In relation to car use, Ewing and Cervero (2010) identify a few

studies which provide evidence of self-selection. Using data from a travel survey in Raleigh, North Carolina, Cao, Xu, and Fan (2010) estimated that between 48% and 98% of the variation in VMT was due to environmental influences and that the balance was due to self-selection. A study in the San Francisco Bay Area also found that 87% of the difference in VMT between households in suburban and urban neighbourhoods was due to built environment effects, while the remainder was due to residential self-selection (Bhat & Eluru, 2009). Hence, although the environment seems to have a more important role in travel behaviour than self-selection based on attitudes and preferences, at least in U.S. studies, both effects are present.

Related to self-selection is the idea of residential neighbourhood type dissonance, which refers to an incongruence in terms of land use patterns between the current selected neighbourhood type and the preferred structural characteristics of the neighbourhood. This recognition of potential mismatching is an important consideration for compact city design, because living in a compact city does not necessarily overcome dissonance between environmental orientation and lived experience (Jarvis, 2003). Furthermore, where dissonance is higher for those living in urban areas, the probability of commuting by car is greater (Schwanen & Mokhtarian, 2005). A study by Frank et al. (2007) in Atlanta found that those who preferred and lived in walkable neighbourhoods walked most (33.9% of trips), those who preferred and lived in car-dependent neighbourhoods drove most (43min/day) and walked least (3.3%), and individuals who did not prefer a walkable neighbourhood walked very little regardless of the nature of the neighbourhood they lived in.

Residential dissonance can exist for a number of reasons relating to preferences and how they might differ over time within and across households, the residential choice process, and life course and attitude dynamics such as a parental concern to find a good school (Jarvis, 2003; Schwanen & Mokhtarian, 2004, 2005). Dissonance between actual and preferred residential environments is also closely connected to neighbourhood attachment (Schwanen & Mokhtarian, 2004) and conflicts between revealed and latent preferences. In relation to this, Vasanen (2012, p. 308) asks 'do people choose their residence according to their residential preference or do they adjust their preference according to their residential environment through the process of cognitive dissonance reduction?' Here, cognitive dissonance reduction refers to the process of altering preferences to align more closely with the actual residential environment individuals find themselves. It has been observed that some mismatched urban dwellers (i.e. those living in central city areas but prefer suburban environments) disapprove of policies limiting car travel (Schwanen & Mokhtarian,

2005). The same group are also more auto-oriented than matched urban residents but less auto-oriented than matched suburban residents, whose travel behaviour is similar whether or not they live in an area which aligns with their preferences (X. J. Cao et al., 2009). The impact of dissonance therefore seems to be weaker among suburban residents compared to urban residents, while sociodemographic variables are the most consistent determinants of mismatch overall (Schwanen & Mokhtarian, 2004). Tracing evidence of dissonance between expressed values and revealed behaviour is one way of capturing the ongoing process of preference formation by focusing on the compromises households make (Jarvis, 2003).

3.4 The influence of housing and neighbourhoods on travel

3.4.1 Neighbourhood form and physical characteristics

Notwithstanding self-selection, housing and residential location are thought to have a significant influence on travel behaviour, where both physical neighbourhood structure and preferences regarding built environment attributes are at work simultaneously. Characteristics of neighbourhoods may also change how individuals travel in spite of preferences. The physical characteristics which influence travel behaviour have been described as the 'Five D's;' density, diversity, design, destination accessibility, and distance to public transport (Ewing & Cervero, 2010; Nunns, 2015), and these features can influence travel behaviour directly or indirectly. In terms of direct urban form impacts, compact, mixed-use, pedestrian-friendly development provides opportunities for less vehicle use, more frequent non-motorised travel, and shorter motorised trips. For example, walking for transport and reduced car use are associated with increased residential density, high street connectivity, pedestrian-friendly street design, mixed land use, and proximity to a variety of destinations (Christiansen et al., 2016; Frank et al., 2007; Giles-Corti et al., 2013; Knuiman et al., 2014; Schwanen & Mokhtarian, 2005), while increases in residential density and self-reported improved access to parks have positive correlations with cycling (Beenackers et al., 2012). Households located in neighbourhoods with high accessibility are also associated with fewer vehicle miles travelled (VMT) and number of trips taken (Krizek, 2003), whereas longer public transport travel times increases the odds of a household owning a greater number of cars (Clark, Chatterjee, Melia, Knies, & Laurie, 2014).

Mixed land use and higher densities in particular seem to have the greatest impact on travel behaviour, both of which work against solo driving, discouraging car trips and facilitating public transit and active travel (X. J. Cao et al., 2009; Cervero, 2002).

More specifically, dense neighbourhoods with multi-use buildings and 4-way intersections average less VMT; higher shares of apartments near places of residence lower the odds of driving alone relative to transit use; and street connectivity, access to transit stops, and local destination variety determine walking for transport (Cervero, 2002; Cervero & Kockelman, 1997; Knuiman et al., 2014). Mixed land-uses may also lead to choices of walking or cycling instead of driving, rather than in addition to it (X. J. Cao et al., 2009), which along with housing intensification and vibrant social areas can reduce reliance on cars and create positive outcomes for older people, young families, and those limited in their mobility (Aditjandra et al., 2012; Scott et al., 2015). However, connectivity, density, and land-use mix are not always equally important determinants of travel behaviour, particularly active transport, which tends to be most affected by neighbourhood design, the ability to socialise, the attractiveness of residential locations, safety (e.g. lighting and surveillance), and transport preferences (X. J. Cao et al., 2009; Knuiman et al., 2014; Scott et al., 2015).

Different transport modes are influenced to varying extents by different neighbourhood characteristics and styles. VMT most strongly relates to accessibility; walking is most strongly related to land use diversity, intersection density, and the number of destinations within walking distance; and public transport use is equally related to proximity to transit and street network design variables (Ewing & Cervero, 2010). Linked to residential mismatching, suburban environments also limit urban-style travel (i.e. public transport, walking, and cycling) to a greater extent than urban environments limit suburban-style travel (i.e. driving) (X. Cao et al., 2007), while the conditioning influence of the environment prevails over residential preferences in suburban neighbourhoods for commute mode choice (Schwanen & Mokhtarian, 2005).

Another common observation is that changes in urban form characteristics have a stronger influence on transport mode choice for non-work travel compared to work-related travel (Cervero & Kockelman, 1997; Pan, Shen, & Zhang, 2009), an impact that has been found for the average neighbourhood resident, but it is as yet unclear to what extent it holds for all segments of a neighbourhood population (Schwanen & Mokhtarian, 2005). As noted before, population density and land use mix are more consistent positive correlates of active transport than neighbourhood design factors (Cervero, 2002), where the number of weekly walking or cycling trips is consistently higher in walkable, dense neighbourhoods compared to non-walkable, sprawling areas (Saelens et al., 2003). However, population and job densities tend to only be

weakly associated with travel behaviour once other variables are controlled for, and while the physical environment seems to play a more important role in travel behaviour than attitudes and residential preferences, both effects are present (Ewing & Cervero, 2010). This result is supported by numerous studies, for example, Cervero and Kockelman (1997) and Zhou and Kockelman (2007), who hypothesise that although reduced trip rates and more non-auto travel occur when a household's built environment is characterised by higher densities, land-use mixing, and better pedestrian design, this result may be more associative than causal.

While there has been a wide range of research evaluating how land use affects travel, there are few studies which consider how automobile use influences land use. In a study of 12 U.S. cities, McCahill and Garrick (2012) found that for each 10% increase in automobile mode share, there was an expected increase in parking space of 2.53m^2 per person and a decrease of 1,700 people/km^2. Importantly, the relationship with parking was not uniform; for cities with lower automobile use, there were only modest increases in parking associated with increases in mode share, whereas for cities with the highest automobile use the average parking provision was nearly twice as high and less predictable. These differences may be due to inefficient use of parking in automobile-oriented cities and the fact that cities with low automobile use are more likely to monitor parking provision closely (McCahill & Garrick, 2012). Land use, therefore, both influences and is influenced by, travel patterns, whereby compact cities enable greater use of alternative transport modes and, when car use increases, are more efficient in the provision of infrastructure and use of land.

3.4.2 Attitudes

Neighbourhood preferences and travel-related attitudes also influence travel behaviour indirectly through residential choice and how this process depends on factors such as lifestyle or life situation (Aditjandra et al., 2012; Scheiner & Holz-Rau, 2007). As a result, there is some uncertainty around whether differences in behaviour across urban forms are due to individuals' underlying preferences for travel activity and residential choices or are an independent function of the environment (Frank et al., 2007). Although most research has found a relationship between the built environment and travel behaviour, some studies which control for attitudinal characteristics tend to conclude that personal and household variables have a stronger influence on travel demand and behaviour than the built environment (Cervero & Kockelman, 1997; Pan et al., 2009; Van Wee et al., 2002; Zhou & Kockelman, 2007). For example, a San Francisco study found that attitudinal and lifestyle variables had the greatest impact on travel demand, while residential location

type had little influence. Positive attitudes towards a neighbourhood are also associated with increased minutes of transportation and recreational walking (Giles-Corti et al., 2013). Similarly, a study in Utah by Liao et al. (2014) discovered that those who do not give emphasis to privacy and appreciate social heterogeneity in the neighbourhood are more likely to select compact, walkable, transit-oriented neighbourhoods. People who prefer walking, cycling, and public transport, and are supportive of urban growth boundaries and environmental protection policies were also found to prefer compact development. Hence, the association between land use configuration and travel patterns may not be one of direct causality but rather due primarily to correlations of each of these variables with others (Bagley & Mokhtarian, 2002). However, there are few studies which explicitly incorporate both travel attitudes and land use as explanatory variables of choices of residential location and commute mode (Schwanen & Mokhtarian, 2005).

3.4.3 Demographics

It is also important to note the intervening relationship between density and household demographics, whereby – due to small household size – residents of higher density communities tend to have lower auto needs and greater transit dependency (Crane, 2000). Again, however, there is little literature which focuses on modal preferences within homogeneous groups of people and the impact of these preferences on residential choice (Van Wee et al., 2002). Those studies that have specifically considered demographics have found that lower age, fewer vehicles, and lower percentages of licensed drivers are all predictors of increased likelihood of walking trips. Conversely, higher VMT and preferences for suburban neighbourhoods are both associated with high household income, larger families with children under 18, more vehicles owned, and a greater percentage of licensed drivers (Frank et al., 2007; Liao et al., 2014). Somewhat overlapping both physical neighbourhood characteristics and attitudinal factors, changes in travel behaviour are also likely during major life events, especially those involving a change in household composition and residential or job location (Clark et al., 2014). For example, household transitions, dwelling preferences, and social mobility aspirations are thought to be drivers of short-distance travel (Coulter & Scott, 2015; Van Ham, 2012).

3.4.4 Summary

The interaction between attitudes, the built environment, residential selection, and travel behaviour is an ongoing and complex process, and residential choice can both coincide with changes in travel-related attitudes and behaviours and induce them

(Bohte et al., 2009). Furthermore, travel costs, geography, and demand for residential location may also influence housing and travel choices, but their relative influence appears specific to each community and the manner in which observed behaviour is analysed (Crane, 2000). A range of housing types can attract a diverse mix of people to certain neighbourhoods, but preferences and broader social, cultural, policy, and economic contexts are equally important in shaping where people live (Scott et al., 2015). Households choose their residential location based on a variety of interdependent factors including transport preferences, commute patterns, and external constraints. Although few studies have focused solely on work-related travel behaviours (Badland et al., 2012), and there is limited New Zealand literature on this topic, this research indicates that the built environment appears to have a considerable influence on travel patterns overall, particularly in U.S. cities.

4. Conceptual and Methodological Framework

4.1 Research Questions

Based on a review of the literature, the main research question of this study will be:

- What are the current housing, neighbourhood, and transport preferences for Auckland households? How do these preferences align with the concept and characteristics of compact urban development?

To assist in answering this question, further sub-questions will also be investigated. These include:

- Do preferences in Auckland remain consistent with the car-dependent and standalone housing-oriented nature of the city?
- Do people in Wellington have stronger preferences for, and greater use of, public transport than Auckland, considering the largely monocentric nature of Wellington?
- Is the compact nature of Wellington associated with stronger preferences for walking and cycling, and similarly, is it more strongly associated with mixed neighbourhoods and townhouses and/or apartments, than in Auckland
- How do transport preferences and patterns across between residential location and housing typologies? Are residents able to use their preferred mode of transport and, if not, what prevents them from doing so?
- Which neighbourhood and housing attributes are most important in determining residential preferences and choices, and how do households trade off these attributes in the decision process?
- To what extent is residential dissonance present among Auckland households? What impact does this have on where people live and how they travel?
- How do sociodemographics influence preferences for density and accessibility?

4.2 Theoretical Background

The traditional housing demand research method means that only relatively simple questions can be asked about the willingness to move, residential preferences, and the current housing situation. Sociodemographic characteristics are often collected and residential preferences are predicted and generalised based on the background variables. This method assumes that social background may both create opportunities and limit residential choices. However, society changes rapidly. Households have become smaller and the variation in household types has increased, thus generating more diverse housing preferences and a broader variety in housing behaviour. The interdependent nature of housing and residential location behaviour means that households must trade off certain attributes (e.g. cost, travel options, neighbourhood structure, dwelling characteristics, etc.) in a 'compensatory' decision process involving preferences, market conditions, housing availability, and personal factors (Coolen & Hoekstra, 2001; Jansen et al., 2011; Schwanen & Mokhtarian, 2004; Yates & Mackay, 2006). As discussed earlier, residential preferences might also be influenced by tastes and values, so new methods – such as the lifestyle approach – have been conceived to address the variety in housing, neighbourhood, and transport preferences (Jansen, 2014).

This study employs a conceptual framework based on a range of approaches identified in the literature and discussed in the Literature Review chapter above (Chapter 3). Sociodemographic characteristics such as age, income, and life stage interact to create a set of lifestyle preferences for residential location, housing, and travel (Frank et al., 2007). These preferences are influenced by the cost and supply in neighbourhood and housing markets, whilst developers may also make inferences as to what type of housing to provide based on the general preferences of the population. In the decision process, households will trade off certain attributes (e.g. distance to CBD, dwelling size, affordability) to choose a residential location which is most aligned with their preferences (Maré et al., 2011; Yates & Mackay, 2006). Based on the various outcomes of this process and the assumption that people with different lifestyle preferences will exhibit different residential location choice behaviour (Walker & Li, 2007), we are able to identify a number of subgroups or latent classes within the population that account for preference heterogeneity (Eshghi et al., 2011; Liao et al., 2014). Some households are not able to live in their preferred neighbourhood type due to the availability and cost of housing in such a built environment; factors such as housing supply, job location, and quality of schools force households to compromise in their residential location choice. Hence, a household's residential

location will be either matched or mismatched with their initial preferences, and they may be grouped in a latent class that does not fully describe these preferences. This result is particularly important in relation to travel, because residential location both influences and is influenced by travel behaviour, such that built environment characteristics enable or restrict the use of different transport modes. It is also important to note here the potential influence of residential self-selection, where a household or individual may choose a residential location that will allow them to use a certain mode of transport. Figure 5.1 below summarises the relationship between preferences and the housing choice decision process.

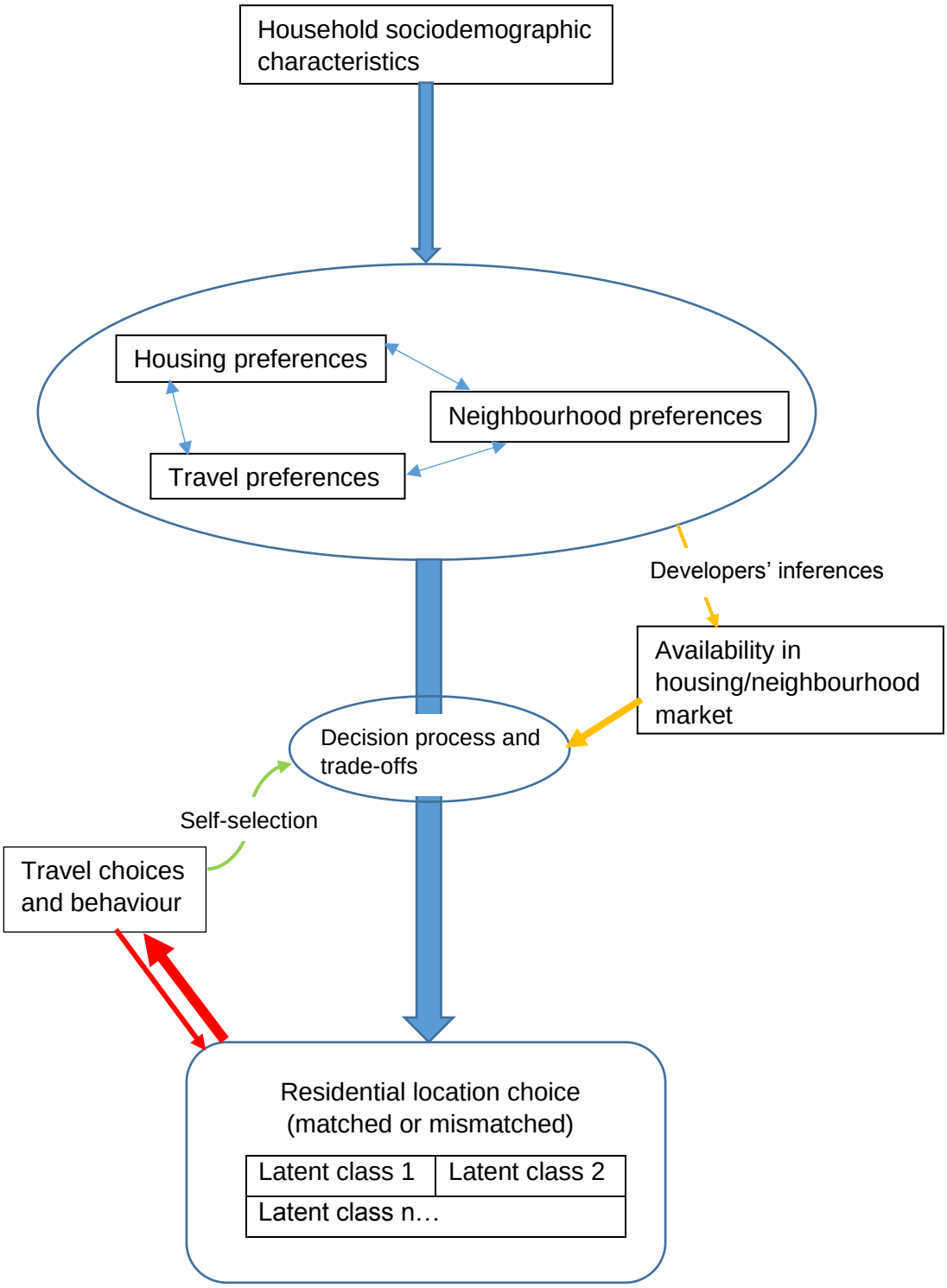

Fig. 4.1. A theoretical model of preference formation and the residential location decision process.

4.3 Methodology and Study Design

In November 2015, at the request of Ralph Chapman of the New Zealand Centre for Sustainable Cities, the Auckland Council People's Panel collaborated with the Centre and Victoria University of Wellington to complete an independent study on housing preferences in Auckland. The initial stage of this project was to design and distribute a survey aimed at identifying housing and transport choices made by people in Auckland and the importance neighbourhood type may have when considering their preferred options. This study will use the data collected to determine housing, neighbourhood, and transport preferences; understand to what extent these factors influence each other; and how trade-offs are made in the residential location choice process. Similar surveys were conducted in Wellington City and Hamilton City (Dodge, 2015, 2016). Collecting comparable Auckland data will enable the findings to be compared between cities.

The survey was distributed online through the Auckland Council People's Panel email list. Given the size of Auckland, this was the most efficient way to distribute the survey to as many people as possible. There are also a large number of People's Panel members (approximately 7,000), improving the likelihood that the sample is representative of Auckland's overall population in terms of age, ethnicity, etc. One difficulty with using the People's Panel email list was that the survey had to be formatted to match other previous People's Panel surveys. This process incurred a significant financial cost but was deemed necessary given the benefits outlined above. Recipients were given approximately two weeks to complete the survey, after which responses were collected into an Excel file and passed on to the researchers. All respondent information was kept confidential throughout the process.

	Auckland	Wellington	Hamilton
Sample size	3,285	452	200
Survey distribution methods	Online (Auckland Council People's Panel email list)	1. Door-to-door (clustered stratified random sampling) 2. Online (Wellington City Council email list)	1. Door-to-door (clustered stratified random sampling) 2. Online (Hamilton City Council email list)

Table 4.1. Sample sizes and survey distribution methods from comparable studies in Auckland, Wellington, and Hamilton (undertaken or commissioned by researchers from the New Zealand Centre for Sustainable Cities).

4.3.1 Research method

In this study, housing-related choices were collected in a stated choice survey of 3,285 Auckland residents. A latent class multinomial logit model was developed to examine the preferences and trade-offs residents may be willing to make between housing, neighbourhood and transport-related attributes. Other forms of quantitative analysis including basic frequencies, factor correlations, and tests for equality of variances and means will supplement the analysis of this model. LC MNL models may be based either upon data collected in a stated choice experiment or from observed real world behaviour. A stated choice experiment is the preferred method when the research is about choices that are not widely available in the current marketplace, as is the case with medium and high-density housing, and travel choices for some urban locations, in New Zealand.

Latent class multinomial logit models (LC MNL) are a type of multinomial logit model that allow for the identification of market segments as a way of accounting for preference heterogeneity. Unlike other methods, they are not dependent upon a predefined specification of preferences or lifestyle segments (Eshghi et al., 2011; Liao et al., 2014). Rather, class membership and class profiles are simultaneously determined by respondents' choices and/or behaviour, and may include other individual level characteristics such as demographics. In a LC MNL model, latent class membership is known *a priori* and is treated as probabilistic (Walker & Li, 2007). The theoretical basis of stated choice experiments, and discrete choice modelling more generally, lies in random utility theory, where a rational decision maker will make a decision that provides the highest level of utility or satisfaction.

Under random utility theory, the utility of a good comprises the sum of the utilities of its component parts plus an unexplainable component. These parts can be described as attributes with various levels. For each respondent *i* the utility of an alternative *j* is a function of the housing and neighbourhood attributes X_{ijt} in choice situation *t* is:

$$U_{ijt} = \beta_c x_{ijt} + \varepsilon_{ijt}$$

In a discrete choice experiment, respondents choose between two or more options comprising attributes with various levels. By repeating this task, the survey displays various combinations of attribute levels that can be displayed to the respondent. This method introduces dependence between observations, allowing the disentanglement of the relative impact of each attribute on the overall utility of the good (Louviere et al., 2000). Constructing a stated choice experiment involves selecting the attributes that are the most salient to influencing choice behaviour and are mutually exclusive,

exhaustive, and finite in number. However, these design priorities must also be weighed against the cognitive burden placed on respondents; the complexity and length of the survey must be minimised in order to ensure participation and the elicitation of accurate responses (Clover, 2013; Rose & Bliemer, 2009). The probability that a respondent *i* chooses alternative *j* from a choice set J in situation *t* is:

$$P_{ijt}|c = \exp(\beta_c x_{ijt}) / \Sigma^{J}_{i=1}\exp(\beta_c x_{ijt})$$

All estimation was conducted using Latent Gold Choice v. 5.0 (Vermunt & Magidson, 2005; 2013), which uses a non-parametric variant of the mixed conditional logit model that uses latent classes to account for preference heterogeneity (Louviere et al., 2000; McFadden & Train, 2000; Vermunt, 2010). Class membership is determined by a function where membership is assumed to be probabilistic and the number of classes is finite. The inclusion of attitudinal and sociodemographic variables can both increase the predictive power of the model and allow the researchers to estimate the probabilities of class membership of people who did not participate in the discrete choice experiment (Vermunt, 2010). Demographic variables (gender, age, income, household type, dwelling type) and attitudinal variables (transport preference, attribute importance when choosing current location) were used as covariates in the study.

4.3.2 Survey design

Based on previous research into housing preferences in Wellington City and Hamilton City (Dodge, 2015, 2016), respondents were asked to choose between three different dwelling options, which were labelled as a standalone house, a townhouse, or an apartment. Each respondent was asked to answer 12 choice questions. The experiment design was created using the efficient design method (Rose & Bliemer, 2009) using the NGENE Software by ChoiceMetrics. Efficient design methods use previous knowledge about the values of attributes to design more efficient choice questions, and are thus able to decrease sample size requirements and/or increase the reliability of parameter estimates. The D-error criterion was used to determine these choice tasks as it is considered the most appropriate criterion when designing a stated choice experiment that will be used to model market segmentation (Kessels, Goos, & Vandebroek, 2006; Rose & Bliemer, 2009). Responses from the stated choice experiment were used to construct a latent class multinomial logit model of preferences among Auckland residents.

The survey design had to include the effect on residential selection of: neighbourhood-level attributes, specifically those recognised as being critical determinants of travel behaviour; housing-level attributes, specifically those that are strongly related to urban form; and, transport-related attributes, such as travel opportunities that are embedded in residential location choice. The final attributes chosen for inclusion in each option were dwelling type, outdoor space, transport accessibility (time to destinations by driving, public transport, and walking), neighbourhood type (i.e. land use mix), and parking provision. Each of these attributes was given three levels, which were intended to cover the extent of variation within Auckland. The 'house type' attribute was accompanied by a visual aid, as it became clear in the survey design and review process that housing type terms are not well agreed in New Zealand and that verbal descriptions of housing types are not universally understood. Price was included to allow for the valuation of the other attributes and to mimic real world decision-making processes. The first four attribute levels are nominal in nature, whereas price is numeric and was expressed in dollars per week, but was derived as a ratio in order to allow for comparability between respondents and to provide a temporally consistent figure. Based on research by Dodge (2016), price was given four levels and derived from market rents published in 2013 by the Ministry of Business, Innovation and Employment. Recalculated for the Auckland market, the price levels used were: lower quartile, median, upper quartile, and upper quartile*1.2, for each number of bedrooms, and rounded to the nearest $50 increment.

Prior to the housing choice questions, respondents were asked how likely they were to move house within the next two years and to identify whether they would prefer a 1-, 2-, 3-, or 4-bedroom dwelling. Depending on their answers, the choice sets respondents were later given differed in market rent based on dwelling size, with 1-bedroom dwellings having the lowest rents and 4-bedroom dwellings having the highest. All other housing attributes remained the same regardless of dwelling size.

Standalone house	Townhouse	Apartment
		
Small section	Large section	Porch / balcony
30 min **walk** to local town centre 30 min **drive** to CBD 60 min **bus** to CBD	5 min **walk** to local town centre 5 min **drive** to CBD 15 min **bus** to CBD	No centres in **walking** distance 45 min **drive** to CBD 1 hr 15 min **bus** to CBD
Mix of apartments / townhouses and standalone houses	Primarily standalone houses	Mix of apartments / townhouses and standalone houses
Off street	On street	On street
$400	$400	$300

Fig. 4.2. Example of a choice set (No. 9) for 1-bedroom dwelling options (attributes: housing type, outdoor space, accessibility/distance to CBD/town centre, neighbourhood type, parking, and market rent). See Appendix 3 for a full description of the options in each of the 12 choice sets.

Using a Likert scale rating of priorities, respondents were also asked to consider how important certain factors were when choosing their existing house or flat (Table 5.2). Results from this question will provide further insight into how people make trade-offs in the residential location decision process, as well as which characteristics (e.g. accessibility, dwelling type, affordability, etc.) are most important when choosing a home. It is also possible to analyse these responses using both sociodemographics, (e.g. age, income, area, etc.) and other attributes as independent variables to determine whether different groups of people display different preferences.

	Not at all important	Somewhat important	Important	Very important	Extremely important
Had a convenient commute via **motor vehicle**					
Had a convenient commute via **bus, train, or ferry**					
Had a convenient commute via **walk or cycle**					
Was walking distance to outdoor space, such as parks					
Was walking distance to local amenities, such as shops					
Was near family/friends					
Was in a safe neighbourhood					
Was in a visually attractive neighbourhood					
Was convenient to desirable schools					
Was affordable					

Was warm and dry					
Had a private outdoor space					
Had architectural features					
Was a standalone home					
Had a private parking space					
Was on a quiet street					

Table 4.2. Survey question asking respondents to identify what factors were important in determining their choice of existing house or flat.

Sociodemographics (gender, age, income, employment status, and ethnicity) were collected to support the stated choice experiment and provide information that may be used as a basis for analysing housing and travel choices. Following these questions, respondents were asked which transport option (drive, bike, walk or jog, or public transport) they would most prefer to use for their daily transport needs. Those respondents in work or study were directed by the survey to questions related to how often they used certain transport modes and the barriers that prevented them from cycling, walking, and using public transport. These questions provide the information that is used to examine transport preferences and how they interact with housing choices. Household composition, the number of people aged 18 years or older, dwelling type, ownership status, weekly home ownership costs, area, the number of motor vehicles, and length of residence were also requested to provide further support to the stated choice questions. Lastly, respondents were asked how they feel about where they currently live (satisfaction) and whether there were any major problems related to their house/flat (size, cost, condition, heating, etc.) or neighbourhood (distance to work, safety, air pollution, cycle lanes, etc.).

4.3.3 Data preparation and analysis

Before any analysis was possible, the original Excel data was first cleaned and formatted. As the 12 choice questions were dependent upon the number of bedrooms a respondent would prefer, the original data was grouped based on dwelling size. Hence, it was necessary to merge the responses into one overall file to enable them to be analysed across all preferred house sizes. The factors listed in Table 4.2 were also given numerical values to improve the ease with which the correlation of these characteristics with other variables could be analysed. On a 5-point scale, ‘not at all important’ was given the value 1 and ‘extremely important’ was given a value of 5. Another question in the survey asked respondents what, if any, barriers existed that prevented them from cycling, walking, or using public transport. The answers to this question were initially compiled as continuous lists for each respondent, so it was necessary to separate these lists into individual barriers. In other words, if a

respondent had identified four barriers to cycling, these needed to be separated into four individual responses rather than having only one response which covered all four barriers. One of the final changes was to identify all 'other (please specify)' responses across a number of questions and either: 1) if necessary, summarise the answer in fewer words; 2) if the answer was similar to another of the provided categories, assign the response to this category, or; 3) group similar specifications together but retain them as 'other' responses.

Weighting the survey data was another important process, particularly as the survey sample was initially observed to be skewed towards older, higher-income households and the NZ European/Pakeha ethnicity group (see Table 5.1). The sample was rim weighted to a maximum case weight of 5 using the variables age, income, and ethnicity. Rim weighting treats each control variable on a marginal basis and the sample is weighted to the first such variable (e.g. age). This set of weights is retained in comparing the sample balance with the targets for the second control variable (e.g. income). New weights are calculated to correct this and are then multiplied by the first set of weights. This process continues until the last control variable (here, ethnicity) has been weighted. At this final stage, the sample will not necessarily be balanced against any of the variables exactly, but the overall balance is ideally better than prior to weighting. This entire process is repeated until either: a) satisfactory balance is achieved with all control variables; b) no further convergence can be obtained; or, c) the number of iterations reaches a pre-set limit. Rim weighting has the advantage of being able to weight key variables even when the targets are not available, and enables a larger number of variables to be balanced simultaneously, compared to cell weighting (Sharot, 1986). The intent and outcome of the weighting process was that those groups that were under-represented in the original sample were given a higher weighting than the over-represented groups. This removes any undue influence of sociodemographic inconsistencies and ensures that the results are more representative of the sampled population – Auckland in this case.

As noted earlier, various analytical techniques and approaches are used throughout this study. The 2013 New Zealand census provides a useful comparison for sociodemographics, while household characteristics, transport preferences and frequencies, stated choice outcomes, and the importance of certain dwelling and neighbourhood factors are compared with the preceding Wellington study (Dodge, 2016). Household characteristics refer to household and dwelling types, ownership status, the number of cars available, and weekly dwelling costs, which provide insight into contextual differences between cities. The data collected enables a comparison

of transport preferences and the importance of dwelling and neighbourhood factors across different groups, using age, income, household type, dwelling type, and transport preference as independent variables. This analysis helps to determine whether different groups of people have different preferences and, if so, how they might trade off certain attributes in the decision-making process. These results are then compared with those from the Wellington study, and with any equivalent findings from the literature. The SPSS Statistical package also supplements the latent class analysis in two ways: 1) calculating correlations between all dwelling and neighbourhood factors; and, 2) comparing the importance of dwelling and neighbourhood factors for Auckland and Wellington using a t-test for equality of means. Lastly, the stated choice experiment outcomes and latent class analysis provides insight into household preferences and the trade-offs people state they would be willing to make in the residential location choice process, which are compared across Auckland, Wellington, and Hamilton.

5. Results

This chapter outlines and explains the key results of the study, beginning with a description of sociodemographic and household characteristics of the sample and the limitations of it (Section 5.1). The analysis of what Auckland residents do and do not like about their house and neighbourhood begins in section 5.2, followed by an analysis of preferences, behaviours, and barriers in relation to transport. The latter section (5.3) is particularly important, as it forms the basis for a discussion of whether people are able to meet their transport preferences and, if not, what prevents them from doing so. Section 5.4 examines the importance of dwelling and neighbourhood factors in the residential choice process, including an analysis of how these factors are valued differently across sociodemographic groups. Section 5.5 inspects the differences in household preferences between Auckland, Wellington, and Hamilton. Lastly, the most important results are summarised in section 5.6.

5.1 Sociodemographics and household characteristics

Compared to the 2013 New Zealand census, the Auckland survey sample had a significantly lower percentage of 18-24 year olds, people of Asian/MELAA[2], Maori, and Pacific Island ethnicity, very low-income earners, and singles, even after weighting. In contrast, there were higher proportions of females, older people, high-income earners, owner-occupied households, and households with two cars in the sample compared to the census. These biases need to be borne in mind when interpreting the findings. For example, preferences for standalone housing are likely to be stronger among high-income earners and owner-occupied households.

	All respondents n=3285	Unweighted % n=3285	Weighted % n=3285	Statistics NZ % (2013 Census)
Gender				
Female	1888	57.5%	54%	51.4%
Male	1388	42.3%	46%	48.6%
Other	9	0.3%	0%	
Age				
18-24 years	47	1.4%	8%	14.2%
25-34 years	284	8.6%	18%	18.8%
35-49 years	884	26.9%	32%	28.7%
50-59 years	730	22.2%	18%	16.4%
60-69 years	770	23.4%	13%	11.6%
70-84 years	507	15.4%	9%	8.4%
85 or more years	22	0.7%	2%	1.8%
Prefer not to say	41	1.2%	1%	

Ethnicity *(multiple response)*				
Asian/MELAA[2]	207	6.3%	20%	25.0%
NZ European	2698	82.1%	54%	
Maori	147	4.5%	8%	10.7%
Pacific Islander	87	2.6%	11%	14.6%
Other European	133	4.0%	1%	
Other	28	0.9%	0%	1.2%
Prefer not to say	122	3.7%	5%	
Income (NZ$)				
$20,000 or less	270	8.2%	31%	35.0%
$20,001-$30,000	293	8.9%	10%	10.3%
$30,001-$40,000	234	7.1%	9%	9.9%
$40,001-$50,000	276	8.4%	9%	8.3%
$50,001-$60,000	284	8.6%	8%	6.8%
$60,001-$70,000	244	7.4%	6%	5.2%
$70,001-$100,000	531	16.2%	9%	7.6%
$100,001-$150,000	362	11.0%	5%	4.0%
$150,000 or more	213	6.5%	3%	2.7%
Prefer not to say	578	17.6%	11%	10.4%
Household type				
Family	1190	36.2%	46%	45.8%
Older couple	1122	34.2%	21%	
Flatting	326	9.9%	15%	
Single	488	14.9%	12%	19.0%
Young couple	101	3.0%	5%	
Prefer not to say	58	1.8%	2%	
Dwelling type				
Standalone house	2561	78.0%	73%	74.7%
Townhouse	344	10.5%	10%	24.8% (units, apartments, and terraced housing)
Flat	104	3.3%	6%	
High-rise apartment	120	3.7%	6%	
Low-rise apartment	120	3.7%	3%	
Prefer not to say	33	1.0%	2%	
Dwelling ownership status				
Owner-occupied	2715	82.6%	70%	61.5%
Rented (privately)	491	14.9%	26%	
Rented (state)	39	1.2%	3%	
Other	40	1.3%	1%	
Weekly home ownership costs (NZ$)				
Less than $200	620	18.9%	18%	
$200-$299	439	13.4%	11%	
$300-$399	317	9.6%	9%	
$400-$499	295	9.0%	12%	
$500-$599	270	8.2%	9%	
$600-$699	207	6.3%	6%	
$700-$799	141	4.3%	4%	
$800-$899	93	2.8%	3%	
$900-$999	56	1.7%	1%	
More than $1000	203	6.2%	5%	

[2] Middle Eastern/Latin American/African

Don't know	644	19.6%	21%	
Occupants over 18 years-old				
1	647	19.7%	15%	
2	1846	56.2%	51%	
3	418	12.7%	15%	
4	233	7.1%	12%	
5 or more	85	2.6%	5%	
Prefer not to say	56	1.7%	2%	
Household cars				
0	108	3.3%	7%	7.6%
1	1055	32.1%	30%	34.2%
2	1512	46.0%	44%	39.9%
3 or more	610	18.6%	19%	18.4%
Ward[3]				
Albany	222	6.8%	6%	10.3%
Albert-Eden-Roskill	418	12.7%	13%	10.7%
Franklin	123	3.7%	4%	4.5%
Howick	174	5.3%	4%	9.1%
Manukau	164	5.0%	10%	9.4%
Manurewa-Papakura	147	4.5%	5%	8.4%
Maungakiekie-Tamaki	213	6.5%	8%	5.0%
North Shore	496	15.1%	13%	10.0%
Orakei	210	6.4%	4%	5.8%
Rodney	247	7.5%	5%	3.9%
Waitakere	298	9.1%	10%	10.7%
Waitemata and Gulf	343	10.4%	11%	7.1%
Whau	230	7.0%	7%	5.2%

Table 5.1. Sociodemographic characteristics of the survey sample (unweighted and weighted) compared to the 2013 NZ Census.

Note: The gaps in this table are due to different group specifications between the survey sample and the Statistics New Zealand 2013 census data. For example, in relation to dwelling type, the 2013 census grouped all joined dwellings (units, apartments, terraced housing, etc.) together whereas this survey asked for specific dwelling types.

Comparing these frequencies with those from the Wellington City study reveals some notable differences (Dodge, 2016). Auckland had a lower proportion of people under 35 years of age (26%) compared to Wellington City (49%), and a higher proportion over the age of 60 (24% vs. 12% in Wellington). A higher percentage of Auckland participants earn less than $20,000 per year (31%) than people from Wellington (16%), and a lower percentage earn between $70,000 and $150,000 (14% vs. 34% in Wellington). In terms of household type, the Auckland and Wellington samples had very similar proportions of families, couples, and singles. The only noticeable difference was the higher share of households who 'flat' in Wellington (25%)

[3] See Appendix 4 for a map of Auckland's Local Boards and Wards.

compared to Auckland (15%). Similarly, 14% of dwellings in Wellington were flats compared to only 6% in Auckland. A slightly higher percentage of Auckland respondents live in standalone houses (73%) and high-rise apartments (6%) than people in Wellington (67% and 3% respectively), but a lower proportion live in townhouses (10% vs. 12% in Wellington).

The core results for Auckland respondents were as follows, and notable contrasts with Wellington patterns are identified.

The vast majority of survey participants were very satisfied with where they are currently living (83% responded with 5 or 6, on a 6-point scale where 1 was very dissatisfied and 6 was very satisfied).

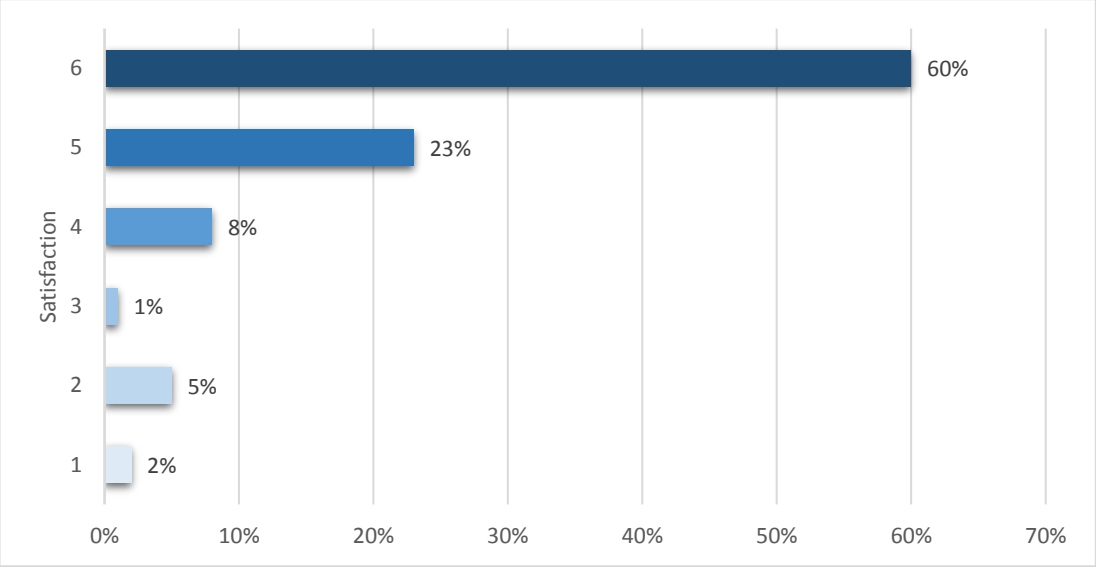

Fig. 5.1. Auckland: Satisfaction with current residence. Base: Panellists participating in survey (n=3,285) – weighted data.

Almost half (48%) of the survey respondents were not at all likely to move house within the next 2 years, while another 25% were somewhat likely. Approximately 20% were very likely to move but, as the satisfaction results suggest, people generally feel very positive about their current places of residence.

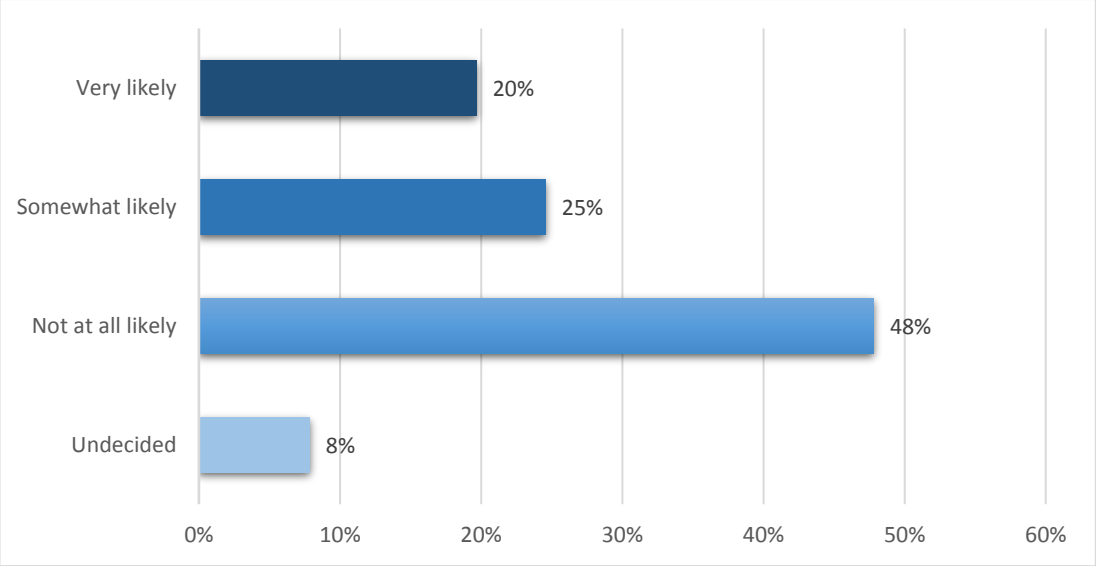

Fig. 5.2. Auckland: Likelihood of moving house. Base: Panellists participating in survey (n=3,285) – weighted data.

Almost a third (32%) of respondents would move to small dwellings with one or two bedrooms, roughly balanced by the 30% who would likely move to large dwellings (i.e. 4 or more bedrooms), and 38% would move to 3-bedroom houses.

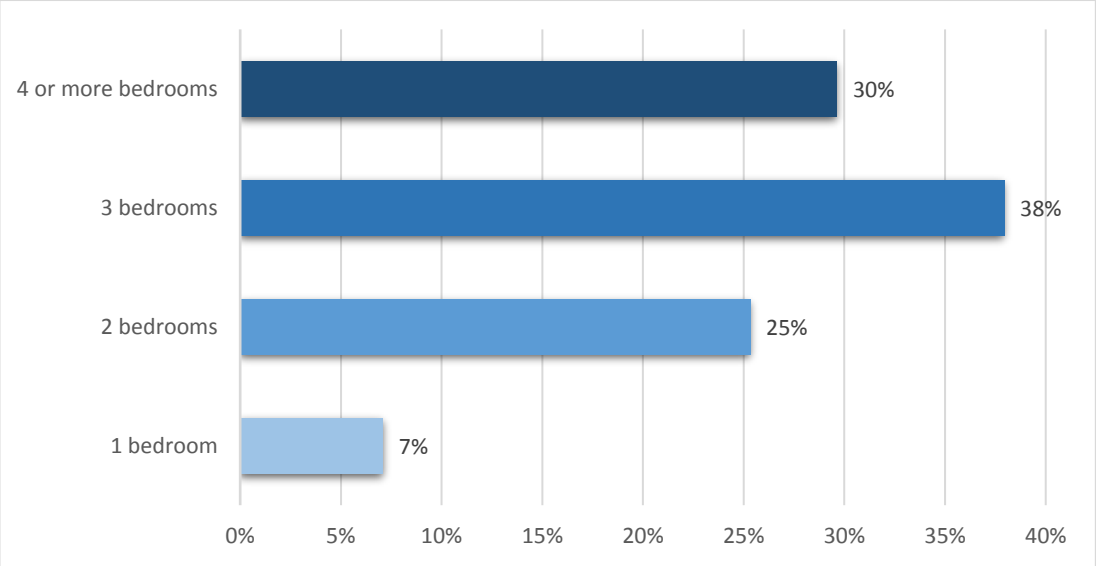

Fig. 5.3. Auckland: Dwelling size most likely to choose if moving. Base: Panellists participating in survey (n=3,285) – weighted data.

5.2 House and neighbourhood problems

Most respondents did not consider there to be any major problems with either housing (40%) or their current neighbourhood (25%), but some problems appeared more often than others.

The dwelling being too small (12%), expensive (11%), cold/difficult to heat (10%), and poor condition (8%) were the most common issues given for dwellings. These problems align well with the most important attributes of housing (section 5.4), which notably included safety, affordability, and the ability to sufficiently heat or cool the house.

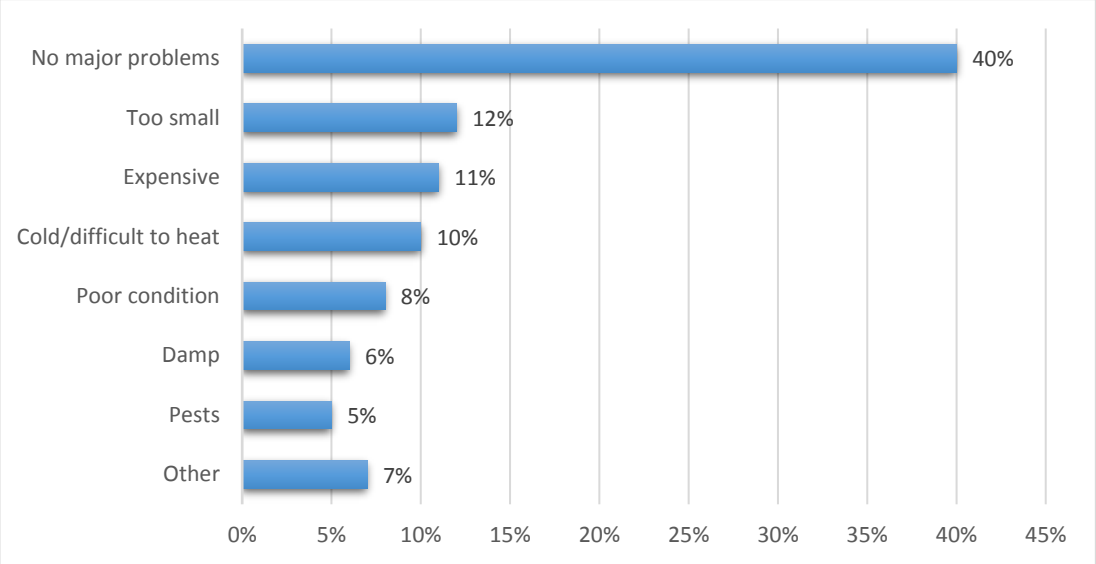

Fig. 5.4. Auckland: Problems with the house or flat. Base: Panellists participating in survey, multiple responses allowed (n=4,085) – weighted data.

The most common major neighbourhood problems were public transport reliability (14%) – which was a problem for only 7% of Wellington residents – noise or vibration (10%), poor or uncommon sidewalks/cycle lanes (9%), distance to work (7%), and problem neighbours (7%).

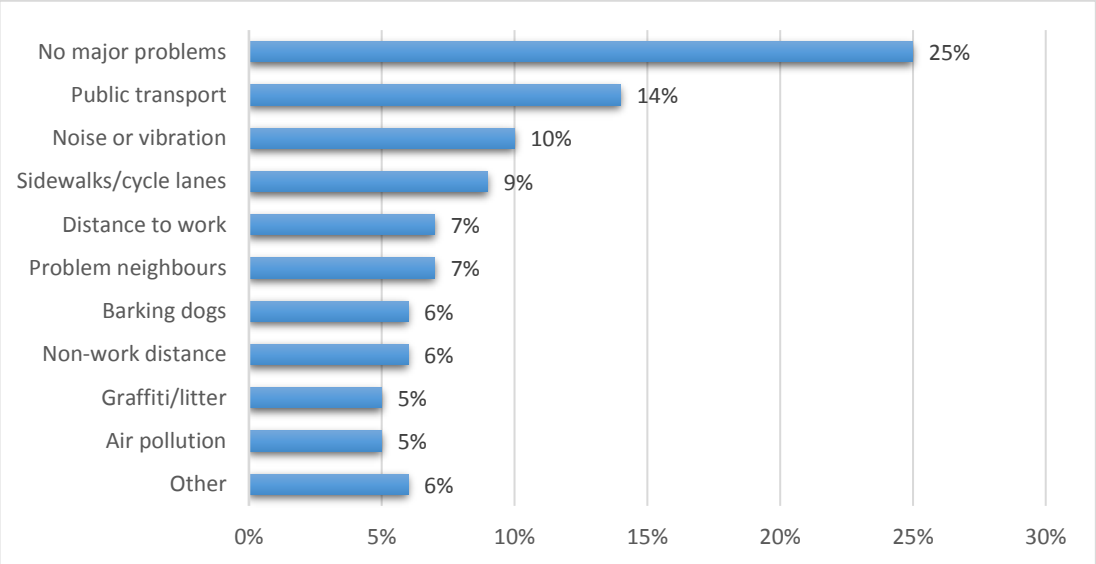

Fig. 5.5. Auckland: Problems with the neighbourhood. Base: Panellists participating in survey, multiple responses allowed (n=5,143) – weighted data.

5.3 Transport preferences, behaviours, and barriers

A third of respondents would prefer to drive (33%), while public transport (28%) and walking (27%) were the preferred modes of transport for just over a quarter of respondents. Cycling was the least preferred transport mode (11%). In contrast, fewer participants in the Wellington study prefer driving (21%) and using public transport (15%), but a much greater share prefer walking/jogging (48%). A slightly higher proportion of Wellington participants also prefer cycling (16%) compared to Auckland (11%).

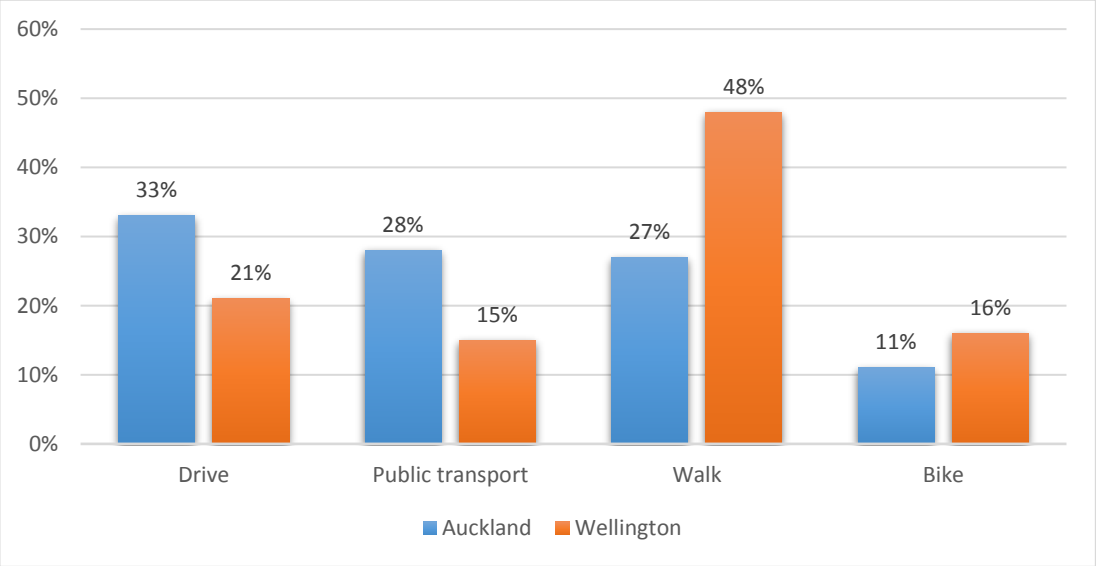

Fig. 5.6. Auckland and Wellington: Transport preferences. Auckland base: Panellists participating in survey (n=3,285), Wellington n=452 (both weighted).

Looking at actual behaviour as a comparison, driving a private car was by far the most common transport mode actually used for commuting to work, with 43% of commuters who drove doing so on between 5-7 days, and another 15% driving 3-4 days in the last 7. Aside from working at home, the next most frequently used transport mode was public transport, although this was only used at least once per week by 30% of respondents.

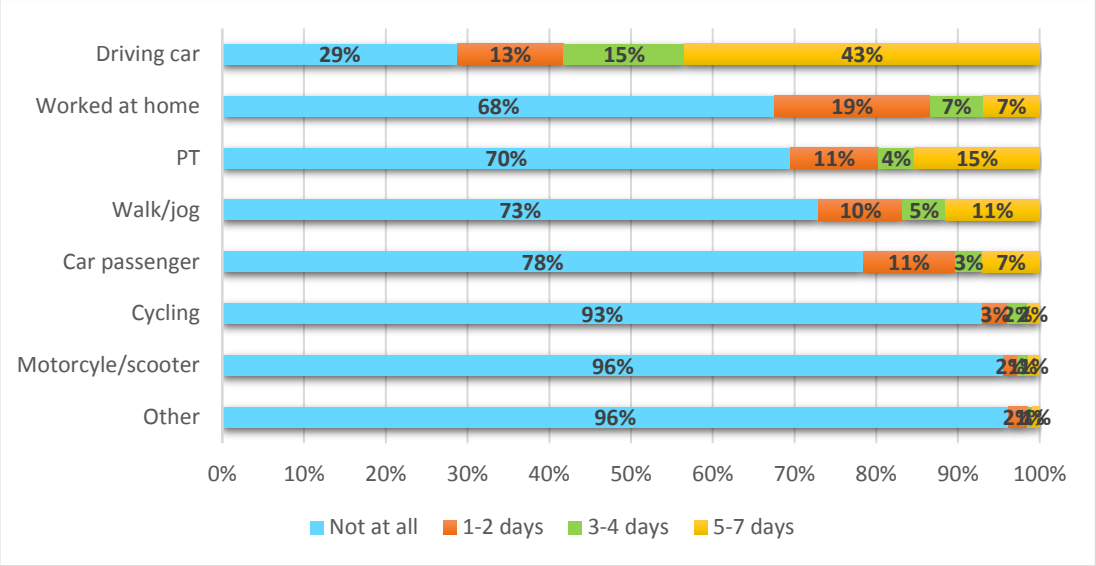

Fig. 5.7. Auckland: Work-related transport mode frequencies. Base: Panellists participating in survey who work and responded (n=2,034) – weighted data.

By comparison, public transport was the most common form of transport used for commuting to study, with 62% of those doing so at least once over the last week and 36% using public transport 3 or more times. Forty-four percent of respondents drove to study at least once per week, while walking/jogging and car passenger modes were used at least once by 40% of respondents.

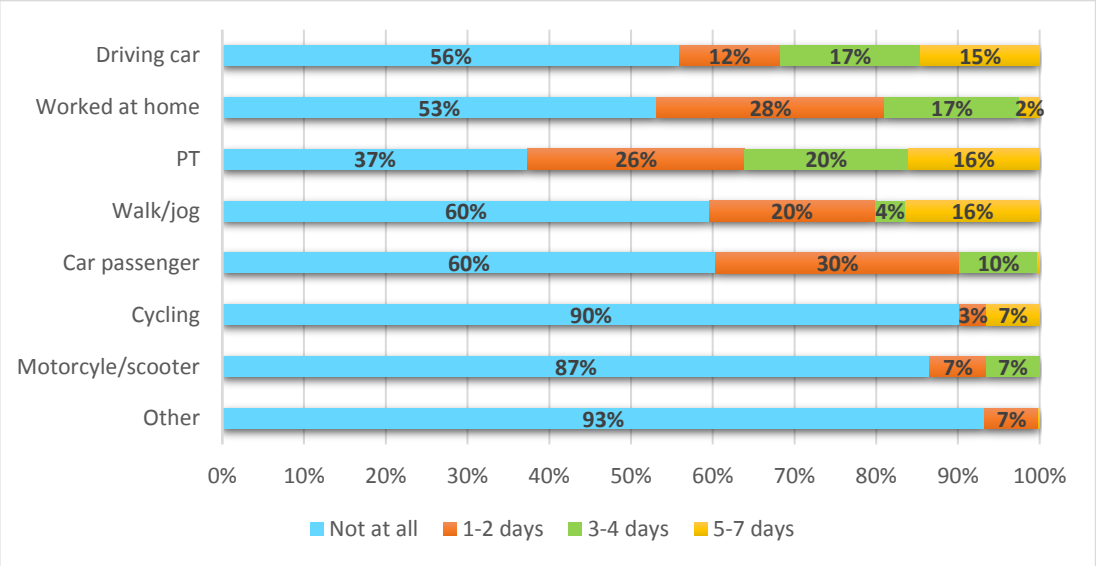

Fig. 5.8. Auckland: Study-related transport mode frequencies. Base: Panellists participating in survey who study and responded (n=54) – weighted data.

Of people working and students who selected for transport, 'if I could, I would bike to work /study every day,' the most common barrier to cycling was a perceived lack of safety (65%). Unpleasant routes (e.g. steep hills) (39%), other things to do (31%), weather (29%), and long journey times (27%) were the other most important barriers.

16% said there were no barriers to cycling, and there was a wider range of barriers to cycling given compared to barriers to walking and public transport.

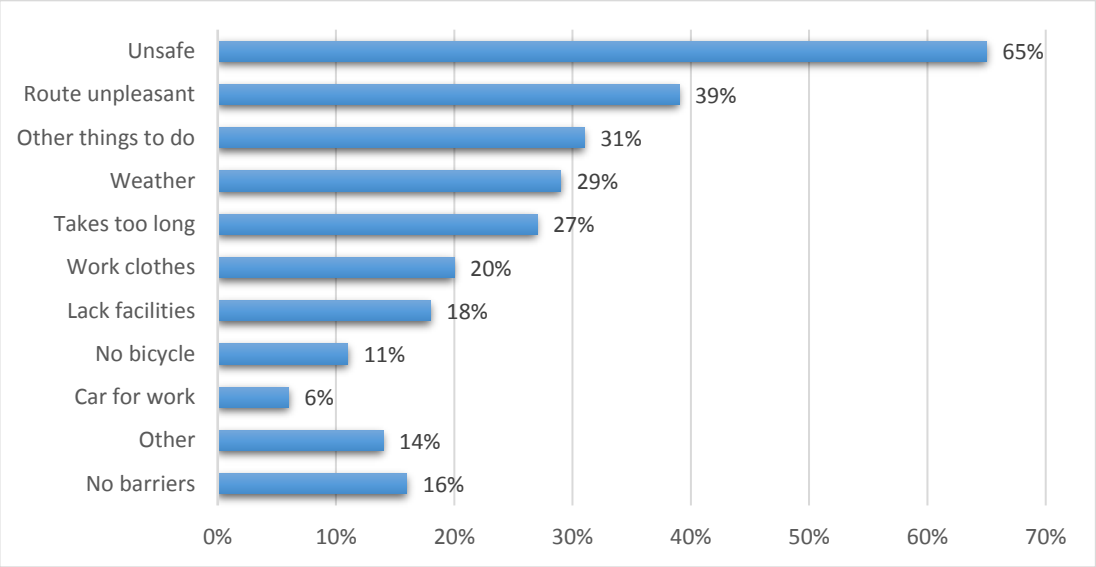

Fig. 5.9. Auckland: Barriers to cycling. Base: Panellists who, if they could, would bike to work or study every day (n=327) – weighted data.

Of people working and students who selected for transport, 'if I could, I would walk to work /study every day,' 'takes too long' was by far the most commonly given barrier to walking (66%). Weather (42%), other things to do (29%), and 'work clothes' (i.e. having an appropriate appearance at work) (23%) were also identified as significant barriers, while 11% of participants who responded to this question did not perceive any barriers to walking.

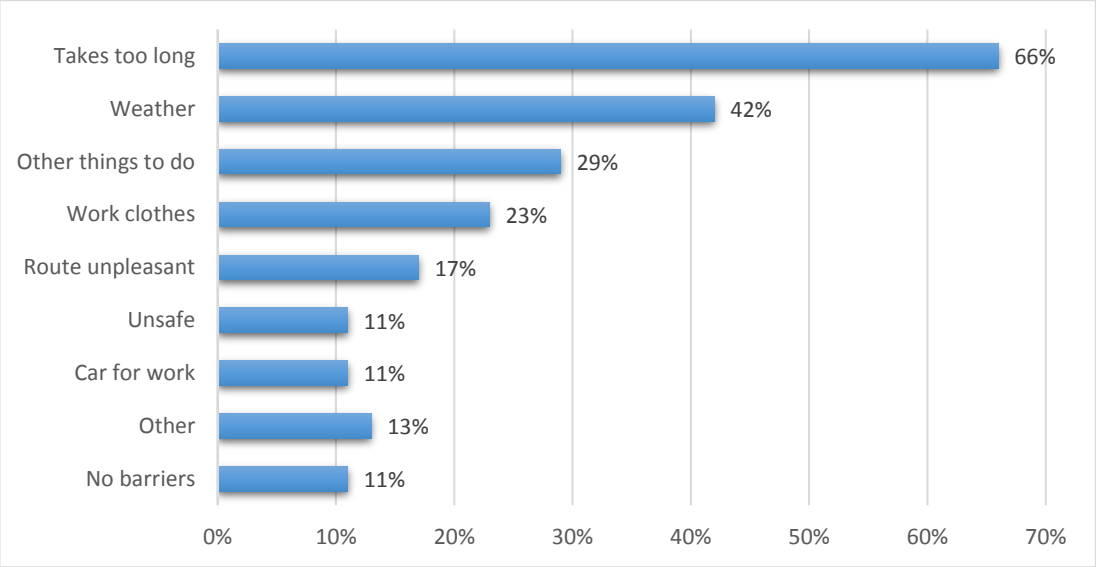

Fig. 5.10. Auckland: Barriers to walking. Base: Panellists who, if they could, would walk to work or study every day (n=578) – weighted data.

As with walking, ‘takes too long’ was the barrier most people who selected ‘if I could, I would take public transport to work/study every day’ gave for using public transport (49%). The other most common barriers were an unsuitable or infrequent timetable (34%), no easily accessible stop or station (33%), an unreliable service (22%), and having other things to do (21%). 26% of those who responded said there were no barriers to using public transport.

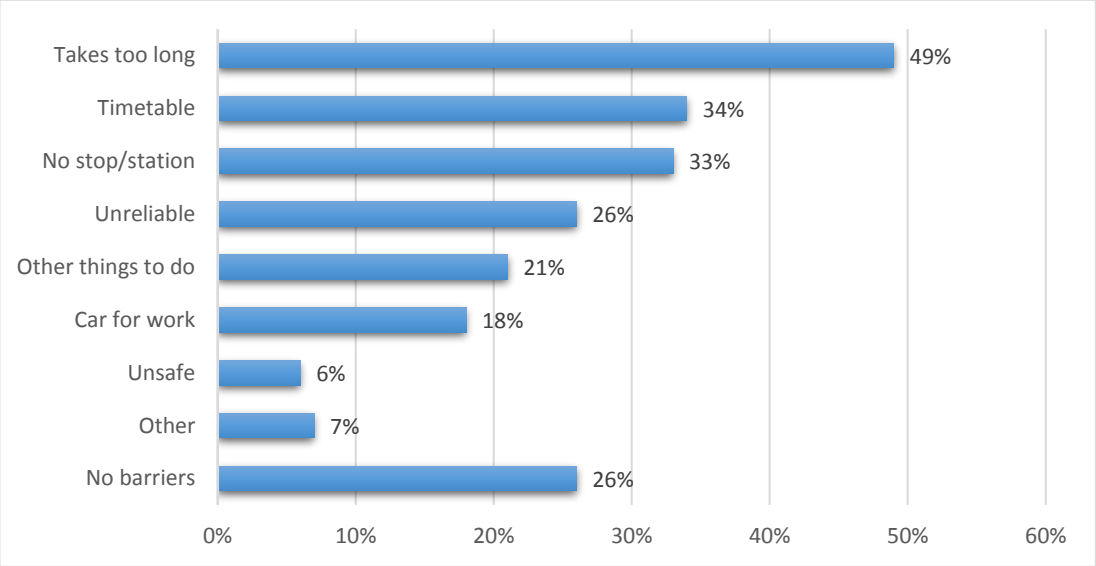

Fig. 5.11. Auckland: Barriers to using public transport. Base: Panellists who, if they could, would take public transport to work or study every day (n=536) – weighted data.

5.4 Dwelling and neighbourhood factors in dwelling choice

Overall, the most important factors for households when choosing their existing dwelling were affordability, warmth and dryness, a safe neighbourhood, and outdoor space. Parking (35%) and a standalone home (31%) were also extremely important to a substantial proportion of respondents, but having a standalone home was also not at all important or only somewhat important to 30% of households. That this proportion is so high is notable and is discussed further below. Distance to shops and parks were approximately equal in importance, while architectural features, a convenient commute via active transport, being near family/friends, and schools were the least important factors. A convenient commute via public transport was more important than active transport, with 58% rating it important, very important, or extremely important compared to 45% for active transport. Public transport was also very important and extremely important to more respondents (39%) than a convenient commute via car (35%), but had a higher proportion saying it was not at all important (23% vs. 18%).

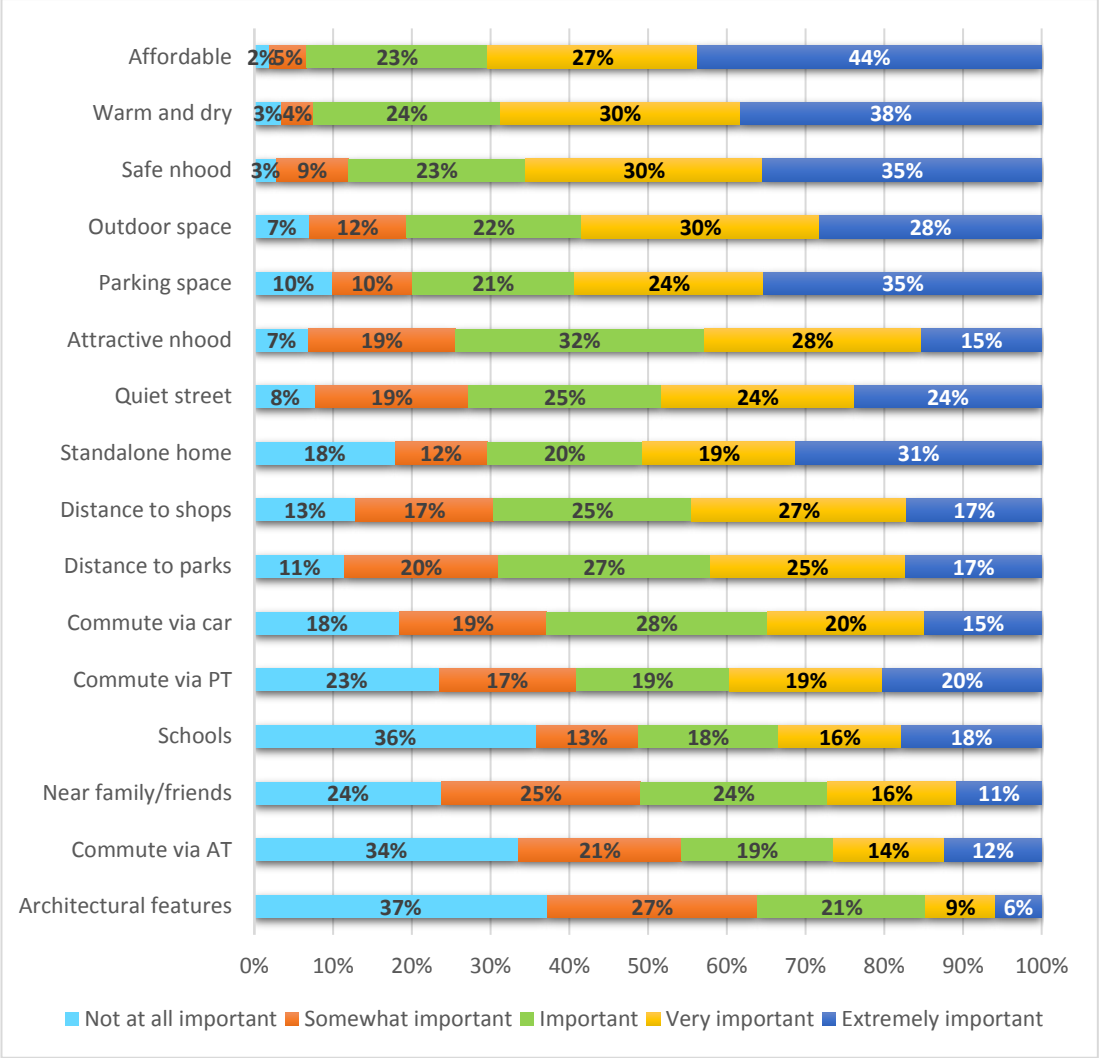

Fig. 5.12. Auckland: Importance of factors in choosing existing house/flat. Factors are ordered by the sum of responses of 'important,' 'very important' and 'extremely important' (highest to lowest).

Compared to Wellington City, the most important (affordability, warmth and dryness, and a safe neighbourhood) and least important (near family/friends, architectural features, and schools) factors were the same, but there are some noticeable differences. Distance to shops was much less important to Auckland households (9th of 16 factors) than those in Wellington (4th), and distance to parks was also less important in Auckland (10th vs 6th). In terms of travel, Auckland respondents considered both public transport and active transport less important than did Wellingtonians, but car use was more important. A convenient commute via active transport was not at all important to 34% of Auckland households (15th of 16), while the walking factor was not at all important to only 19% of Wellington households (10th of 16). Public transport was also more important in Wellington (8th) than Auckland (12th), while being able to commute via car was considered not at all important to 18%

of Auckland respondents but 29% of those in Wellington. Lastly, there were significant differences in the importance of having a standalone home and parking. A standalone home was extremely important to 31% of Auckland households (8th of 16) compared to 21% in Wellington (12th), while parking was extremely important to 35% of Aucklanders (5th of 16) but only 20% of Wellingtonians (11th).

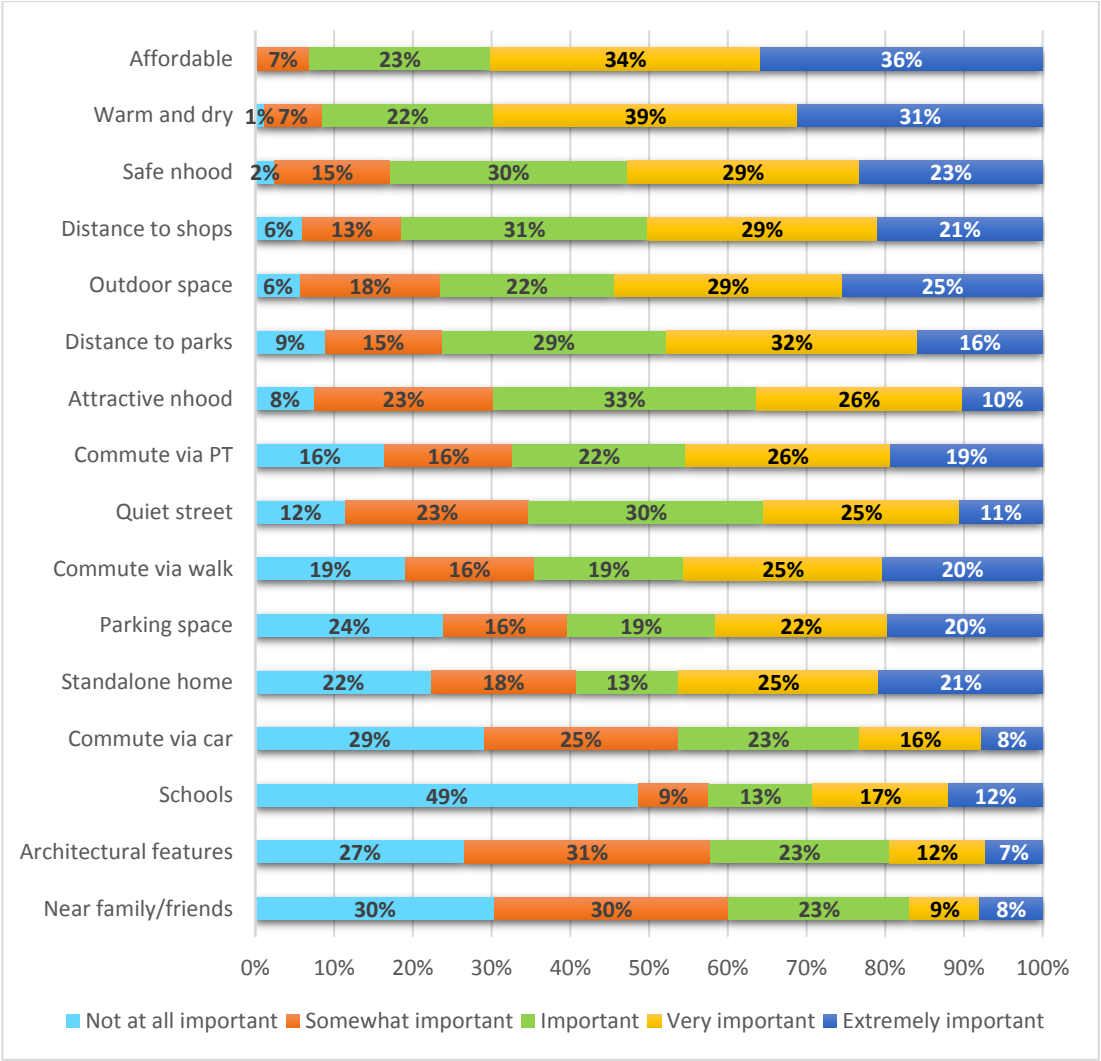

Fig. 5.13. Wellington: Importance of factors in choosing existing house/flat. Factors are ordered by the sum of responses of 'important,' 'very important' and 'extremely important' (highest to lowest).

5.4.1 Factor importance vs. sociodemographics

Comparing the importance of attributes across different groups (age, income, dwelling type, household type, area, tenure, transport preference etc.)[4] reveals that

[4] Ethnicity was not used to compare attributes as many people identified themselves as having multiple ethnicities or ethnic backgrounds.

different sociodemographic groups of people have varying preferences regarding housing, neighbourhood, and transport.

Age:

Young people and the elderly consider outdoor space, a standalone home, and parking far less important than other age groups. Around 20% of 18-24 year olds and those over 85 said outdoor space was not at all important compared to under 10% for every other group, while only 0.4% of the 85 or more age bracket said outdoor space was extremely important, compared to 40% of the 50-59 group. In short, younger and older groups valued outdoor space less than other groups. Forty-four percent of the 18-24 group also rated a standalone home as not at all important, twice the proportion of the next closest group (25-34 years old), and only 5% of the 18-24s said it was extremely important. Only the 85+ age bracket had a lower proportion answering extremely important (1%), although 34% of this elderly group also thought a standalone home was very important, more than any other group.

In terms of parking, the 18-24 bracket had the highest proportion of respondents saying this factor was not at all important (30%) and the lowest proportion saying it was extremely important (10%). Responses for parking were similar across the other age groups, but 46% of the 60-69 year olds considered it extremely important. These results point to a clear life-stage effect on valuing standalone homes, outdoor space, and parking.

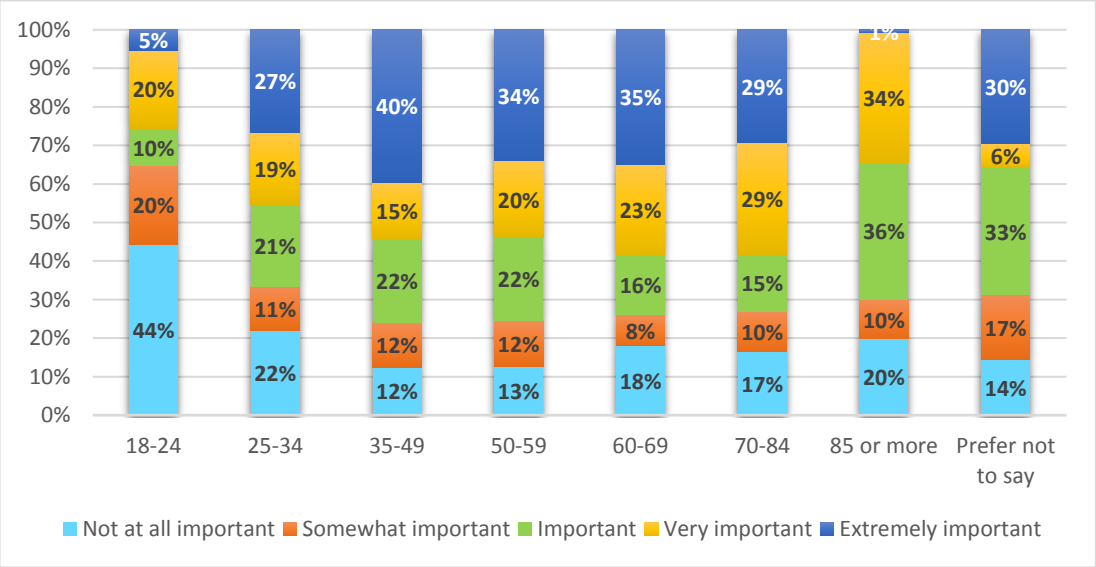

Fig. 5.14. Auckland: Importance of a standalone home by age. Base: Panellists participating in survey (n=3,285) – weighted data.

Distance to shops also seems to be more important to younger people, although not to the same extent as the attributes discussed above. While the responses for not at

all important were similar for most age groups, a slightly higher proportion of those aged 18-24 (56%) said distance to shops was very or extremely important. Interestingly, the similarity in preferences between young people and the elderly observed for outdoor space, a standalone home, and parking, does not seem to exist for distance to shops. Although only 1% of those over the age of 85 considered distance to shops not at all important, 37% said it was somewhat important – far more than any other group – and 17% said it was extremely important – a similar proportion to the other age groups.

Both a convenient commute via public transport and a convenient commute via active transport were more important to younger people, while being able to commute via car was less important. Higher proportions of those aged 18-24 (32%) and 25-34 (31%) said a public transport commute was extremely important than any other age group, and the same goes for those aged 70-84 and 85 or more responding with not at all important (36% and 34% respectively). Similarly, 58% and 40% of the 18-24 and 25-34 brackets said an active transport commute was either very or extremely important, whilst approximately half of those aged 60-69 and 70-84 said this factor was not at all important. In contrast to public and active transport, a convenient commute via car was least important to younger people – 35% of those aged 18-24 said it was not at all important, more than any other group. In this way, it is clear that continued investment in roads systematically works against the interests of younger people.

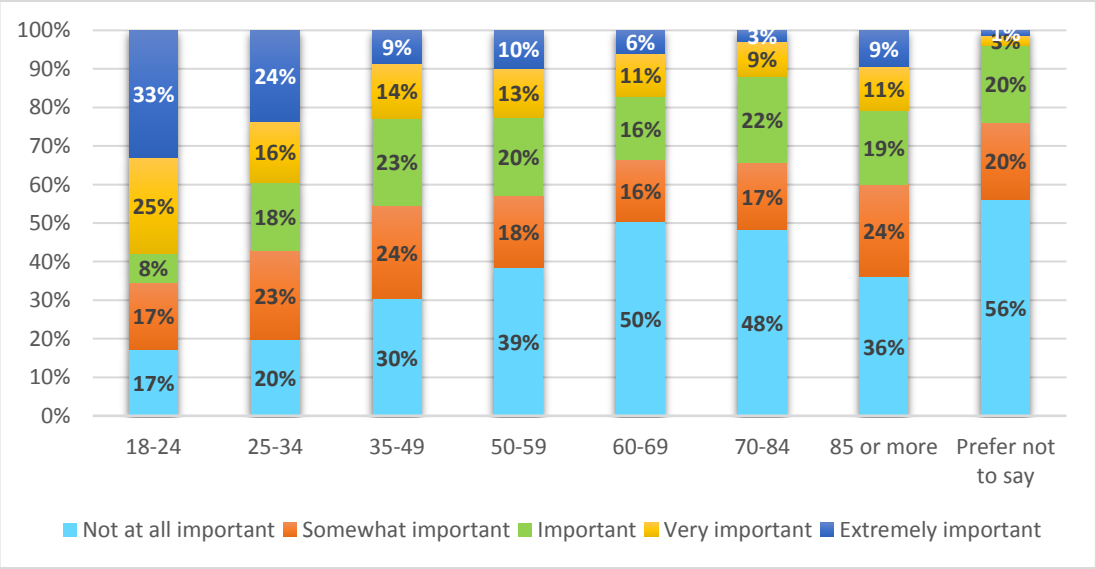

Fig. 5.15. Auckland: Importance of commute via active transport by age. Base: Panellists participating in survey (n=3,285) – weighted data

In relation to transport preferences, younger people have much stronger preferences for cycling and walking, and weaker preferences for public transport and driving. Fifty percent of the 18-24 age group preferred walking, 20 percentage points more than the next closest group (25-34), and 15% preferred driving and public transport, both of which are lower than any other group. Unsurprisingly, the vast majority of those over the age of 85 prefer driving (72%), whilst the 70-84 group show the strongest preference for public transport (37%).

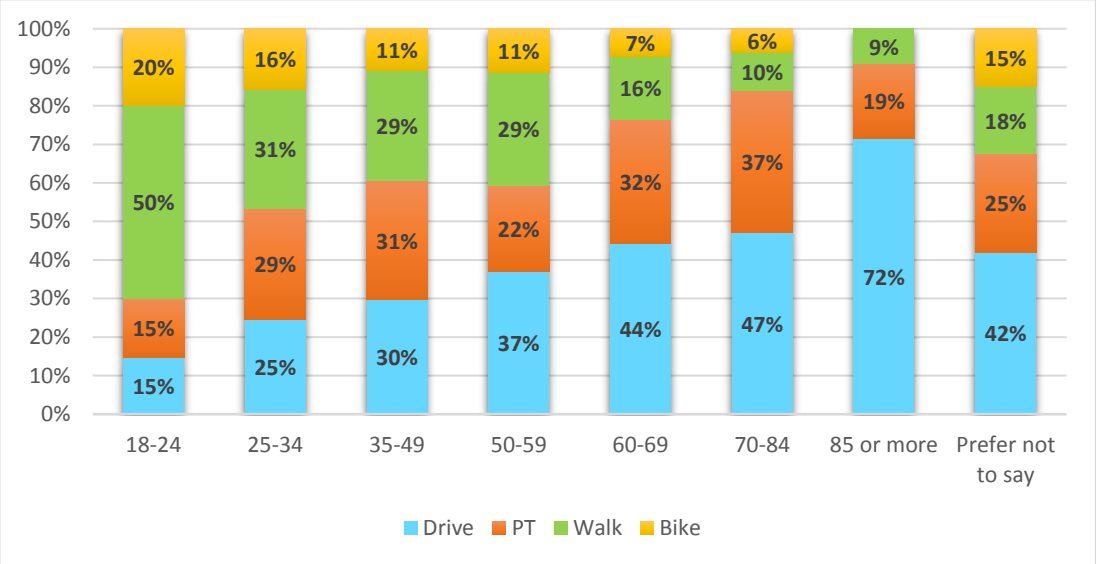

Fig. 5.16. Auckland: Transport preferences by age. Base: Panellists participating in survey (n=3,285) – weighted data.

Income:

Excluding the $20,000 or less income bracket, both outdoor space and parking become more important with higher incomes, while a standalone home is fairly equally important to all income groups. Although the proportions of low-income households[5] who said outdoor space and parking were extremely important (33% and 38% respectively) were relatively high, both factors become more important with increasing incomes – 44% and 49% of the $150,001+ group said outdoor space and parking were extremely important.

In terms of having a standalone home, there is no obvious distinction between income groups. However, there are some notable results, with 30% of the $30,001-40,000 group saying it was not at all important compared to only 6% of the $150,001 or more group.

[5] $20,000 or less

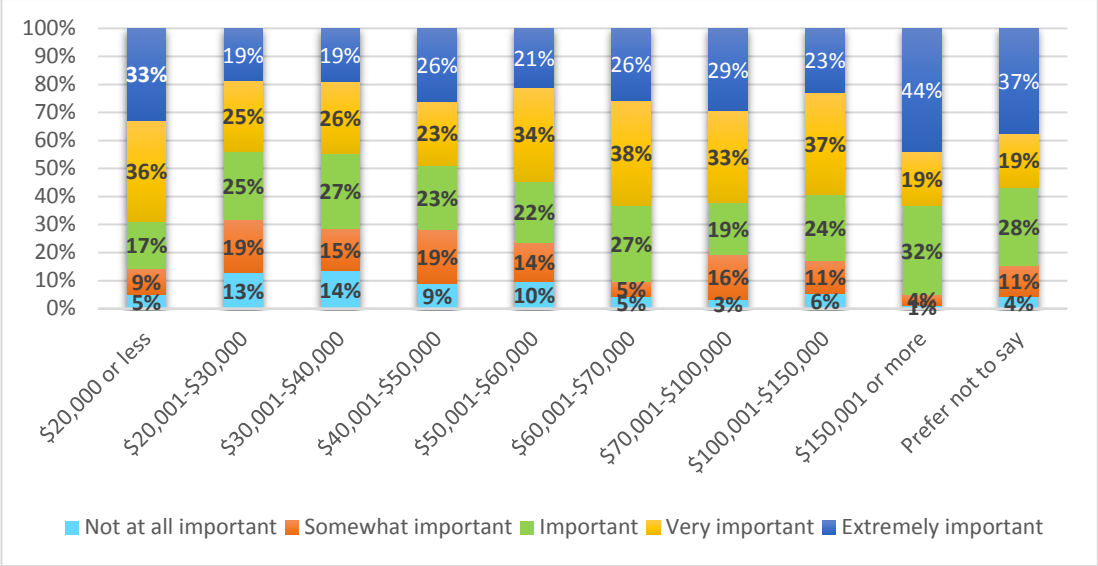

Fig. 5.17. Auckland: Importance of outdoor space by income. Base: Panellists participating in survey (n=3,285) – weighted data.

Distance to shops was least important to high-income households[6] (24% not at all important for the $150,000+ group) and most important to the $50,001-60,000 income group (37% very important and 20% extremely important). The $20,001-30,000, $40,001-50,000, and $50,001-60,000 groups also had the lowest proportions of households responding with not at all important (5%, 8%, and 7% respectively).

Both a convenient commute via public transport and a convenient commute via active transport are generally less important to higher-income groups, whilst the opposite is true for a commute via car. Public and active transport also seem to be equally important to the $20,000 or less group and high-income groups. Thirty-four percent of the $150,000+ bracket said a public transport commute was not at all important, while active transport was not at all important to about 40% of the very low- ($20,000 or less) and very high- (more than $100,000) income brackets. By comparison, a convenient commute via car was extremely important to 29% of the $60,001-70,000 group (highest) and only 5% of the $20,001-30,000 group (lowest).

[6] $100,001-150,000 and $150,001+

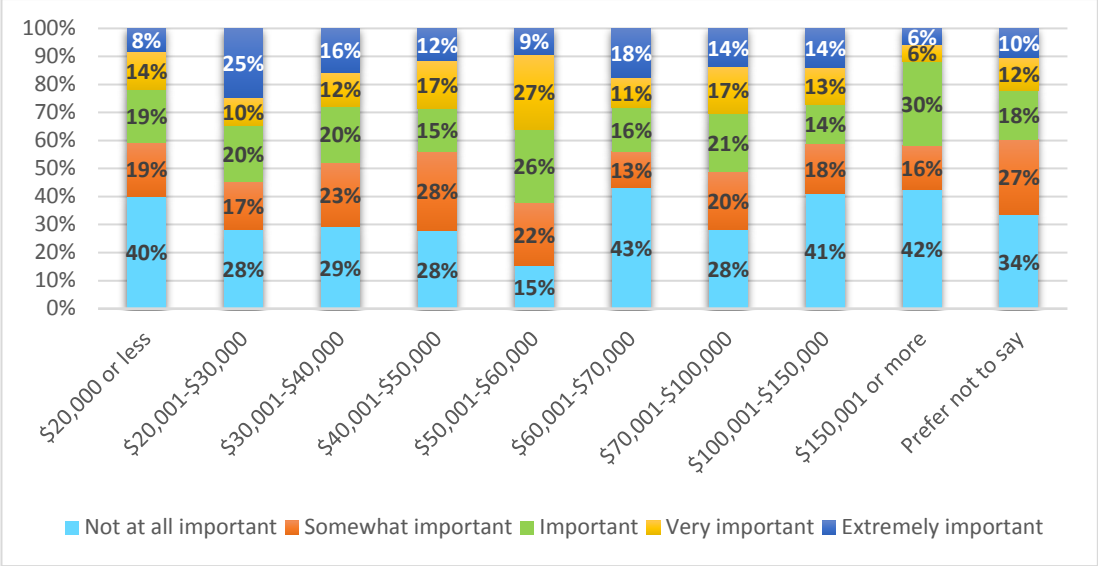

Fig. 5.18. Auckland: Importance of commute via active transport by income. Base: Panellists participating in survey (n=3,285) – weighted data.

In terms of preferred transport mode, preferences for driving were fairly even while preferences for walking decrease with higher incomes – the $40,001-50,000 group have the highest preference for walking at 35%. Cycling was most preferred by the $50,001-60,000 group (17%), who also display strong preferences for public transport (33%), and the $60,001-70,000 group have the strongest preference for public transport (35%).

Household type:

Young couples considered outdoor space, a standalone home, and parking far less important than other groups – these factors were not at all important to 22%, 48%, and 23% respectively – while 38% of singles also considered a standalone home not at all important. These three factors were approximately equally important to families and older couples, and slightly less important to those flatting.

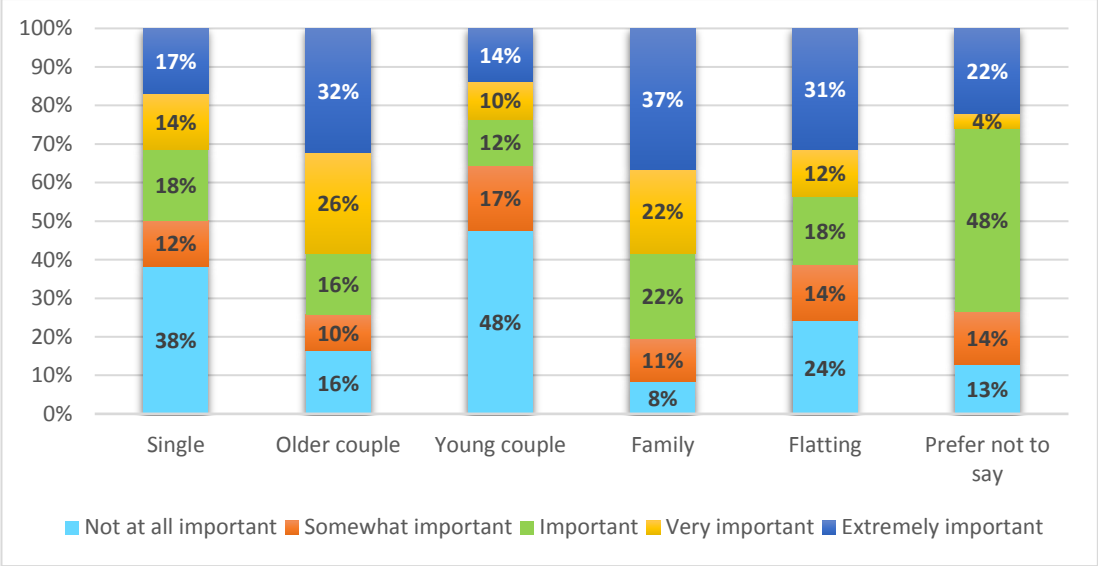

Fig. 5.19. Auckland: Importance of a standalone home by household type. Base: Panellists participating in survey (n=3,285) – weighted data.

Distance to shops was not at all important to 17% and 14% of older couples and families respectively, and extremely important to 35% of young couples. This factor was also very important to singles (34%).

A convenient commute via public transport and a convenient commute via active transport were least important to older couples, with 31% and 51% respectively saying these factors were not at all important. Both commute options were slightly more important to families, but they were most important to young couples – public transport was extremely important to 47% and active transport was extremely important to 43%. A convenient commute via car was not at all important to 31% of young couples.

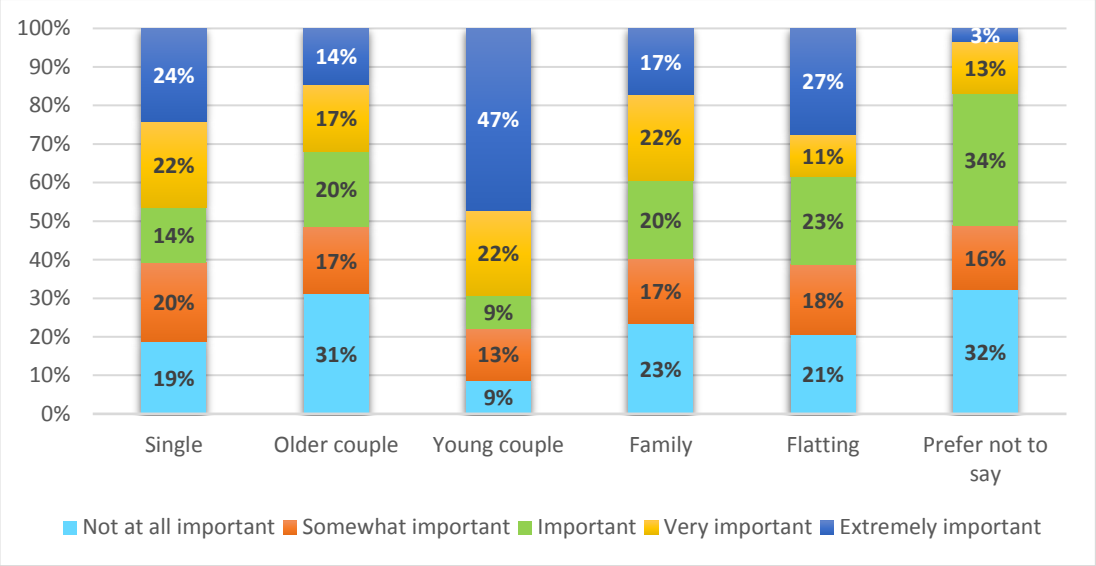

Fig. 5.20. Auckland: Importance of commute via public transport by household type. Base: Panellists participating in survey (n=3,285) – weighted data.

In terms of transport preferences, young couples displayed the highest preferences for both cycling (25%) and walking (40%) and the lowest preferences for driving (10%). In contrast, older couples had the strongest preferences for driving (46%) and the weakest preferences for walking (15%). Singles, families, and people flatting had similar preferences for each transport mode, although a slightly higher proportion of singles preferred public transport (36%) than people flatting (31%) and families (25%).

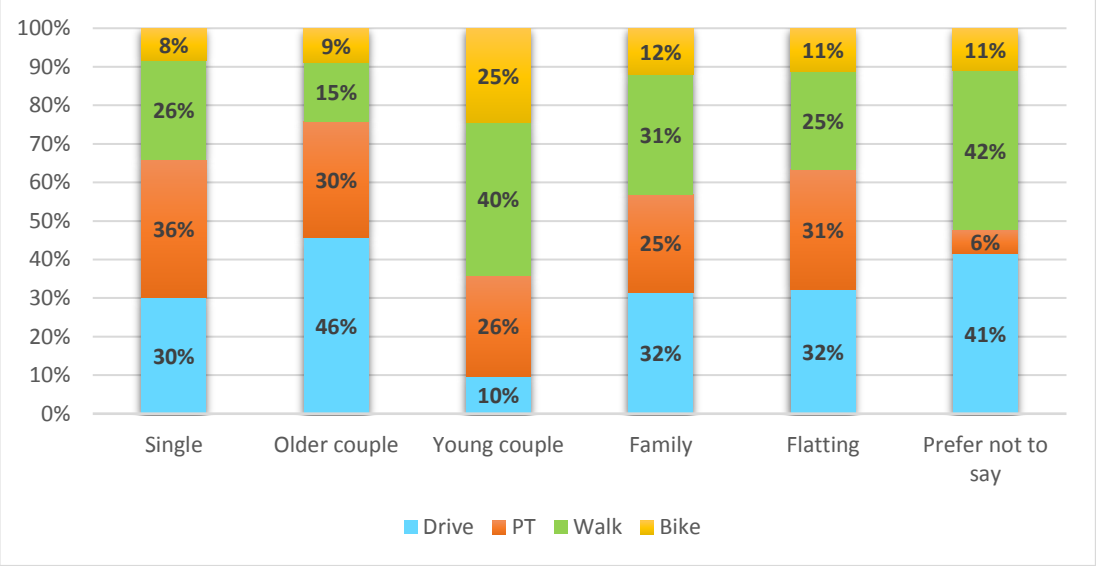

Fig. 5.21. Auckland: Transport preferences by household type. Base: Panellists participating in survey (n=3,285) – weighted data.

Dwelling type:

Outdoor space, parking, and a standalone home were least important to apartment occupants and most important to those living in standalone homes. Those in

townhouses and flats displayed fairly similar preferences for these factors. Outdoor space was not at all important to 36% and 22% of high- and low-rise apartment occupants respectively, and was extremely important to only 1% and 3%. In contrast, outdoor space was extremely important to 33% of standalone home occupants.

A standalone house was even less important to those in apartments, with 76% and 88% of high- and low-rise apartments saying it was not at all important. Unsurprisingly, this factor was extremely important to 40% of standalone home occupants. In terms of parking, 44% and 31% of high- and low-rise apartments said it was not at all important, while 39% of standalone homes said it was extremely important. Interestingly, 21% of those in high-rise apartments and flats considered it extremely important.

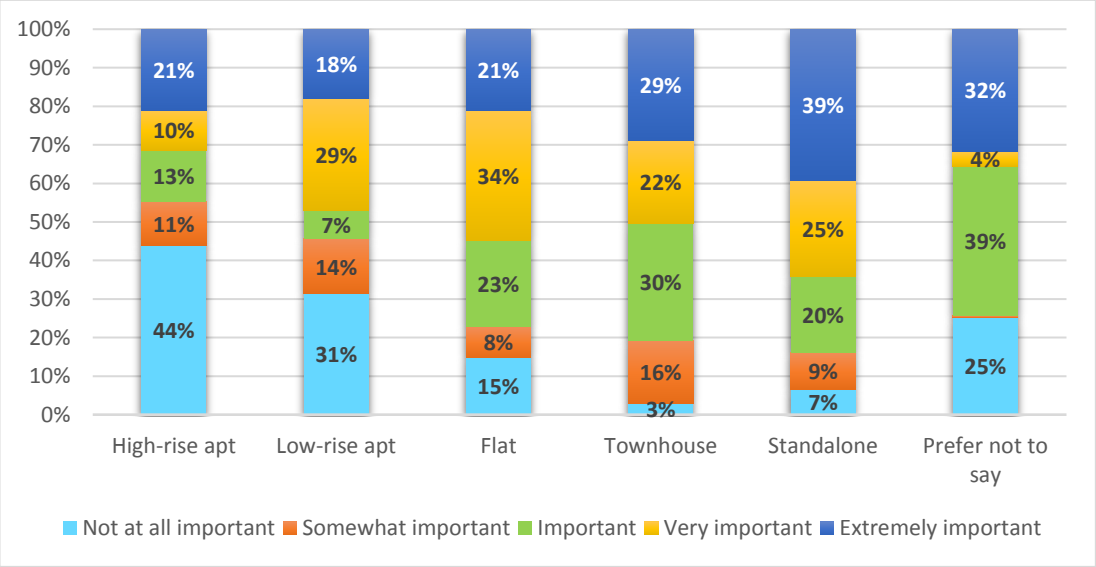

Fig. 5.22. Auckland: Importance of parking space by dwelling type. Base: Panellists participating in survey (n=3,285) – weighted data.

Distance to shops, on the other hand, was most important to high-rise apartment occupants, with 1% considering it not at all important and 38% considering it extremely important. Preferences for this attribute were fairly similar for those living in flats and standalone homes, although the latter dwelling type had the lowest rating of extremely important (14%) and the highest for not at all important (15%).

Both a convenient commute via public transport and a convenient commute via active transport were least important to standalone home occupants – these factors were not at all important to 26% and 38% respectively. While a public transport commute was very similar for all dwelling types, with about a third of respondents considering it extremely important, an active transport commute was far more important to high-rise apartment occupants compared to other groups, with 47% saying it was

extremely important and only 9% saying it was not at all important. In contrast, a convenient commute via car was not at all important to 52% of households in high-rise apartments and was only slightly more important to those in low-rise apartments. The importance of this factor was similar for townhouses and standalone homes, while 30% of flats said it was very important.

Transport preferences seem to align with the importance of other factors, with those in higher density dwelling types showing preferences for active transport and lower density house occupants preferring driving. High- and low-rise apartments had the highest preferences for walking (42% and 38% respectively), and the lowest preferences for driving (9% and 14%). Cycling was preferred by 22% of those in flats and 20% of those in low-rise apartments, while townhouses and standalone homes had very similar preferences for all transport modes.

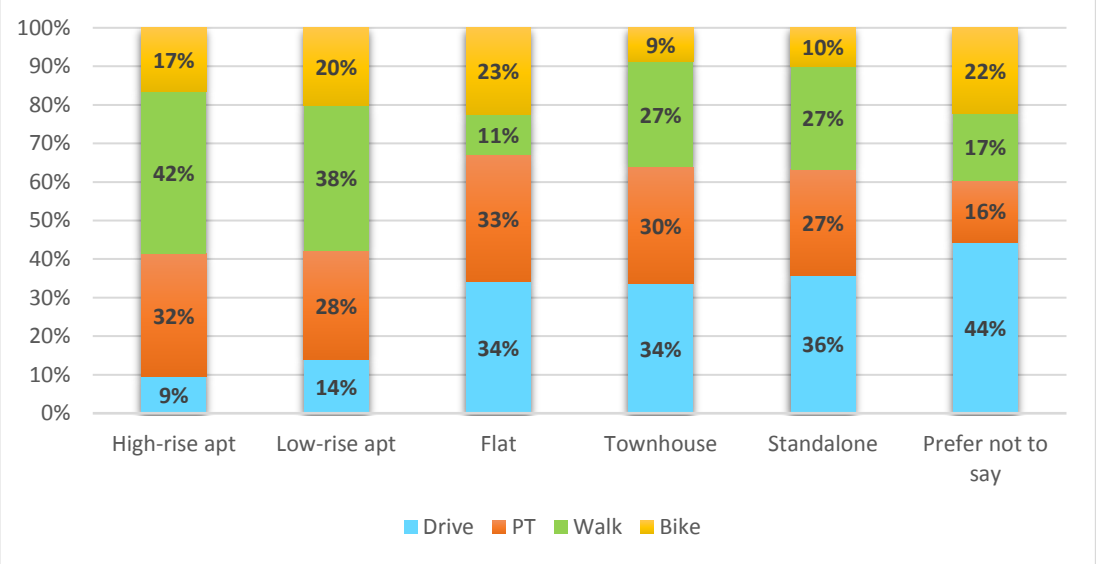

Fig. 5.23. Auckland: Transport preferences by dwelling type. Base: Panellists participating in survey (n=3,285) – weighted data.

Area:

Outdoor space, a standalone home, and parking were most important to households located in areas a long way from central Auckland, including Manurewa, Rodney, and Waitakere, where between 36% and 45% of households said these factors were extremely important. By comparison, Waitemata (the isthmus area, including the CBD) had the highest share of households rating all three factors not at all important (21%, 51%, and 31% respectively). Other interesting results include 33% of Orakei households saying a standalone home was not at all important, Waiheke households saying a standalone home was extremely important (44%) but parking was not

important (23%), and 43% of Albany households saying parking was extremely important.

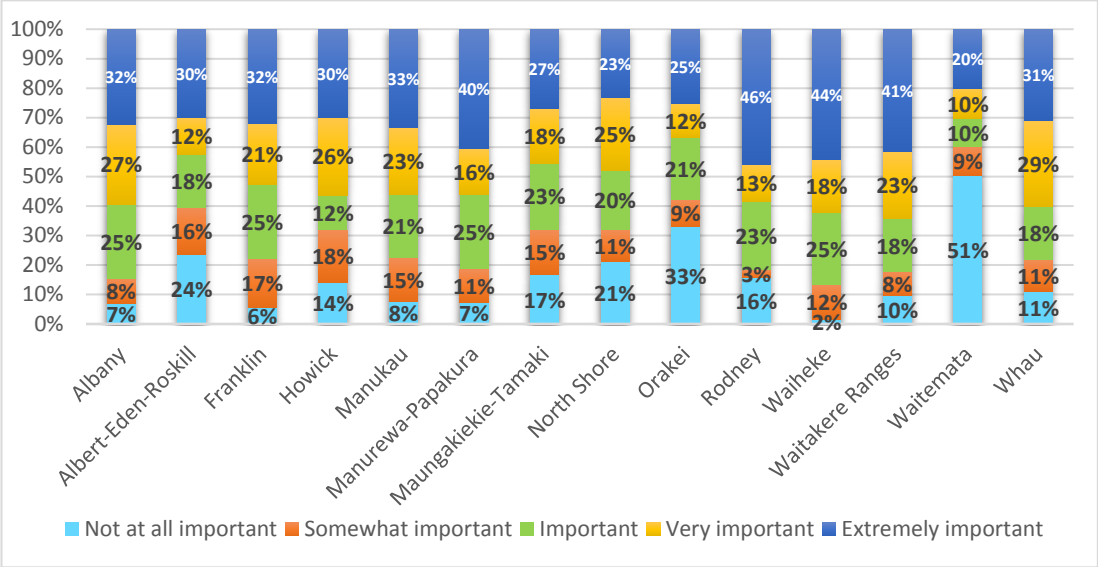

Fig. 5.24. Auckland: Importance of a standalone home by area. Base: Panellists participating in survey (n=3,285) – weighted data.

Distance to shops was most important to households in Waitemata, where 32% said it was extremely important, 38% said it was very important, and only 1% said it was not at all important. This factor was least important to households in Rodney (31% not at all important), Manurewa (25%), Waiheke (23%), and Franklin (21%).

Similar to distance to shops, a convenient commute via public transport was least important to households in Rodney (48% not at all important), Manurewa (41%), and Franklin (41%). Waiheke (31%), Waitakere (29%), Orakei (27%), Waitemata (26%), and Albert-Eden-Roskill (26%) were the areas with the highest proportions of households who considered this factor extremely important. A convenient commute via active transport was not at all important to over half the households in Albany (58%), Franklin (55%), and Rodney (51%), but was extremely important to 38% of households in the Waitemata area. There were very few significant results for the importance of a convenient commute via car, but 78% and 43% of households in Waiheke and Waitemata respectively said this factor was not at all important.

In terms of transport preferences, households in Waitemata and Waiheke showed strong preferences for both cycling (21% and 19%) and walking (45% and 41%), while driving was preferred most by households in Manukau (55%) and Manurewa (50%), which have relatively good motorway access to most jobs. Although preferences for public transport were somewhat consistent between areas, Orakei had the highest

proportion of households preferring public transport (35%), and had a high proportion of households who preferred walking (41%).

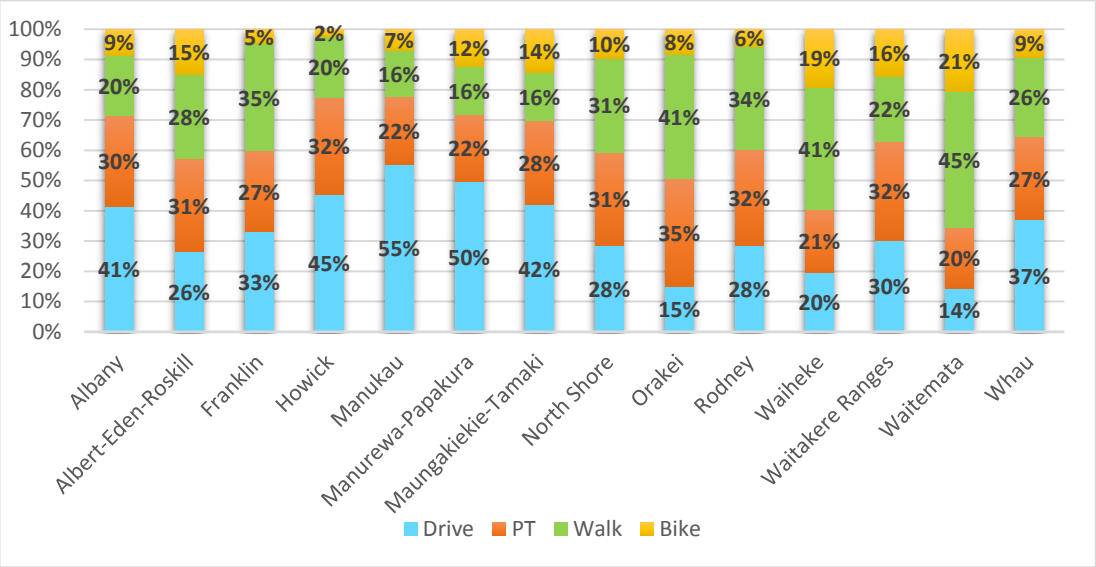

Fig. 5.25. Auckland: Transport preferences by area. Base: Panellists participating in survey (n=3,285) – weighted data.

Transport preference:

Outdoor space, a standalone home, and parking are more important to those who prefer driving than other Transport preference groups – these attributes were extremely important to 37%, 42%, and 50% of drivers respectively. Interestingly, 35% of cyclists considered outdoor space very important, while only 10% said it was not at all important compared to 30% for a standalone home. Parking seemed to be slightly more important to those who prefer public transport than walkers or cyclists.

Distance to shops was least important to drivers, with only 9% considering it extremely important and 19% saying it was not at all important. This attribute was equally important to walkers and cyclists, with 24% of walkers considering it extremely important.

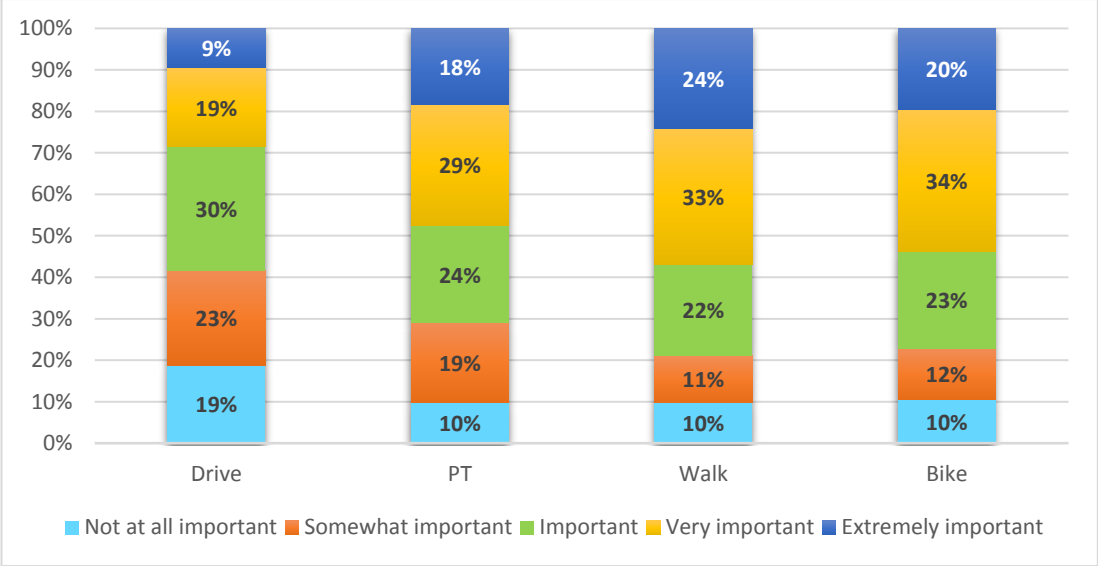

Fig. 5.26. Auckland: Importance of distance to shops by Transport preference. Base: Panellists participating in survey (n=3,285) – weighted data.

A convenient commute via public transport and a convenient commute via active transport were least important to those who prefer driving, with 34% and 50% respectively considering it not at all important. A public transport commute was most important to those with preferences for public transport (30% extremely important), while an active transport commute was most important to cyclists and walkers (23% and 21% extremely important). Interestingly, 31% of those preferring public transport said a commute via active transport was not at all important. A convenient commute via car was most important to drivers, although only 21% considered it extremely important, and least important to cyclists, 31% of whom said it was not at all important.

5.4.2 Factor correlations

A correlation matrix (see Table 5.2) can help provide insight into the relationships between pairs of dwelling and neighbourhood characteristics. The Pearson correlation coefficient (Pearson Corr.) is a measure of the linear dependence between two variables, giving a value between +1 and -1, where +1 is a total positive linear correlation, 0 is no linear correlation, and -1 is a total negative linear correlation. Table 5.2 shows that most pairs of factors have a statistically significant correlation at the 0.01 level. The pairs of factors that do not have a significant correlation are: outdoor space preference and distance to shops (i.e. preference for a short distance to shops); a standalone home preference and being near family/friends; distance to shops and preferences for a quiet street; preferences for a commute via AT and affordability; preferences for a commute via AT and a commute via car; and distance to parks and affordability. The non-significant correlations are highlighted in Table 5.2.

		outdoor space	standalone home	parking space	distance to shops	commute via PT	commute via AT	Commute via car	Distance to parks	Near family/friends	Safe nhood	Attractive nhood	Schools	Affordable	Warm and dry	Architectural features	Quiet street
outdoor space	Pearson Corr.	1															
standalone home	Pearson Corr.	.504**	1														
parking space	Pearson Corr.	.455**	.523**	1													
distance to shops	Pearson Corr.	.008	-.139**	-.045**	1												
commute via PT	Pearson Corr.	-.068**	-.197**	-.145**	.407**	1											
commute via AT	Pearson Corr.	-.093**	-.230**	-.209**	.482**	.494**	1										
Commute via car	Pearson Corr.	.240**	.196**	.342**	.091**	.101**	.003	1									
Distance to parks	Pearson Corr.	.149**	-.016**	.028**	.592**	.299**	.392**	.155**	1								
Near family/friends	Pearson Corr.	.080**	-.004	.046**	.251**	.111**	.123**	.105**	.208**	1							
Safe nhood	Pearson Corr.	.306**	.225**	.342**	.199**	.100**	.068**	.291**	.276**	.245**	1						
Attractive nhood	Pearson Corr.	.364**	.259**	.321**	.153**	.014**	.023**	.183**	.311**	.173**	.563**	1					
Schools	Pearson Corr.	.179**	.235**	.177**	.067**	.034**	.061**	.207**	.157**	.134**	.336**	.253**	1				
Affordable	Pearson Corr.	.149**	.071**	.130**	.061**	.099**	.009	.125**	.005	.086**	.119**	-.021**	.078**	1			
Warm and dry	Pearson Corr.	.303**	.078**	.247**	.177**	.132**	.089**	.159**	.190**	.141**	.324**	.255**	.083**	.357**	1		
Architectural features	Pearson Corr.	.294**	.256**	.222**	.106**	.015**	.068**	.113**	.184**	.126**	.172**	.375**	.117**	-.091**	.133**	1	
Quiet street	Pearson Corr.	.447**	.441**	.459**	.000	-.078**	-.109**	.219**	.122**	.021**	.358**	.396**	.154**	.082**	.230**	.251**	1

*Table 5.2. Auckland: Correlations of all dwelling and neighbourhood factors. **Correlation is significant at the 0.01 level (2-tailed). Non-significant correlations are highlighted yellow.*

Some of the most notable results are:

- Preference for outdoor space has significant *positive* correlations with preferences for a standalone home (0.504), parking space (0.455), and a quiet street (0.447).
- Preference for a standalone home has significant *positive* correlations with preferences for parking space (0.523) and a quiet street (0.441), and significant *negative* correlations with distance to shops (-0.139), commute via PT (-0.197), and commute via AT (-0.230).
- Parking space has significant *positive* correlations with commute via car (0.342) and a quiet street (0.459), and significant *negative* correlations with commute via PT (-0.145) and commute via AT (-0.209).
- Distance to shops has significant *positive* correlations with commute via PT (0.407), commute via AT (0.482), and distance to parks (0.592).
- Commute via PT has a significant *positive* correlation with commute via AT (0.494).
- Commute via AT has a significant *positive* correlation with distance to parks (0.392).
- Distance to parks has a significant *positive* correlation with an attractive neighbourhood (0.311).
- A safe neighbourhood has significant *positive* correlations with an attractive neighbourhood (0.563) and a quiet street (0.358).

5.5 Comparing Auckland, Wellington, and Hamilton

An important part of this study is to examine the differences between Auckland Wellington, and Hamilton household preferences. The first section examines differences in mean importance of dwelling and neighbourhood factors in dwelling choice between Auckland and Wellington City. Following this, the outcomes of the stated choice experiments are compared between Auckland and Wellington City, with specific attention given to transport preferences and frequencies and outdoor space. Lastly, the latent class model is analysed and the latent classes (preference groups) are compared between Auckland, Wellington, and Hamilton.

5.5.1 Importance of dwelling and neighbourhood factors in dwelling choice

An Independent Samples Test (Table 5.4) analyses whether the differences between the two groups are statistically significant. Levene's Test for Equality of Variances is a test that determines if the two conditions have about the same or different amounts of *variability* between scores. The significance (Sig.) value also determines which row to read from for the t-test for Equality of Means, where a value greater than 0.05 indicates that one reads from the top row and a value less than 0.05 means one reads from the bottom row. In this case, the Sig. values are less than 0.05 for all factors excluding commute via AT, where it is 0.177. Hence, the *difference* between Auckland and Wellington is statistically significant for all importance factors excluding commute via AT. Following on from the variances test, the Sig. (2-tailed) value from the t-test for Equality of Means indicates whether the *means* are statistically different. Here, these values are less than 0.05 for all factors. Hence, there is a statistically significant difference between the *mean* importance of all factors for Auckland and Wellington.

Given this outcome, the most important patterns shown in Table 5.3 are:

- Outdoor space, a standalone home, parking, a commute via car, a safe and attractive neighbourhood, and a quiet street are were more important to Auckland households.
- Distance to shops, a commute via PT, and a commute via AT were more important to Wellington households.
- Parking space was much more to Auckland households (3.85) than Wellington households (2.98).
- Conversely, an easy commute via AT was much more important to Wellington households (3.11) than Auckland households (2.28).

- There was also a fairly large difference in the mean importance of a quiet street (0.541), which was more important to Auckland households (3.54) than Wellington households (3.00).

Dwelling/neighbourhood factor	City	N	Mean	Std. deviation	Std. Error Mean
Outdoor space	Auckland	39419	3.84	1.124	0.006
	Wellington	16272	3.51	1.206	0.009
Standalone home	Auckland	39419	3.46	1.451	0.007
	Wellington	16272	3.04	1.471	0.012
Parking space	Auckland	39419	3.85	1.206	0.006
	Wellington	16272	2.98	1.455	0.011
Distance to shops	Auckland	39419	3.11	1.304	0.007
	Wellington	16272	3.47	1.131	0.009
Commute via PT	Auckland	39419	2.75	1.438	0.007
	Wellington	16272	3.16	1.353	0.011
Commute via AT	Auckland	39419	2.28	1.384	0.007
	Wellington	16272	3.11	1.407	0.011
Commute via car	Auckland	39419	2.973	1.2876	0.0065
	Wellington	16272	2.483	1.2676	0.0099
Distance to parks	Auckland	39419	3.24	1.293	0.007
	Wellington	16272	3.31	1.165	0.009
Near family/friends	Auckland	39419	2.54	1.292	0.007
	Wellington	16272	2.34	1.220	0.010
Safe neighbourhood	Auckland	39419	3.85	1.050	0.005
	Wellington	16272	3.57	1.066	0.008
Attractive neighbourhood	Auckland	39419	3.49	1.102	0.006
	Wellington	16272	3.09	1.092	0.009
Schools	Auckland	39419	2.47	1.501	0.008
	Wellington	16272	2.34	1.504	0.012
Affordable	Auckland	39419	3.92	1.046	0.005
	Wellington	16272	3.99	0.935	0.007
Warm and dry	Auckland	39419	3.96	1.027	0.005
	Wellington	16272	3.92	0.952	0.007
Architectural features	Auckland	39419	2.32	1.246	0.006
	Wellington	16272	2.42	1.207	0.009
Quiet street	Auckland	39419	3.54	1.214	0.006
	Wellington	16272	3.00	1.168	0.009

Table 5.3. Group statistics for the importance of dwelling/neighbourhood factors. N is approximately 12 times the sample size for both Auckland and Wellington because all participants were assigned 12 rows, each associated with one of the 12 choice sets in the discrete choice experiment. Factors showing major differences between Auckland and Wellington are highlighted.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	Interval	
									Lower	Upper
Outdoor space	A	543.141	.000	30.688	55689	.000	.328	.011	.307	.349
	B			29.804	28518	.000	.328	.011	.307	.350
Stand-alone home	A	24.547	.000	31.365	55689	.000	.426	.014	.399	.452
	B			31.183	29962	.000	.426	.014	.399	.453
Parking space	A	1684.607	.000	73.301	55689	.000	.877	.012	.854	.900
	B			67.860	25954	.000	.877	.013	.852	.902
Distance to shops	A	490.684	.000	-30.781	55689	.000	-.360	.012	-.383	-.337
	B			-32.646	34711	.000	-.360	.011	-.382	-.339
Commute via PT	A	292.118	.000	-30.738	55689	.000	-.406	.013	-.431	-.380
	B			-31.530	31907	.000	-.406	.013	-.431	-.380
Commute via AT	A	1.821	.177	-64.569	55689	.000	-.837	.013	-.862	-.811
	B			-64.117	29885	.000	-.837	.013	-.862	-.811
Quiet street	A	433.503	.000	48.336	55689	.000	.541	.011	.519	.563
	B			49.105	31420	.000	.541	.011	.519	.562

Table 5.4. Independent Samples Test comparing the mean importance of dwelling/neighbourhood factors in Auckland and Wellington. See Appendix 5 for the full table with comparisons of all dwelling/neighbourhood factors.

Note: A = equal variances assumed, B = equal variances not assumed; t = t-test value; df = degrees of freedom.

5.5.2 Stated choice experiment outcomes

To reiterate, the stated (discrete) choice experiment required respondents to trade off a number of dwelling, neighbourhood, and transport attributes in each choice set. This enabled a clearer picture of preferences than if no trade-offs were required. In the Auckland survey, regardless of house size, standalone homes were chosen as the most preferred dwelling type in eight of the 12 choice sets. Townhouses were selected most often in three choice sets – although only slightly more than standalone homes – and the apartment option was preferred in only one choice set. It is important to note that, where the apartment was the most commonly chosen dwelling, this option also had a large section and was only a 10-minute walk to the town centre. These results are similar to those observed in the Wellington study (Dodge, 2016), where the standalone home option was chosen most often in seven of the 12 choice sets, townhouses were preferred in four choice sets, and the apartment in only one.

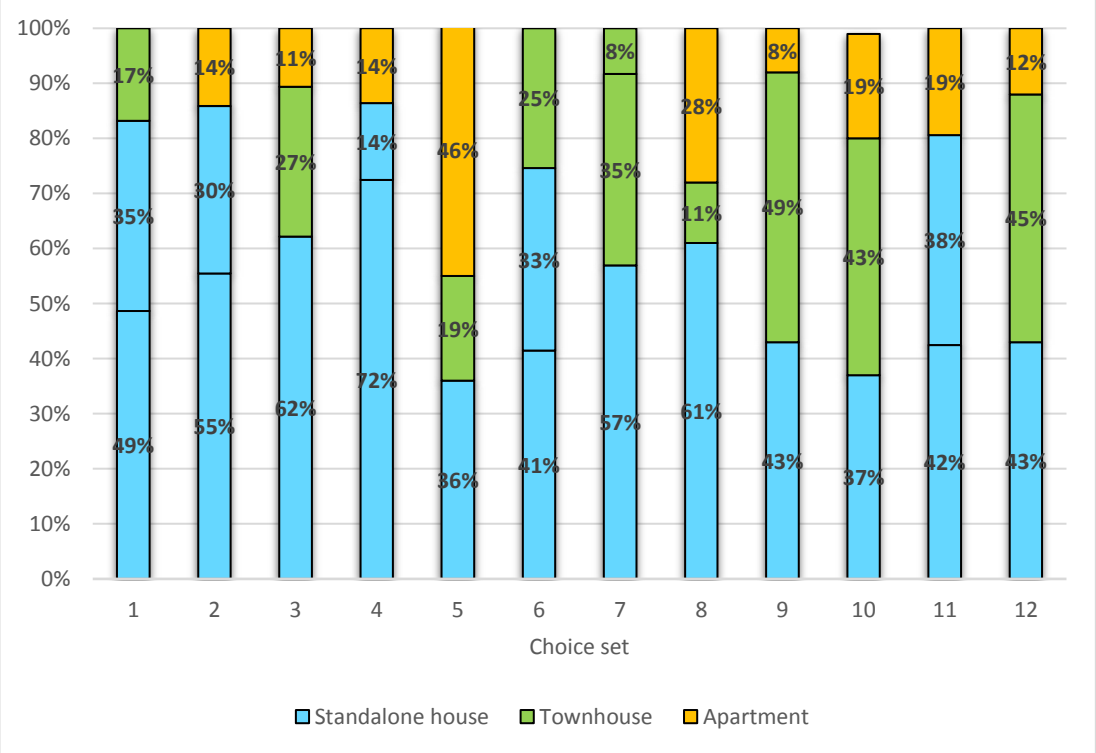

Fig. 5.27. Auckland: Outcome of the stated choice experiment in regard to dwelling type chosen. Base: Panellists participating in survey (n=3,285) – weighted data.

Note: Some choice sets have two sections of the same colour because these choice sets had two options of the same dwelling type (e.g. choice set 1 had two standalone house options and one townhouse option).

Results from Auckland also suggest that accessibility is important for most households. In 11 of the 12 choice sets, the most preferred option was a high or medium accessibility one (either a 5- or 15-minute drive to the CBD). Some form of

parking (on-street or off-street) was another common feature of the preferred housing choices but there was no clear preference regarding neighbourhood type and housing prices/rents. Again, these results are similar to those observed in the Wellington study, where 11 of the 12 choice sets showed preferences for medium or high destination accessibility and either on-street or off-street parking.

However, there do seem to be some differences between Auckland and Wellington preferences for neighbourhood density and outdoor space. In the Wellington study, 10 out of 12 choice sets indicate a preference for either medium or high-density neighbourhoods, whereas there is no clear preference as to density within the Auckland sample. Ten choice sets also show preferences for outdoor space (either a small or a large section) in Wellington, compared to eight choice sets from the Auckland survey. However, the apparent differences in outdoor space preference in Auckland may be due to other characteristics rather than outdoor space alone. Where a porch/balcony was preferred (three choice sets), these options were also characterised by high accessibility. Furthermore, in the one choice set where the most preferred option had no outdoor space, this option was chosen only slightly more often (43%) than the option of a standalone house with a large section (37%), and was also located within 15 minutes of the CBD whereas the standalone house was 45 minutes from the CBD. These results suggest that people may be willing to trade off outdoor space in exchange for greater accessibility.

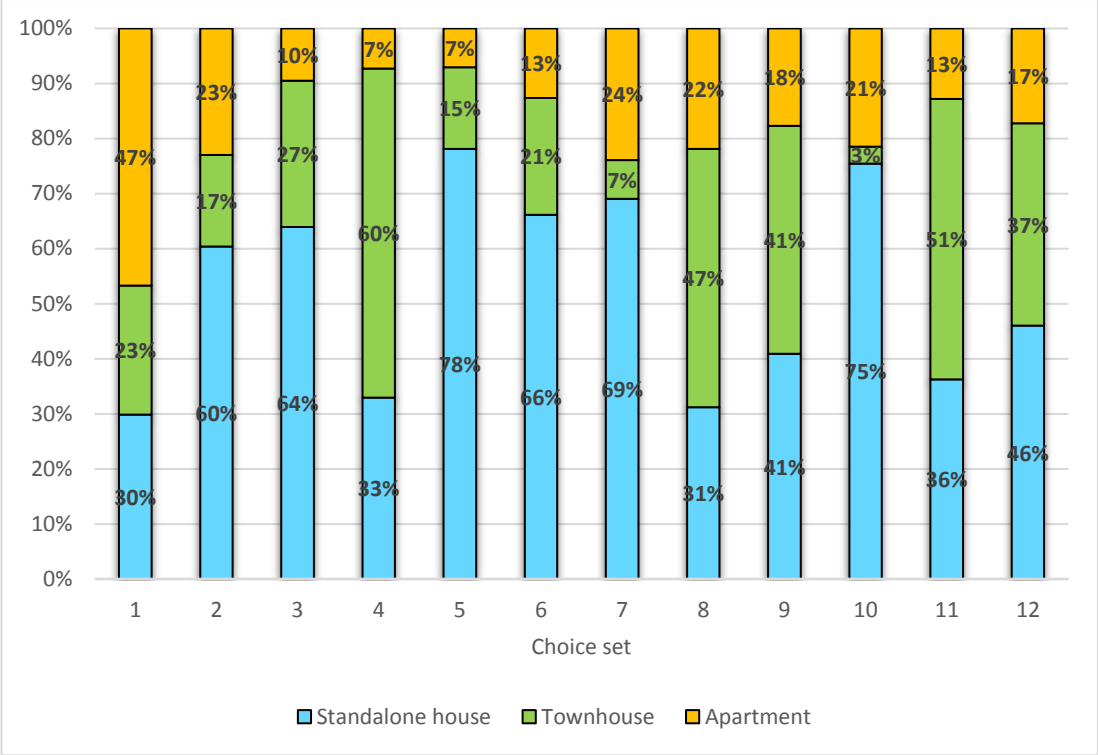

Fig. 5.28. Wellington: Outcome of the stated choice experiment in regard to dwelling type chosen. Base: Panellists participating in survey (n=452).

5.5.3 Transport preferences and frequencies – neighbourhood type and accessibility

Transport preferences are similar regardless of the preferred type of neighbourhood, but show greater differences in terms of preferred neighbourhood accessibility. Those who would prefer to live in a neighbourhood comprising mostly apartments and townhouses have very similar transport preferences to those who would prefer a mix of apartments/townhouses and standalone houses, with 26% of both groups preferring walking, 29% preferring public transport, 33% preferring to drive, and 12% preferring cycling. Although preferences for walking and cycling are similar for those who would prefer a neighbourhood with mainly standalone houses, a slightly higher proportion of the mainly standalone house preference group prefer driving (36%) and preferences for public transport are lower (26%).

In terms of accessibility, those who prefer very high accessibility (5-minute drive to the CBD) have similar transport preferences to those who prefer high accessibility (15-minute drive to the CBD), with 12% of both groups preferring cycling and about 30% preferring driving, public transport, and walking. For those who prefer moderate accessibility (30-minute drive to the CBD), driving is the preferred mode of transport for 38%. Public transport (11%) and cycling (28%) are preferred by similar proportions

of people in this group to those who prefer to live closer to the central city, but walking has slightly lower attraction (23%). Unsurprisingly, 42% of those who would choose a location far from the CBD prefer driving, while preferences for cycling (10%), public transport (27%), and walking (21%) are lower compared to all previous groups. In short, those who prefer to live closer to the central city have stronger preferences for public and active transport than those who prefer living further away.

Similar to transport preferences, actual travel mode choices are comparable for those who would choose to live within a 5-minute drive and 15-minute drive of the CBD. In both groups, of those who walked or jogged to work, 12% did so on 5-7 days over the last week, 18% of public transport patrons used this mode on 5-7 days, and 40% of those who drove did so on 5-7 days. Only 34% never drove, 68% never used public transport, 71% did not walk or jog at all, and 92% did not cycle at all over the last week. For respondents who would prefer to live within a 30 minute drive of the CBD, the frequency of cycling is similar to those with preferences for higher accessibility (92% not at all), but the frequencies of walking/jogging (74% not at all) and public transport (71% not at all and 12% on 5-7 days) are lower. Driving was more common in this group, with the proportion of car users who did not drive at all over the last week falling to 25%, and 48% driving on 5-7 days, 15% driving on 3-4 days, and 12% driving on 1-2 days. Those respondents who prefer to live 45 minutes from the CBD experienced similar walking/jogging and cycling frequencies to the other groups, although 6% of cyclists cycled to work on 1-2 days (highest proportion). Public transport use increased slightly compared to the 30-minute walk group, with 15% of patrons using this mode on 1-2 days, 13% on 5-7 days, and 67% not using it at all over the last week. The proportion of drivers who did not drive at all over the last week also decreased to 22%, with slightly more people driving on 1-2 days (14%) and 3-4 days (17%) compared to the previous group.

5.5.4 Outdoor space – neighbourhood type and accessibility

Outdoor space is more important to those who would prefer a neighbourhood with mainly standalone houses than those who would prefer a mixed neighbourhood or one with mostly apartments/townhouses. For those who would prefer a neighbourhood with mainly standalone houses, outdoor space is extremely important to 34%, very important to 32%, and not at all important to only 4%. Interestingly, outdoor space is more important to those who would prefer a neighbourhood with mostly apartments and/or townhouses (31% very important and 27% extremely important) than those who would prefer a mixed neighbourhood (28% very important and 25% extremely important).

Compared with neighbourhood accessibility, outdoor space is most important to those who prefer moderate accessibility (30-minute drive to the CBD) (33% extremely important and 32% very important), although only slightly more important than for those who prefer low accessibility (45-minute drive to the CBD) (28% extremely important and 32% very important). For those who would prefer to live within a 5- and 15-minute drive of the CBD, outdoor space is equally important.

5.5.5 Latent class analysis – preference groups

The responses from the stated choice experiment were used to construct a latent class multinomial logit model of housing, neighbourhood, and transport preferences among Auckland households. Estimated utility function parameters are shown in Table 5.5 and class membership parameters are shown in Table 5.6, while Figure 6.29 represents the coefficients for the LC MNL visually. Positive coefficient values indicate that an attribute level has a positive impact on utility, while negative coefficients indicate than an attribute level negatively affects utility. A latent class model with four classes was identified, and the four latent classes were named according to dominant attribute preferences: 'low-density, 'high-accessibility,' 'low-density, parking-oriented', and 'price-oriented.'

	Class 1	Class 2	Class 3	Class 4
R^2	0.4027	0.4431	0.3103	0.0908
$R^2(0)$	0.4083	0.4452	0.3118	0.091
	Low-density	High-accessibility	Low-density, parking-oriented	Price-oriented
Attributes				
Dwelling type				
apartment	-1.1325	-0.4217	-0.2691	-0.009
townhouse	-0.1323	0.1556	-0.1384	0.0487
standalone	1.2647	0.2661	0.4076	-0.0397
Outdoor space				
none	-0.8579	-0.4093	-0.1009	-0.1437
porch	-0.4213	0.0549	-0.137	-0.0201
small section	0.5339	0.2296	0.2728	0.0987
large section	0.7453	0.1248	-0.0349	0.0651
Distance to CBD (drive)				
5 minutes	0.0871	1.6222	0.6428	-0.146
15 minutes	-0.0815	-0.6484	0.0538	-0.0316
30 minutes	0.3961	1.4388	0.685	0.2492
45 minutes	-0.4017	-2.4126	-1.3817	-0.0717
Neighbourhood				
high-density	-0.1682	-0.2934	-0.1081	0.0344
medium-density	-0.1577	0.1235	-0.0386	0.06
low-density	0.3259	0.1699	0.1467	-0.0943
Parking				
no parking	-0.1984	-0.119	-1.0683	-0.0763
on street	-0.0496	0.0829	-0.1461	0.1247
off street	0.2479	0.036	1.2145	-0.0484
Price				
	-0.0028	-0.0056	-0.0047	-0.0082

Table 5.5. Auckland: Latent class model and coefficients describing preferences for attributes by preference group. Key coefficients are highlighted yellow.

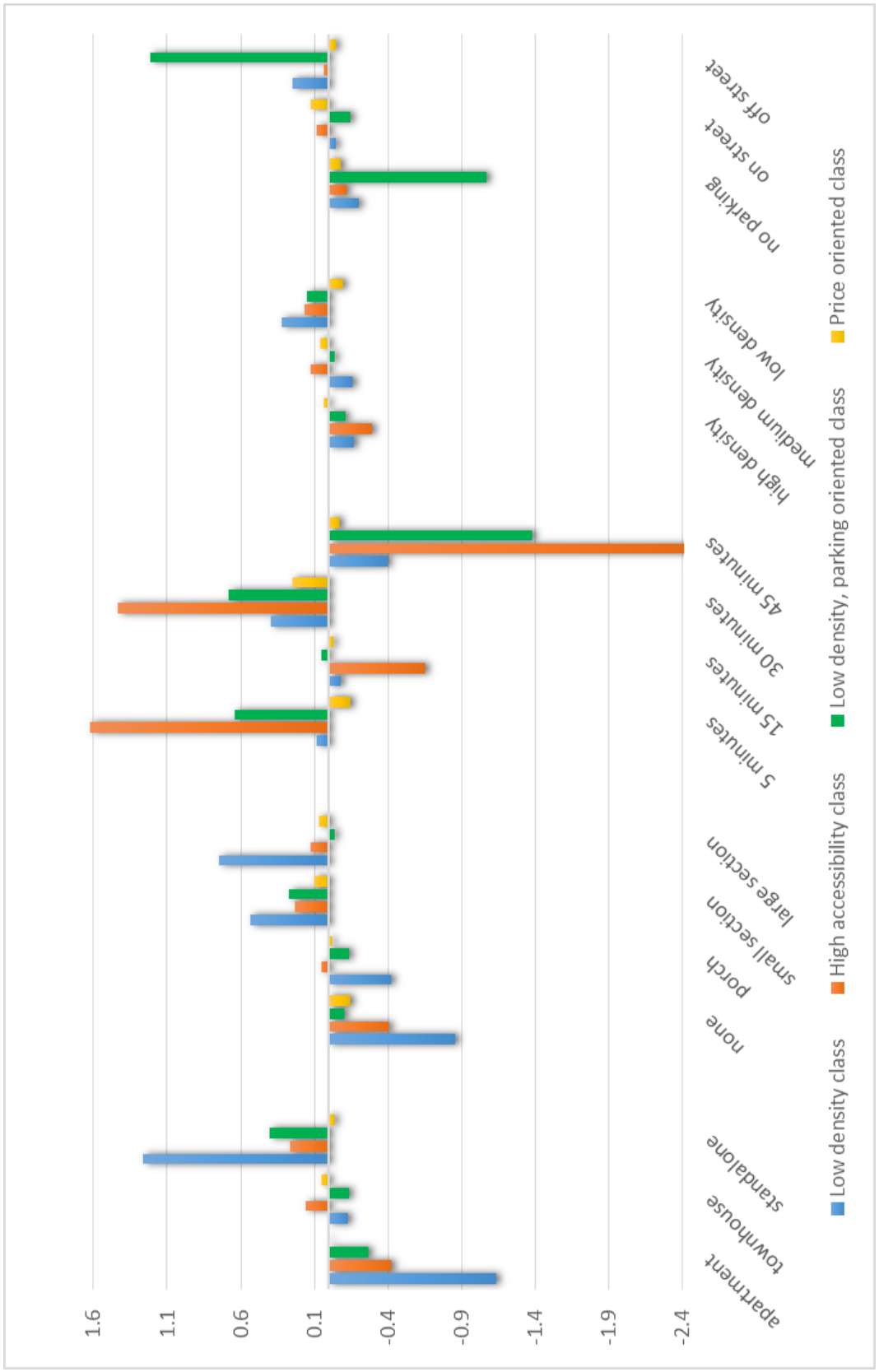

Fig. 5.29. Auckland: Latent class model coefficients for attribute preferences by preference group.

	Low-density	High-accessibility	Parking	Price-oriented
Class Size	36%	34%	16%	14%
Gender				
Female	60%	57%	48%	36%
Male	39%	43%	52%	63%
Age				
18 - 24 yrs	6%	14%	1%	3%
25 - 34 yrs	16%	22%	12%	20%
35 - 49 yrs	41%	26%	26%	28%
50 - 59 yrs	18%	15%	22%	21%
60 - 69 yrs	11%	11%	22%	11%
70 - 84 yrs	6%	11%	11%	11%
85 or more years	1%	2%	4%	3%
Prefer not to say	1%	0%	2%	3%
Income				
$20,000 or less	34%	26%	28%	37%
$20,001-$30,000	7%	11%	12%	10%
$30,001-$40,000	8%	10%	8%	12%
$40,001-$50,000	7%	8%	9%	12%
$50,001-$60,000	6%	9%	9%	10%
$60,001-$70,000	7%	6%	6%	4%
$70,001-$100,000	10%	9%	10%	5%
$100,001-$150,000	5%	6%	4%	2%
$150,000 or more	3%	3%	3%	2%
Prefer not to say	14%	11%	10%	7%
Household type				
Older couple	17%	23%	28%	16%
Family	65%	33%	37%	40%
Flatting	10%	17%	14%	21%
Single	5%	14%	13%	20%
Young couple	1%	11%	6%	0%
Prefer not to say	2%	1%	2%	2%
Mean importance in choice of current dwelling				
Parking space	4.0	3.1	4.2	3.3
Distance to shops	3.0	3.6	3.0	2.9
Commute via PT	2.5	3.5	2.7	3.0
Commute via AT	2.2	3.1	2.2	2.3
Standalone home	4.0	2.7	3.4	2.9
Outdoor space	4.1	3.2	3.7	3.2
Current dwelling type				
Flat	2%	5%	5%	16%
High rise apartment	1%	12%	0%	8%
Low rise apartment	1%	6%	2%	5%
Standalone house	89%	62%	81%	53%
Townhouse	6%	14%	10%	14%
Prefer not to say	1%	1%	1%	3%
Transport preference				
Walk	26%	37%	16%	17%
Bike	8%	14%	14%	12%
PT	24%	29%	25%	39%
Drive	42%	20%	45%	33%

Table 5.6. Auckland: Characteristics of the four latent classes – LC MNL model.

The latent class for whom low density is a preference is prominent. This 'low-density' preference group (36% of the sample) prefers low-density, moderately accessible living. They would ideally prefer a standalone house, a small or large section, a low-density, medium accessibility neighbourhood, and off-street parking. Interestingly, the low-density preference group has a stronger preference for medium accessibility neighbourhoods (30 minutes from CBD) than high (15 minutes from CBD) or low accessibility neighbourhoods (45 minutes from CBD). Both neighbourhood density and parking are relatively unimportant to the group, although high- and medium-density are disfavoured. Outdoor space is the most important attribute and parking and a standalone house are the second most important attributes for this group when choosing where to live. This group has the highest percentage of people aged 35-49, the second highest percentage of people earning less than $20,000, and the lowest percentage of people earning between $20,000 and $60,000. The vast majority (89%) of people in this group live in standalone houses, and the most common household types are families (65%), older couples (17%), and people flatting (10%). Forty-two percent of the low-density preference group prefer driving, and only 8% would like to cycle, the lowest percentage across all preference groups. However, even in this group, surprising proportions would prefer more sustainable modes (26% would prefer to walk and 24% prefer public transport).

The 'high-accessibility' preference group is also large (34% of the sample). These respondents show a mild preference for low- to medium-density, but highly accessible living. They would ideally prefer a standalone house, but townhouses and medium-density neighbourhoods have unusual appeal, suggesting that these attributes may be chosen to match high CBD accessibility. They would also prefer a small section, a low-density, high-accessibility neighbourhood, and on-street parking. This group has a strong preference for very high (five minutes from CBD) and moderate (30 minutes from CBD) accessibility but has an apparent aversion to neighbourhoods located 15 minutes from the CBD. This may be an artefact of the very strong preference for centrality. A small section is more highly valued than a large section, and both neighbourhood density and parking are relatively unimportant to the group. In other words, it seems they do not care about density. Distance to local shops and a convenient public transport commute were the most important factors in the choice of current dwelling. This group had the highest percentage of people aged 18-24 and 25-34, and the lowest percentage of people earning less than $20,000. Although 62% of the group live in standalone houses, 12% live in high-rise apartments and 6% in low-rise apartments, the highest percentages for all groups. The most common

household types are families (33%) and older couples (23%), while 11% are young couples (highest). This group has the highest percentage of people preferring walking (37%) and the lowest percentage of people preferring driving (20%), while 29% prefer public transport and 14% prefer cycling.

The ‘low-density, parking-oriented’ preference group (16% of the sample) has a preference for low-density, relatively accessible living. They would ideally prefer a standalone house, a small section, a low-density, medium- to high-accessibility neighbourhood, and off-street parking. Very high accessibility (5 minutes to CBD) and medium accessibility (30 minutes to CBD) are preferred more than high accessibility (15 minutes to CBD), and a small section is more highly valued than a large section. In this case, density is relatively unimportant while parking (off-street) is extremely important. When choosing where to live, parking space was the most important factor and the second most important was outdoor space. This group had the lowest percentage of people aged under 34 and the highest percentage of people aged 50 and above. Eighty-one percent of this group live in standalone houses and the most common household types are families (37%) and older couples (28%). Similar to the low-density preference group, the most preferred mode of transport in this group is driving (45%), while about a quarter (25%) prefer public transport, 14% prefer cycling, and 16% prefer walking.

The ‘price-oriented’ preference group (14% of the sample) has a preference, although weak, for medium- to high-density, medium-accessibility living. They would ideally prefer a townhouse, a small section, a medium-density, moderately accessible neighbourhood, and on-street parking. A small section is more highly valued than a large section, and medium accessibility (30 minutes to CBD) is the only accessibility level with a positive coefficient. There is also a minor aversion to low-density neighbourhoods and a slight preference for on street parking. High-density neighbourhoods also have a positive coefficient, suggesting this attribute may be chosen in exchange for lower price. Overall, these attributes have little attraction for the price-oriented group relative to the other groups. This group had the highest percentage of people earning less than $20,000 and the lowest percentage of people earning over $60,000. This group also has the lowest share of people occupying standalone houses (53%) and the highest share of flats (16%). The most common household types are families (40%), people flatting (21%), and singles (20%, highest). Public transport is the most preferred mode of transport in this group (39%, highest), while 33% prefer driving, 17% prefer walking, and 12% prefer to cycle.

Fig. 5.30. Auckland: Mean rating of factor importance in choosing current dwelling by preference group.

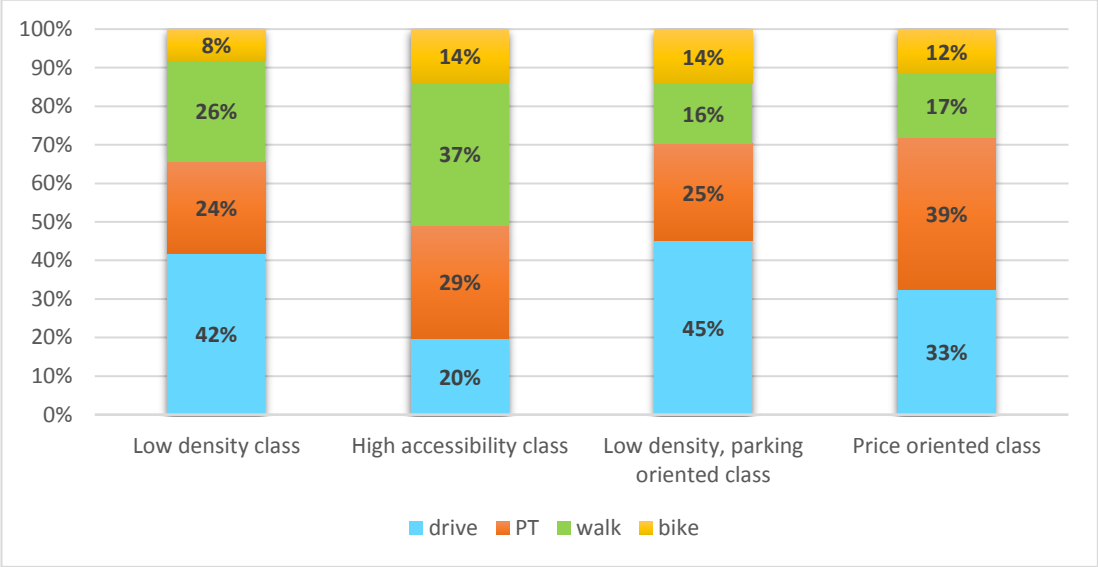

Fig. 5.31. Auckland: Transport preferences by preference group.

5.5.6 Comparing latent classes across cities

Although the preference groups revealed in this study have different classifications to those in the Wellington and Hamilton studies (Dodge, 2015, 2016), it is possible to draw some conclusions about how these groups align or diverge between cities. In each of Auckland, Wellington, and Hamilton, affordability and warmth/dryness were the most important factors when choosing one's dwelling and where to live for all groups. Being able to commute via public transport and walking/cycling, and being near local shops, were more important to the 'high-accessibility' group than all other groups in Auckland and Hamilton, a similar result to Wellington, while distance to local shops was slightly less important to the 'price-oriented group' than the 'low-density' group in Wellington. Furthermore, over 80% of those with a low-density preference in both Auckland and Wellington, and 77% of those with this preference in Hamilton, live in standalone houses, suggesting this preference is generally able to be met in the current market for these people. Nevertheless, a preference for low-density may be met at the expense of other attributes.

The 'high-accessibility' group in Auckland shows similar preferences to the 'medium-density' preference groups in Wellington and Hamilton in terms of preferred dwelling and neighbourhood type, destination accessibility, and outdoor space. However, distance to shops and a convenient commute via public transport are the most important factors to the Auckland group compared to price and parking for the Wellington group. For each city, density is less important than accessibility and these groups would be willing to choose a medium-density neighbourhood and/or dwelling if it offers higher accessibility.

The 'low-density' group in Auckland is similar to the 'very low-density' group in Wellington and the 'low-density' group in Hamilton. All groups would ideally (for example, if affordability were not so important) prefer a standalone house with a large section, and a low-density neighbourhood, while the Auckland and Wellington groups also both prefer medium accessibility and off-street parking. Results also suggest that these groups in all three cities may be willing to choose a small section in exchange for a more accessible neighbourhood. A standalone house and outdoor space are the two most important factors when choosing where to live in each city, but a higher proportion of the Wellington very low-density group would prefer to walk, cycle, or use public transport to get to work (~75%) compared to the Auckland (58%) and Hamilton (21%) low-density groups. The 'low-density, parking-oriented' group in Auckland has similar preferences regarding dwelling and neighbourhood type, but would ideally prefer a small section. Parking space was the most important factor to this group

rather than outdoor space or a standalone home, and only 55% would prefer to walk, cycle, or take PT to work. The 'low-density' group in Wellington also has similar preferences but considers accessibility more important and 79% prefer alternatives to driving.

In short, the trade-offs households make differ to some extent by city. In Auckland, households would tend to choose townhouses and medium-density neighbourhoods in exchange for high accessibility, while others would trade off outdoor space if they were able to live closer to the CBD. In Wellington, households would tend to choose a townhouse in exchange for medium destination accessibility and high neighbourhood density. And in Hamilton, households may trade off their preferred dwelling type for medium or high destination accessibility, or more outdoor space.

5.6 Summary

In regards to problems with the house and neighbourhood, the dwelling being too small (12%), expensive (11%), cold/difficult to heat (10%), and in poor condition (8%) were the most common issues given for dwellings. The most common major neighbourhood problems were public transport reliability (14%), noise or vibration (10%), poor or uncommon sidewalks/cycle lanes (9%), distance to work (7%), and problem neighbours (7%).

In terms of transport preferences, driving is the preferred transport mode for a third of respondents, slightly more than public transport (28%) and walking (27%), while cycling was the least preferred mode (11%). Driving was also the most common way of commuting to work, but public transport was used most by people studying. Safety was the most common barrier to cycling, while having other things to do, weather, and unpleasant routes were barriers to both cycling and walking. Unsuitable timetables, no stop or station, and unreliable services were barriers to public transport, and long journey times was a barrier to all alternative transport modes.

Affordability, warmth and dryness, a safe neighbourhood, and outdoor space were the most important factors for Auckland households in their choice of dwelling. Parking (35%) and a standalone home (31%) were also extremely important to many respondents, while a convenient commute via public transport was more important than active transport. Compared to Wellington, outdoor space, a standalone home, parking, and a commute via car were all more important to Auckland households, while distance to shops, a commute via PT, and a commute via AT were more important to Wellington households.

In the Auckland stated choice experiment, standalone homes were chosen as the most preferred dwelling type in eight of the 12 choice sets, townhouses were selected most often in three choice sets and the apartment option was preferred in only one choice set. Results from Auckland also suggest that accessibility is important for most households.

Those who prefer mixed, accessible neighbourhoods have stronger preferences for active transport and use it more frequently than households who prefer standalone houses and low accessibility, who have stronger preferences for cars and are more likely to drive.

Forty-two percent of the low-density preference group in Auckland prefer driving, and only 8% would like to cycle. However, even in this group, surprising proportions would prefer more sustainable modes (26% would prefer to walk and 24% prefer public transport).

Over 80% of those with a low-density preference in both Auckland and Wellington, and 77% of those with this preference in Hamilton, live in standalone houses, suggesting this preference is generally able to be met in the current market for these people. Sixty-two percent of the 'high accessibility' group in Auckland also live in standalone houses, but higher proportions of this group live in high-rise (12%) and low-rise apartments (6%) than the other latent classes in Auckland.

Results also show that the trade-offs households make differ by city. In Auckland, some households would choose townhouses and medium-density neighbourhoods in exchange for high accessibility, while others would trade off outdoor space if they were able to live closer to the CBD. However, there seems to be a general unwillingness to accept high-density housing and neighbourhoods. In Wellington, households may choose a townhouse in exchange for medium destination accessibility and high neighbourhood density. And in Hamilton, households may trade off their preferred dwelling type for medium or high destination accessibility, or more outdoor space.

6. Discussion and Conclusion

6.1 Preferences and the 'compact city' – Auckland and Wellington

Referring to key ideas from the literature (Chapter 3), this section will review the research questions of this thesis against the most important results of the study (Chapter 5) and what these findings say about the relationships between residential and transport preferences in New Zealand and the concept of a compact, sustainable city. This section will also discuss these matters in terms of key features of Auckland and Wellington and comparable results from the literature.

The first research sub-question is whether preferences in Auckland remain consistent with the car-dependent and standalone housing-oriented nature of the city (Chapman et al., 2016; Preval et al., 2010; Randal & Hamer-Adams, 2015; Yeoman & Akehurst, 2015). Preference for a standalone home has significant negative correlations with preferences for distance to shops and easy commutes via public and active transport (section 5.4.2). This suggests that many who prefer a standalone home do not care about distance to shops, public transport, and active transport (i.e. very car-oriented), and may even be hostile to public or active transport in practice.

In terms of transport, results of the survey indicate that more people would prefer to walk or use public transport than currently do so. A third of respondents would prefer to drive (33%), while public transport (28%) and walking (27%) were each the preferred modes of transport for just over a quarter of respondents. Preferences for walking and cycling are stronger among younger people, young couples, and occupants of medium and high-density dwellings, but preferences for public transport are weaker. This may be partly a result of these groups living, on the whole, more centrally and/or finding public transport uncool. Actual travel patterns were that driving to work was far more common than any other transport mode, with 71% of people driving at least once during the past week and 43% of commuters driving on between 5-7 days a week. Public transport was the next most frequently used transport mode, although this was only used at least once per week by 30% of respondents. In short, many peoples' transport preferences are not being realised.

A more detailed explanation of this issue is possible through considering the differences between latent classes/preference groups. Both the 'low-density' and 'low-density, parking-oriented' groups prefer driving (42% and 45% respectively), proportions that more closely resemble actual travel behaviour for the sample. By

contrast, only 20% of the 'high-accessibility' group prefer driving while 37% would prefer to walk. In addition, the 'price-oriented' group shows a strong preference for public transport (39%), which is also preferred by approximately a quarter of households in the other three groups. Therefore, while preferences for driving among the low-density groups may be consistent with car use, the 'high-accessibility' group shows a desire for more walking and all groups seem to want to use public transport more often than they currently do. These results are consistent with other New Zealand and Auckland research, which has found an increasing demand for improved and cheaper public transport (Wooliscroft, 2015), and more walkable neighbourhoods (Allen, 2015; Wildish, 2015). For example, 26% of people would prefer a more walkable neighbourhood than where they currently live (Badland et al., 2012, p. 1473).

In relation to the 'matching' and self-selection literature, the findings may also suggest that suburban environments limit urban-style travel (public transport, walking, and cycling) to a greater extent than urban environments limit suburban-style travel (driving) (X. Cao et al., 2007). The disparity between transport preferences and mode use in Auckland may be due, in part, to the barriers identified in section 5.3. Long trip times and having other things to do were common barriers for all transport modes, while unpleasant routes and weather were concerns for people who would like to walk or cycle to work. Safety (66%) and a lack of facilities (18%) were barriers for cycling, and an unsuitable timetable (34%), having no accessible stop and/or station (33%), and unreliable services (26%) were obstacles for using public transport. Safety in particular has been identified by many studies as a concern for cyclists and transport planning in general (Elvik & Bjørnskau, 2017; Johnson, Oxley, Newstead, & Charlton, 2014; Tin, Woodward, Thornley, & Ameratunga, 2011; Wegman, Zhang, & Dijkstra, 2012). These results suggest that some Auckland households believe there is a lack of quality infrastructure and services for both public and active transport. The high frequency of 'takes too long' as a barrier also points to the sprawling nature of the city and the importance of making public transport faster and/or more frequent (e.g. via dedicated busways) and linking it to active transport modes.

Whether residential preferences are consistent with the standalone housing-oriented nature of the city is another key question to answer. While housing research in New Zealand has found a strong preference for detached housing, with approximately 80% of people preferring standalone houses (Preval et al., 2010; Randal & Hamer-Adams, 2015), Yeoman and Akehurst (2015) observed that only 52% of Auckland residents preferred this type of dwelling. This, in contrast to the proportion of households who

occupy standalone homes – 87% in the Yeoman and Akehurst survey and 75% in this study – suggests that more people live in standalone houses than would like to. Similar to transport preferences, there is a clear life-stage effect on valuing dwelling and neighbourhood attributes (Howden-Chapman, Hamer-Adams, Randal, Chapman, & Salmon, 2015; Randal & Hamer-Adams, 2015), with young people and the elderly considering a standalone home, outdoor space, and parking far less important than other age groups.

As with transport, considering the differences between latent classes/preference groups allows for a more in-depth description of this issue. Both the 'low-density' and 'low-density, parking-oriented' groups have strong preferences for standalone dwellings, and the vast majority of households in these groups occupy such dwellings (89% and 81%). However, those in the 'high-accessibility group,' while displaying a very slight preference for standalone housing (62% live in standalone houses), may prefer an accessible townhouse to an inaccessible standalone house. Furthermore, the 'price-oriented group' would ideally choose a townhouse, but only 14% occupy this dwelling type and 53% live in standalone houses. So while households with preferences for low-density are generally able to meet these preferences, those with preferences for high accessibility, or those driven by price, are more likely to experience a mismatch between their preferred and actual dwelling type. This may be due to the relatively limited supply of attached dwellings and apartments in all areas of Auckland outside the central city.

The second research sub-question is whether people in Wellington have stronger preferences for, and greater use of, public transport than Auckland, considering the largely monocentric nature of Wellington. Comparing the results of this study with those from Dodge (2016), preferences for public transport appear weaker in Wellington than Auckland. Overall, 28% of Auckland households prefer public transport compared to 15% in Wellington. All preference groups in Auckland also have stronger preferences for public transport than those in Wellington, with even the lowest proportion among Auckland's groups (24% in the 'low-density' group) exceeding the highest proportion (18%) from the groups found in the Wellington study. However, a convenient commute via public transport is more important to Wellington households (mean importance = 3.16) than their Auckland counterparts (mean importance = 2.75), suggesting that although Auckland households have stronger preferences for public transport, Wellington households consider accessibility via public transport more important.

This study also found that public transport usage rates are higher in Auckland than Wellington, with 30% of respondents using public transport at least once per week compared to 20% in the Wellington study. These results are not consistent with other New Zealand research, which has observed that people in the Wellington area are most likely to use public transport to travel to work (18%), whereas only 7% of Aucklanders commuted using public transport on the day of the census. Furthermore, 66% of Wellington residents used public transport at least once in the past year compared to 48% in Auckland (Ministry of Transport, 2015, p. 50). Although more respondents in the study prefer public transport in Auckland than Wellington, the latter has higher rates of public transport use. This conclusion is similar to the one explained above, whereby most Auckland residents seem to want to use public transport more often than they currently do. Barriers to using public transport that may explain this outcome include the trip taking too long, an unsuitable timetable, having no stop and/or station close by, and an unreliable service.

Lastly, the third research sub-question is whether the compact nature of Wellington (Adams & Chapman, 2016) is associated with stronger preferences for walking and cycling, and similarly, whether it is more strongly associated with mixed neighbourhoods and townhouses and/or apartments, than in Auckland. A recent "Let's Get Wellington Moving" (LGWM) study found that 'compactness' was the most common 'favourite thing' about Wellington across all surveys (Wellington City Council, 47.5%; Greater Wellington Regional Council, 36%; and LGWM, 40.2%), while 'walkability/easy to get around' also featured prominently (UMR Research, 2016).

In relation to transport mode, preferences for both walking and cycling are stronger in Wellington than Auckland. Walking is the preferred mode of transport for 48% of households in Wellington and 27% of households in Auckland, while 16% of Wellington households prefer cycling compared to 11% in Auckland. All latent class preference groups in Wellington also display stronger preferences for walking and cycling than those found in this research on Auckland, although the differences are smaller for cycling due to low overall levels of preference for cycling. The only groups that have similar preference for walking are the 'high-accessibility' group (37% prefer walking) in Auckland and the 'medium-density' group (39%) in Wellington. In addition to these observations, a convenient commute via active transport and distance to shops were found to be more important to Wellington households, attributes that are generally associated with compact, well-connected cities. A study of the associations between the build environment and active transport found that, due to high residential

density and mixed land use, Wellington had much higher rates of walking than other New Zealand cities (Christiansen et al., 2016). These and other findings from the 2013 census suggest that the preference for walking in Wellington is translating into higher rates of walking for transport. Comparatively low active transport preferences in Auckland may be explained by the sprawling, polycentric nature of the city, meaning destinations such as work are likely perceived as too far away to allow for active transport. This is supported by the fact that 65% of Auckland respondents identified 'takes too long' as a barrier for walking, and 27% did so for cycling.

Similarly, Wellington households seem to have stronger preferences for mixed, medium- to high-density neighbourhoods and high-density dwelling types (apartments and townhouses). The stated choice experiments and latent class models from the Auckland and Wellington studies revealed that people in Wellington are more likely to choose a home in a medium or high-density neighbourhood with a mix of dwelling types. Three of the four preference groups in the Wellington study had positive coefficients – in the estimated preference function – for a high-density neighbourhood, compared to only one group in Auckland ('price-oriented'), and both the 'high-density' and 'low-density' groups in Wellington displayed stronger preferences for medium-density neighbourhoods than the 'high-accessibility' group in Auckland. In terms of dwelling type, the stated choice experiment outcomes show little difference in preferences between Auckland and Wellington. However, the latent class models suggest that, although most people view apartments negatively, townhouses are far more likely to be chosen by Wellington households than those in Auckland. All preference groups in Wellington have positive coefficients for townhouses, and the 'high-density' group actually prefers them to standalone houses, whereas the 'high-accessibility' group in Auckland is the only one that may choose a townhouse but would still ideally choose a standalone house. These results may be due, in part, to a comparative shortfall of high quality apartments and townhouses and mixed-use developments in Auckland, particularly in areas outside the central city.

6.2 Policy relevance

An important part of this thesis was to investigate housing, neighbourhood, and transport preferences that are controlled, to some extent, through the planning process. While the heterogeneity of preferences was a key component, this study is not intended to suggest that urban planning should be driven by an effort to satisfy the current housing and neighbourhood preferences of all households. Instead, sustainability and wider urban planning objectives may be better served by

understanding how preferences can be better met, but in a way consistent with urban planning goals and other desired outcomes. In the case of Auckland, goals for land use and transport planning include achieving a quality, compact city, providing affordable housing, a reduction in carbon emissions, and improving public and active transport, all of which are designed to make Auckland the 'world's most liveable city.'

Although evaluating Auckland's growth trajectory is beyond the scope of this study, it is clear that urban planning in Auckland is at a crucial juncture. While the Unitary Plan Independent Hearings Panel recommendations for feasible enabled residential capacity are more closely aligned with the Auckland Plan, the type of housing that will be provided is equally important. Intensification-related plans to rezone suburbs to allow terraced housing and apartments were scaled back (NZPC, 2015; Auckland Council, 2013a; 2013b), and redevelopment opportunities in inner suburbs seem set to remain low (Early et al., 2015; Parker, 2015). These trends conflict with the Auckland Regional Growth Strategy goal of accommodating 50% of population growth between 1996 and 2046 in multi-unit housing, as well as the significant unmet demand for higher density housing and accessible neighbourhoods. However, an increasing number of apartments in central Auckland, rising public and active transport use, and an emphasis on sustainability and connectedness in the Unitary Plan indicate that Auckland Council is taking positive steps to reshape its development trajectory (Murphy, 2015; Preval et al., 2016, p. 111).

The Auckland Plan currently sets out a target of reducing human-induced greenhouse gas emissions by: 10-20% by 2020; 40% by 2040; and 50% by 2050, all relative to 1990 emissions levels. While in line with national targets, these are not ambitious by European standards. Auckland also aims to support the national target of 90% renewable electricity by 2025 (Auckland Council, 2012, p. 202). A reduction in land transport emissions would require an increase in fuel efficiency, fuel switching, and an increase in active and public transport mode shares, in addition to a compact growth pattern. The goal of a quality, compact city can complement efforts to increase active and public transport use as residents will be closer to destinations, and public transport will become more viable with increasing density and a greater number of residents within walking distance of public transport stops (Dodge, 2016). This study has found an unmet demand for walking and cycling, particularly among those with preferences for high accessibility, and for public transport, with more people driving and less people using alternative modes than would prefer to do so. Planning to meet this demand will align well with compact development, and will have significant potential to reduce energy use and emissions in the medium- to long-term.

While planning policy can enable development in certain areas, it cannot force private development to take place. The achievement of Council goals for residential capacity and affordable housing is therefore reliant on changes in supply (via private property developer and Housing NZ decisions) and in housing demand. Although feasible enabled residential capacity is expected to accommodate the projected population growth in Auckland, and the rising number of central city apartments reflects the changing nature of demand, preferences for compact development have been increasing over the past 30 years, a trend that is likely to continue. This study found that there seems to be an unmet demand for accessible, medium-density neighbourhoods, particularly among households with preferences for high accessibility. These people, and those for whom affordability is a concern, may be willing to live in townhouses and medium-density neighbourhoods if they are accessible and more affordable. Current rules limit medium and high-density development in some inner suburbs, which decreases the availability of accessible medium-density neighbourhoods and may increase the cost of this type of housing. Efforts to make housing closer to the central city more affordable would enable more households to live in such areas. Special Housing Areas also have the potential to increase neighbourhood density, potentially resulting in lower commuting CO_2 emissions (Preval et al., 2016), as long as the SHAs are not peripherally located. Such outcomes could reduce housing and transport costs, satisfy preferences to a greater degree, and result in positive environmental outcomes.

6.3 Limitations and future research

Housing, neighbourhood, and transport preferences are an important issue for New Zealand, and these preferences vary significantly between areas, age groups, income groups, and household types. One weakness of previous research on housing and neighbourhood preferences in New Zealand is that it has not been particularly representative of the population in terms of sociodemographics. Previous research has suffered from small sample sizes, non-random sampling, low response rates, and under-sampling of minority groups, lower-income households, and younger people (Haarhoff et al., 2012; Ivory, Burton, & Harding, 2013; Yeoman & Akehurst, 2015).

This study also drew on an imperfect sample, but the panel did yield a reasonably representative sample. It recruited respondents through the Auckland Council People's Panel email list, and a high number of responses were received. However, it under-represented younger people, people of Asian/MELAA descent, Maori, and Pacific Island ethnicity, very low-income earners, and singles. There was also an over-representation of females, older people, high-income earners, owner-occupied

households, and households with two cars. The weighting process did improve the representativeness of the sample, however, and including households from all local boards helped in the analysis of differences in preferences between areas of the city. Housing, neighbourhood, and transport preferences vary across cities and regions, due to variations in income, urban form, and the tendency of households to select urban areas most closely aligned with their preferences. As Auckland is the largest and one of the most car-oriented cities in New Zealand, it is expected that the city would have a higher percentage of the population preferring standalone houses, private outdoor space, and car travel than in New Zealand as a whole.

Preferences for housing, neighbourhood, and travel were examined by surveying individuals and it was assumed that the individuals' preferences would accurately represent those of the household and residential choices. However, household location decisions are often made by multiple members of a household, with choices being the result of compromises between different members' preferences (Molin et al., 1996). This is a limitation of the current study and future research into the impact of joint decision-making on residential location and dwelling choice would be useful.

In discrete choice experiments, as used in this study, respondents often try to simplify the choice process. One possible way to do this is to ignore a specific attribute, a strategy referred to in the literature as attribute non-attendance (Hensher, Rose, & Greene, 2012; Scarpa, Thiene, & Hensher, 2010). In this study, price seemed to be a relatively weak explanatory variable for all preference groups, although it was more important to the price-oriented group. This suggests that most households' decisions were not strongly influenced by the price attribute when choosing dwellings in the choice experiment. One possible explanation for this behaviour is that many respondents did not treat the price variable seriously. Another is that some respondents were unable to afford some or any of the choices and chose to ignore the price. This may even be true for the price-oriented group, who had relatively low incomes compared to the other groups and the census distribution. Most of the other three groups had higher incomes. Another possibility is that some respondents could afford all of the price levels, but simply were not able to relate to the weekly rent figures (for example, older owner-occupiers would not be familiar with current market rents). Overall, it is unlikely that affordability was irrelevant considering the amount of income a household would have to spend on housing. Future research in this area could improve the likelihood that the price attribute is attended to, thus enabling more reliable explanations of how housing costs influence preferences.

Due to the quantitative nature of the study and the need to limit the complexity of the survey, a relatively simplistic view of housing, neighbourhood, and transport preferences was taken. The survey measured preferences for six housing and neighbourhood attributes: dwelling type, outdoor space, transport accessibility, neighbourhood density, parking, and price. However, other attributes such as dwelling age, building quality and style, natural light, and so on, also vary between dwellings and neighbourhood types (Yeoman & Akehurst, 2015). The likelihood of households choosing medium and high-density housing is likely influenced by these and other factors, including public outdoor space, building rules and body corporate fees, noise, and public amenities. To better address these factors and limitations, future research could use different methods, such as complementary interviews, to examine how multiple factors influence preferences and hence the potential for compact city development in New Zealand.

The survey also did not ask respondents what type of neighbourhood they currently lived in regarding density and accessibility, while actual transport mode use was not included in the LC MNL model outputs despite being collected. Although current dwelling type was provided, such exclusions limit the ability to draw insights on the presence of residential self-selection and dissonance, as well as how travel is influenced by neighbourhood type. Further research could investigate the importance of residential self-selection in New Zealand cities, and expand upon this study's examination of the relationship between residential location and travel.

6.4 Conclusion

While there has been a large amount of research on housing, neighbourhood, and transport preferences, this thesis adds to the literature in several ways. Firstly, this thesis contributes to an understanding of the complex relationship between housing, neighbourhood, and transport preferences, and how they influence the residential choice process. These preferences are sometimes assumed to be well aligned, if not synonymous, whereby a preference for standalone housing, for example, may be assumed to be aligned with a preference for car use. This has significant implications for the provision of transport and housing infrastructure and the recognition of environmental benefits from compact development. This study has attempted to describe the differences between these preferences, and the inter-relationship between preferences and choices, providing a more in-depth picture of the trade-offs that are inherent in the urban residential choice process that encompasses separable aspects of housing, neighbourhood, and transport preferences.

Secondly, this study has examined housing and transport preferences in the context of urban planning rules and policies. This ensures that the research is policy-oriented and allows researchers to understand the extent to which development patterns and environmental outcomes are influenced by both preferences, primarily, and planning, secondarily. Research on preferences can be informed by understanding how planning rules can influence the ability of households to meet their preferences in the current market place. This thesis is thus policy-relevant, to the extent possible given the constraints, and seeks to address the gaps that often exist between environmental, economic, and planning research, as well as the gap between research and policy.

Thirdly, this thesis has examined how housing and transport preferences differ between Auckland, Wellington, and Hamilton, and how these preferences align with travel patterns and urban form. Few studies have done similar comparisons, and the comparative approach provides a better understanding of how historical context and planning rules shape the development trajectory of the city and the extent to which residential and transport preferences differ in each city.

Lastly, this thesis has given some insight into how compact development in Auckland may be able to better accommodate population growth, improve environmental outcomes, and provide a healthier lifestyle for residents. These issues are critical for New Zealand, and especially Auckland, as transport and urban planning have significant potential to encourage a shift away from sprawling, energy-intensive living to a more sustainable, liveable city.

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Appendices

Appendix 1: Human ethics approval

The Human Ethics Committee granted an extension via email of the ethics approval for the 2015 Wellington study, shown below, to me as a 'future researcher.'

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

Phone 0-4-463 5480
Email susan.corbett@vuw.ac.nz

MEMORANDUM

TO	Nadine Dodge
COPY TO	Ralph Chapman
FROM	AProf Susan Corbett, Convener, Human Ethics Committee
DATE	10 November 2015
PAGES	1
SUBJECT	**Ethics Approval: 20392** Benefits of Alternative Development Patterns - Wellington

Thank you for your request to amend and extend your ethics approval. This has now been considered and the request granted. Your application has approval until 10 February 2016.

If your data collection is not completed by this date you should apply to the Human Ethics Committee for an extension to this approval.

Best wishes with the research.

Kind regards

Susan Corbett

Convener, Victoria University Human Ethics Committee

Appendix 2: Survey questionnaire

Welcome to the Auckland Neighbourhood and Housing survey!

Why is this survey important?

The survey is aimed at discovering how people choose between different types of housing and neighbourhoods.

The study will help us understand what trade-offs Aucklanders are willing to make to live in their preferred neighbourhood or housing type.

For example, will a household accept a smaller dwelling (such as a townhouse or apartment) to live in their preferred location?

This survey is also conducted in other major centres, such as Wellington and Hamilton, with the findings being compared to Auckland. Because of this, the format and style of this survey have been adapted to produce comparable results.

How will the information be used?

The information from this survey will be used for research purposes by Victoria University and the Centre for Sustainable Cities.

Auckland Council will use the findings to inform various planning and policy decisions. A research report will be published on the People's Panel website. The research will also be available in the Victoria University Library and may also be published in academic journals.

If you have any further questions or would like to receive further information about the project, please contact us at: peoplespanel@aucklandcouncil.govt.nz.

Let's get started!

Auckland Council
Te Kaunihera o Tāmaki Makaurau

people's panel

1% progress

Think back to when you first chose to move to your existing house/flat. What factors were important in determining your choice? *

	Not at all important	Somewhat important	Important	Very important	Extremely important
Had a convenient commute via **motor vehicle**	○	○	○	○	○
Had a convenient commute via **bus, train, or ferry**	○	○	○	○	○
Had a convenient commute via **walk or cycle**	○	○	○	○	○
Was walking distance to outdoor space, such as parks	○	○	○	○	○
Was walking distance to local amenities, such as shops	○	○	○	○	○
Was near family/friends	○	○	○	○	○
Was in a safe neighbourhood	○	○	○	○	○
Was in a visually attractive neighbourhood	○	○	○	○	○
Was convenient to desirable schools	○	○	○	○	○
Was affordable	○	○	○	○	○
Was warm and dry	○	○	○	○	○
Had a private outdoor space	○	○	○	○	○
Had architectural features	○	○	○	○	○
Was a standalone home	○	○	○	○	○
Had a private parking space	○	○	○	○	○
Was on a quiet street	○	○	○	○	○

Back Save Next

Displayed if respondent indicated they would likely move to a 1-bedroom dwelling. Different prices are displayed for 1, 2, 3, and 4 bedrooms.

Auckland Council people's panel

4% progress

Now, imagine that you are looking for a new place to live that has **1 bedroom**. The following are possible examples of 1 bedroom homes in Auckland City.

Homes are available to rent or to own, and prices are shown in market rent per week.(Market rent is defined as what a landlord might expect to receive, and a tenant might expect to pay for a tenancy)

Keep in mind anything not referred to in the question, such as warmth, appliances, square footage, school quality, and safety, is exactly the same between the options presented.

The pictures included with each question are to indicate the type of housing, and are examples only.

The choices presented may not seem ideal to you, but you should indicate your preferred choice in each case anyway.

For each scenario, choose the option that best reflects your preferences by selecting the button below it.

1 of 12 *

	Standalone house	Standalone house	Townhouse
			
Outdoor space	Large section	Small section	None
Destinations	5 min **walk** to local town centre 5 min **drive** to CBD 15 min **bus** to CBD	No centres in **walking** distance 45 min **drive** to CBD 1 hr 15 minute **bus** to CBD	5 min **walk** to local town centre 5 min **drive** to CBD 15 min **bus** to CBD
Dwellings in neighbourhood	Primarily apartments / townhouses	Mix of apartments / townhouses and standalone houses	Mix of apartments / townhouses and standalone houses
Parking	On street	Off street	None (available for purchase)
Market rent	$500	$400	$500
	○	○	○

Back Save Next

Auckland Council people's panel

6% progress

For 1 bedroom homes in Auckland, select one of these three buttons to show what you prefer.

2 of 12 *

	Standalone house	Apartment	Standalone house
			
Outdoor space	Small section	Small section	Porch / balcony
Destinations	30 min **walk** to local town centre 30 min **drive** to CBD 60 min **bus** to CBD	No centres in **walking** distance 45 min **drive** to CBD 1 hr 15 min **bus** to CBD	10 min **walk** to local town centre 15 min **drive** to CBD 30 min **bus** to CBD
Dwellings in neighbourhood	Primarily standalone houses	Mix of apartments / townhouses and standalone houses	Mix of apartments / townhouses and standalone houses
Parking	On street	Off street	On street
Market rent	$400	$200	$300
	○	○	○

Back Save Next

Auckland Council people's panel

7% progress

For 1 bedroom homes in Auckland, select one of these three buttons to show what you prefer.

3 of 12 *

	Apartment	Standalone house	Townhouse
			
Outdoor space	Large section	Large section	Small section
Destinations	No centres in **walking** distance 45 min **drive** to CBD 1 hr 15 min **bus** to CBD	10 min **walk** to local town centre 15 min **drive** to CBD 30 min **bus** to CBD	5 min **walk** to local town centre 5 min **drive** to CBD 15 min **bus** to CBD
Dwellings in neighbourhood	Primarily apartments / townhouses	Primarily standalone houses	Mix of apartments / townhouses and standalone houses
Parking	Off street	Off street	On street
Market rent	$300	$400	$400
	○	○	○

Back Save Next

Auckland Council people's panel

9% progress

For 1 bedroom homes in Auckland, select one of these three buttons to show what you prefer.

4 of 12 *

	Apartment	Standalone house	Standalone house
			
Outdoor space	None	Porch / balcony	Small section
Destinations	30 min walk to local town centre 30 min drive to CBD 60 min bus to CBD	No centres in walking distance 45 min drive to CBD 1 hr 15 min bus to CBD	5 min walk to local town centre 5 min drive to CBD 15 min bus to CBD
Dwellings in neighbourhood	Mix of apartments / townhouses and standalone houses	Primarily apartments / townhouses	Primarily apartments / townhouses
Parking	None (available for purchase)	On street	Off street
Market rent	$200	$300	$400
	○	○	○

Back Save Next

Auckland Council people's panel

10% progress

For 1 bedroom homes in Auckland, select one of these three buttons to show what you prefer.

5 of 12 *

	Standalone house	Apartment	Townhouse
			
Outdoor space	Small section	Large section	Large section
Destinations	No centres in walking distance 45 min drive to CBD 1 hr 15 min bus to CBD	10 min walk to local town centre 15 min drive to CBD 30 min bus to CBD	30 min walk to local town centre 30 min drive to CBD 60 min bus to CBD
Dwellings in neighbourhood	Primarily apartments / townhouses	Mix of apartments / townhouses and standalone houses	Primarily standalone houses
Parking	Off street	On street	None (available for purchase)
Market rent	$500	$500	$500
	○	○	○

Back Save Next

Auckland Council

people's panel

12% progress

For 1 bedroom homes in Auckland, select one of these three buttons to show what you prefer.

6 of 12 *

	Townhouse	Standalone house	Standalone house
			
Outdoor space	None	Porch / balcony	Small section
Destinations	10 min **walk** to local town centre 15 min **drive** to CBD 30 min **bus** to CBD	5 min **walk** to local town centre 5 min **drive** to CBD 15 min **bus** to CBD	30 min **walk** to local town centre 30 min **drive** to CBD 60 min **bus** to CBD
Dwellings in neighbourhood	Primarily apartments / townhouses	Mix of apartments / townhouses and standalone houses	Primarily standalone houses
Parking	Off street	None (available for purchase)	On street
Market rent	$500	$500	$500
	○	○	○

Back Save Next

Auckland Council

people's panel

13% progress

For 1 bedroom homes in Auckland, select one of these three buttons to show what you prefer.

7 of 12 *

	Standalone house	Townhouse	Townhouse
			
Outdoor space	Porch / balcony	None	Large section
Destinations	5 min **walk** to local town centre 5 min **drive** to CBD 15 min **bus** to CBD	30 min **walk** to local town centre 30 min **drive** to CBD 60 min **bus** to CBD	10 min **walk** to local town centre 15 min **drive** to CBD 30 min **bus** to CBD
Dwellings in neighbourhood	Primarily standalone houses	Primarily apartments / townhouses	Primarily apartments / townhouses
Parking	Off street	On street	None (available for purchase)
Market rent	$400	$300	$300
	○	○	○

Back Save Next

Auckland Council people's panel

14% progress

For 1 bedroom homes in Auckland, select one of these three buttons to show what you prefer.

8 of 12 *

	Apartment	Standalone house	Townhouse
			
Outdoor space	Small section	Large section	None
Destinations	10 min **walk** to local town centre 15 min **drive** to CBD 30 min **bus** to CBD	5 min **walk** to local town centre 5 min **drive** to CBD 15 min **bus** to CBD	No centres in **walking** distance 45 min **drive** to CBD 1 hr 15 min **bus** to CBD
Dwellings in neighbourhood	Mix of apartments / townhouses and standalone houses	Mix of apartments / townhouses and standalone houses	Primarily apartments / townhouses
Parking	None (available for purchase)	Off street	On street
Market rent	$300	$500	$200
	○	○	○

Back Save Next

Auckland Council people's panel

16% progress

For 1 bedroom homes in Auckland, select one of these three buttons to show what you prefer.

9 of 12 *

	Standalone house	Townhouse	Apartment
			
Outdoor space	Small section	Large section	Porch / balcony
Destination	20 min **walk** to local town centre 30 min **drive** to CBD 60 min **bus** to CBD	5 min **walk** to local town centre 5 min **drive** to CBD 15 min **bus** to CBD	No centres in **walking** distance 45 min **drive** to CBD 1 hr 15 min **bus** to CBD
Dwellings in neighbourhood	Mix of apartments / townhouses and standalone houses	Primarily standalone houses	Mix of apartments / townhouses and standalone houses
Parking	Off street	On street	On street
Market rent	$400	$400	$300
	○	○	○

Back Save Next

Auckland Council people's panel

17% progress

For 1 bedroom homes in Auckland, select one of these three buttons to show what you prefer.

10 of 12 *

	Standalone house	Townhouse	Apartment
			
Outdoor space	Large section	None	Porch / balcony
Destinations	🚶 No centres in **walking** distance 🚗 45 min **drive** to CBD 🚌 1 hr 15 min **bus** to CBD	🚶 10 min **walk** to local town centre 🚗 15 min **drive** to CBD 🚌 30 min **bus** to CBD	🚶 30 min **walk** to local town centre 🚗 30 min **drive** to CBD 🚌 60 min **bus** to CBD
Dwellings in neighbourhood	Mix of apartments / townhouses and standalone houses	Mix of apartments / townhouses and standalone houses	Primarily apartments / townhouses
Parking	On street	None (available for purchase)	Off street
Market rent	$200	$200	$200
	○	○	○

Back Save Next

Auckland Council people's panel

19% progress

For 1 bedroom homes in Auckland, select one of these three buttons to show what you prefer.

11 of 12 *

	Standalone house	Townhouse	Standalone house
			
Outdoor space	Small section	Large section	Large section
Destinations	🚶 5 min **walk** to local town centre 🚗 5 min **drive** to CBD 🚌 15 min **bus** to CBD	🚶 30 min **walk** to local town centre 🚗 30 min **drive** to CBD 🚌 60 min **bus** to CBD	🚶 10 min **walk** to local town centre 🚗 15 min **drive** to CBD 🚌 30 min **bus** to CBD
Dwellings in neighbourhood	Primarily apartments / townhouses	Mix of apartments / townhouses and standalone houses	Primarily standalone houses
Parking	None (available for purchase)	Off street	Off street
Market rent	$200	$200	$400
	○	○	○

Back Save Next

Auckland Council

people's panel

20% progress

For 1 bedroom homes in Auckland, select one of these three buttons to show what you prefer.

12 of 12 *

	Townhouse	Standalone house	Apartment
			
Outdoor space	Porch / balcony	Small section	None
Destinations	10 min **walk** to local town centre 15 min **drive** to CBD 30 min **bus** to CBD	30 min **walk** to local town centre 30 min **drive** to CBD 60 min **bus** to CBD	No centres in **walking** distance 45 min **drive** to CBD 1 hr 15 min **bus** to CBD
Dwellings in neighbourhood	Primarily apartments / townhouses	Primarily apartments / townhouses	Mix of apartments / townhouses and standalone houses
Parking	On street	None (available for purchase)	Off street
Market rent	$300	$900	$200

Back Save Next

Auckland Council

people's panel

74% progress

Are you? *

- Male
- Female
- Other

Are you? *

- 18 - 24 yrs
- 25 - 34 yrs
- 35 - 49 yrs
- 50 - 59 yrs
- 60 - 69 yrs
- 70 - 84 yrs
- 85 or more years
- Prefer not to say

Back Save Next


Auckland Council
people's panel
75% progress
Please indicate your gross individual income per year (before tax): *
$20,000 or less
$20,001 - $30,000
$30,001 - $40,000
$40,001 - $50,000
$50,001 - $60,000
$60,001 - $70,000
$70,001 - $100,000
$100,001 - $150,000
$150,000 or more
Prefer not to say
Which best describes you? *
Looking for work/unemployed
Looking after home/family
Working full time (30+ hours per week)
Working part time (less than 30 hours per week)
Full-time student
Part-time student
Retired
Beneficiary
Other (please specify)
Prefer not to say
Back
Save
Next


Auckland Council
people's panel
77% progress
Which ethnic group or groups do you identify with?
You may select more than one. *
NZ European/ Pakeha
Māori
Pacific Islander
Asian Middle Eastern/ Latin American/ African
Other (please specify)
Prefer not to say
Back
Save
Next

*Displayed if respondent would **bike** to study/work every day.*

*Displayed if respondent would **walk or jog** to study/work every day.*

*Displayed if respondent would take **public transport** to study/work every day.*

Either study or work – travel modes are constant.

Auckland Council people's panel

67% progress

In the last 7 days, how often did you use each of the following travel methods to commute to study? *

	5 -7 days	3 - 4 days	1 - 2 days	Not at all
Walking or jogging	○	○	○	○
Cycling	○	○	○	○
Public transport (bus, train)	○	○	○	○
Driving a passenger motor vehicle (car, truck, van)	○	○	○	○
Passenger in a motor vehicle	○	○	○	○
Driving a motorcycle or motor scooter	○	○	○	○
Worked at home	○	○	○	○
Other	○	○	○	○

Back Save Next

Auckland Council people's panel

88% progress

Which best describes your current household? *

- ○ Couple living alone
- ○ Couple living with other adults
- ○ Couple or extended family living with children, some aged 0-17 years
- ○ Single adult living with children, some aged 0-17 years
- ○ Family living with children, all aged 18 years or older
- ○ Adult living alone
- ○ Adult living with other adults
- ○ Living with parents/guardian
- ○ Other (please specify) [ ]
- ○ Prefer not to say

Including yourself, how many people in your household are aged 18 years or older? ***Please do not include anyone who usually lives somewhere else or is just visiting*** *

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5 or more people
- ○ Prefer not to say

Back Save Next

Either (mainly) study or work – areas are constant.

Auckland Council people's panel

94% progress

In which of these areas do you (mainly) study? *Please select from the dropdown list below.* *

Back Save Next

Auckland Council people's panel

96% progress

And in which of these areas do you live? ***Please select from the dropdown list below.*** *

Back Save Next


Auckland Council
people's panel
97% progress
How many motor vehicles are normally available for use by people in your household? *
0
1
2
3 or more
How long have you lived at your current residence? *
Less than 1 year
1 - 5 years
More than 5 years
Back
Save
Next

99% progress

How do you feel about where you are currently living? *

Very dissatisfied	Dissatisfied	No feeling either way	Somewhat satisfied	Satisfied	Very satisfied	Don't know
○	○	○	○	○	○	○

Think about your house/flat. Are any of these things major problems for you? ***You can select as many as you wish.*** *

- ☐ It's too small
- ☐ It's hard to get to from the street
- ☐ It's in poor condition
- ☐ It's damp
- ☐ It's too cold or difficult to heat/keep warm
- ☐ There are pests such as mice or insects
- ☐ It's too expensive
- ☐ Other major problems (please specify)
- ○ No major problems

Think about your neighbourhood. Are any of these things major problems for you? ***You can select as many as you wish.*** *

- ☐ It's too far from work
- ☐ It's too far from other things I want to get to
- ☐ It's not safe
- ☐ It doesn't have adequate public transport service
- ☐ It doesn't have adequate sidewalks, cycle lanes, and/or pedestrian crossings
- ☐ Noise or vibration
- ☐ Air pollution from traffic fumes, industry, or other smoke
- ☐ Problem neighbours
- ☐ Graffiti, litter, and/or rubbish
- ☐ Barking dogs
- ☐ Other major problems (please specify)
- ○ No major problems

Back Save Next

100% progress

Thanks so much for completing this survey!

- ○ Yes, enter me to win a pair of movie passes.

Back Save Finish

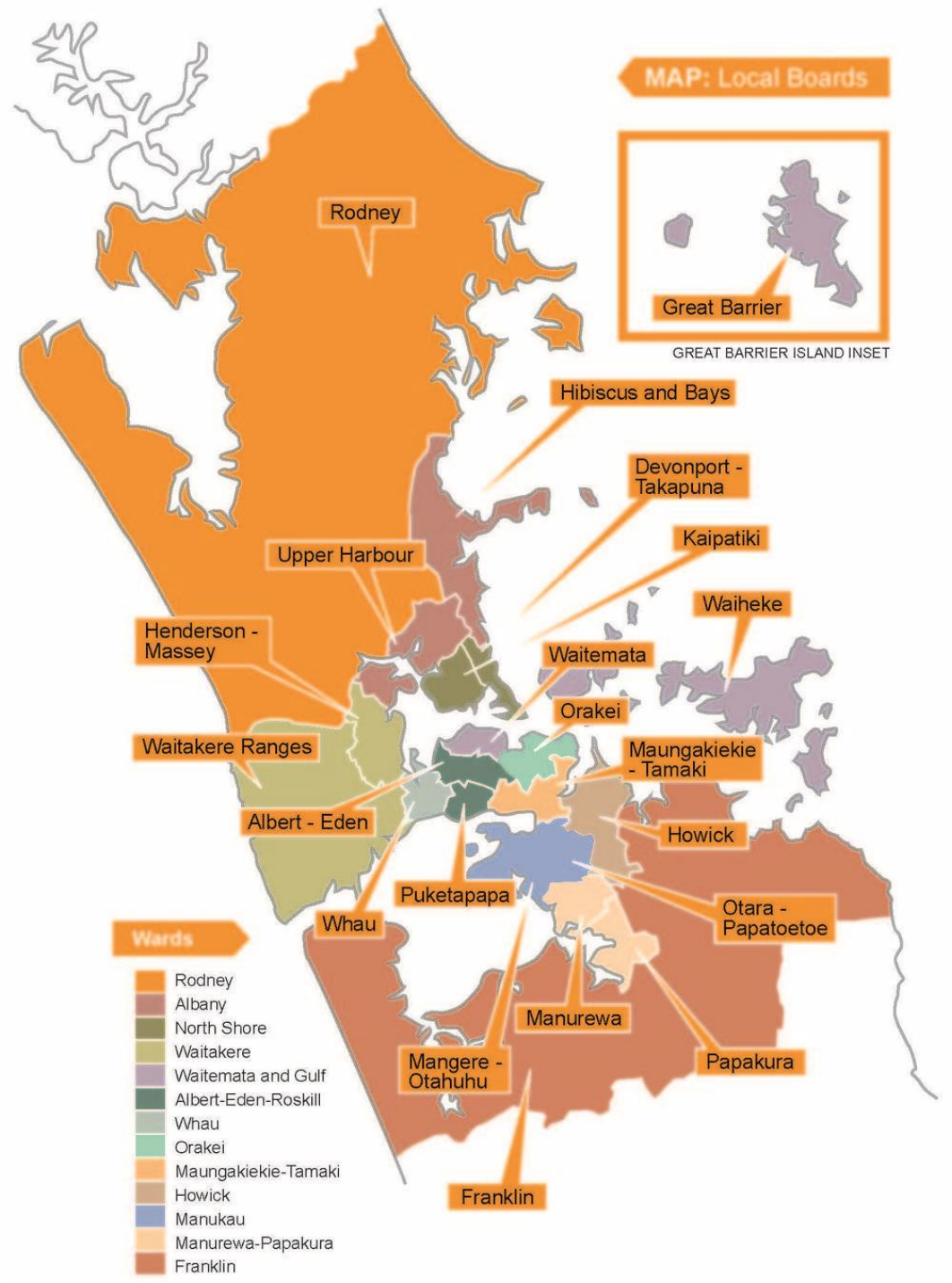
Appendix 3: Description of choice options in the stated choice experiment (attributes: dwelling type, outdoor space, distance to CBD/town centre, neighbourhood dwellings, parking, and market rent for 1-, 2-, 3-, and 4-bedroom dwellings).

Choice set	Option 1	Option 2	Option 3
1	Standalone; large section; 5 min walk to town centre, 5 min drive/15 min bus to CBD; apts/townhouses; on street parking; $500/750/1,000/1,250	Standalone; small section; no centres in walking distance, 45 min drive/1 hr 15 min bus to CBD; mixed; off street parking; $400/600/800/1,000	Townhouse; no outdoor space; 5 min walk to town centre, 5 min drive/15 min bus to CBD; mixed; no parking; $500/750/1,000/1,250
2	Standalone; small section; 30 min walk to town centre, 30 min drive/1 hr bus to CBD; standalone; on street parking; $400/600/800/1,000	Apt; small section; no centres in walking distance, 45 min drive/1 hr 15 min bus to CBD; mixed; off street parking; $200/300/400/500	Standalone; porch/balcony; 10 min walk to town centre, 15 min drive/30 min bus to CBD; mixed; on street parking; $300/450/600/750
3	Apt; large section; no centres in walking distance, 45 min drive/1 hr 15 min bus to CBD; apts/townhouses; off street parking; $300/450/600/750	Standalone; large section; 10 min walk to town centre, 15 min drive/30 min bus to CBD; standalone; off street parking; $400/600/800/1,000	Townhouse; small section; 5 min walk to town centre, 5 min drive/15 min bus to CBD; mixed; on street parking; $400/600/800/1,000
4	Apt; no outdoor space; 30 min walk to town centre, 30 min drive/1 hr bus to CBD; mixed; no parking; $200/300/400/500	Standalone; porch/balcony; no centres in walking distance, 45 min drive/1 hr 15 min bus to CBD; apts/townhouses; on	Standalone; small section; 5 min walk to town centre, 5 min drive/15 min bus to CBD; apts/townhouses; off

		street parking; $300/450/600/750	street parking; $400/600/800/1,000
5	Standalone; small section; no centres in walking distance, 45 min drive/1 hr 15 min bus to CBD; apts/townhouses; off street parking; $500/750/1,000/1,250	Apt; large section; 10 min walk to town centre, 15 min drive/30 min bus to CBD; mixed; on street parking; $500/750/1,000/1,250	Townhouse; large section; 30 min walk to town centre, 30 min drive/1 hr bus to CBD; standalone; no parking; $500/750/1,000/1,250
6	Townhouse; no outdoor space; 10 min walk to town centre, 15 min drive/30 min bus to CBD; apts/townhouses; off street parking; $500/750/1,000/1,250	Standalone; porch/balcony; 5 min walk to town centre, 5 min drive/15 min bus to CBD; mixed; no parking; $500/750/1,000/1,250	Standalone; small section; 30 min walk to town centre, 30 min drive/1 hr bus to CBD; standalone; on street parking; $500/750/1,000/1,250
7	Standalone; porch/balcony; 5 min walk to town centre, 5 min drive/15 min bus to CBD; standalone; off street parking; $400/600/800/1,000	Townhouse; no outdoor space; 30 min walk to town centre, 30 min drive/1 hr bus to CBD; apts/townhouses; on street parking; $300/450/600/750	Townhouse; large section; 10 min walk to town centre, 15 min drive/30 min bus to CBD; apts/townhouses; no parking; $300/450/600/750
8	Apt; small section; 10 min walk to town centre, 15 min drive/30 min bus to CBD; mixed; no parking; $300/450/600/750	Standalone; large section; 5 min walk to town centre, 5 min drive/15 min bus to CBD; mixed; off street parking; $500/750/1,000/1,250	Townhouse; no outdoor space; no centres in walking distance, 45 min drive/1 hr 15 min bus to CBD; apts/townhouses; on street parking; $200/300/400/500

9	Standalone; small section; 30 min walk to town centre, 30 min drive/1 hr bus to CBD; mixed; off street parking; $400/600/800/1,000	Townhouse; large section; 5 min walk to town centre, 5 min drive/15 min bus to CBD; standalone; on street parking; $400/600/800/1,000	Apt; porch/balcony; no centres in walking distance, 45 min drive/1 hr 15 min bus to CBD; mixed; on street parking; $300/450/600/750
10	Standalone; large section; no centres in walking distance, 45 min drive/1 hr 15 min bus to CBD; mixed; on street parking; $200/300//400/500	Townhouse; no outdoor space; 10 min walk to town centre, 15 min drive/30 min bus to CBD; mixed; no parking; $200/300/400/500	Apt; porch/balcony; 30 min walk to town centre, 30 min drive/1 hr bus to CBD; apts/townhouses; off street parking; $200/300/400/500
11	Standalone; small section; 5 min walk to town centre, 5 min drive/15 min bus to CBD; apts/townhouses; no parking; $200/300/400/500	Townhouse; large section; 30 min walk to town centre, 30 min drive/1 hr bus to CBD; mixed; off street parking; $200/300/400/500	Standalone; large section; 10 min walk to town centre, 15 min drive/30 min bus to CBD; standalone; off street parking; $400/600/800/1,000
12	Townhouse; porch/balcony; 10 min walk to town centre, 15 min drive/30 min bus to CBD; apts/townhouses; on street parking; $300/450/600/750	Standalone; small section; 30 min walk to town centre, 30 min drive/1 hr bus to CBD; apts/townhouses; no parking; $300/450/600/750	Apt; no outdoor space; no centres in walking distance, 45 min drive/1 hr 15 min bus to CBD; mixed; off street parking; $200/300/400/500

Appendix 4: Map of Auckland's Local Boards and Wards



Appendix 5: Independent Samples Test comparing the mean importance of dwelling/neighbourhood factors in Auckland and Wellington

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									Interval of the	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
outdoor space	Equal variances assumed	543.141	.000	30.688	55689	.000	.328	.011	.307	.349
	Equal variances not assumed			29.804	28518.445	.000	.328	.011	.307	.350
standalone home	Equal variances assumed	24.547	.000	31.365	55689	.000	.426	.014	.399	.452
	Equal variances not assumed			31.183	29962.464	.000	.426	.014	.399	.453
parking space	Equal variances assumed	1684.607	0.000	73.301	55689	0.000	.877	.012	.854	.900
	Equal variances not assumed			67.860	25954.306	0.000	.877	.013	.852	.902
distance to shops	Equal variances assumed	490.684	.000	-30.781	55689	.000	-.360	.012	-.383	-.337
	Equal variances not assumed			-32.646	34710.982	.000	-.360	.011	-.382	-.339
commute via PT	Equal variances assumed	292.118	.000	-30.738	55617	.000	-.406	.013	-.431	-.380
	Equal variances not assumed			-31.530	31906.771	.000	-.406	.013	-.431	-.380
commute via AT	Equal variances assumed	1.821	.177	-64.569	55689	0.000	-.837	.013	-.862	-.811
	Equal variances not assumed			-64.117	29885.182	0.000	-.837	.013	-.862	-.811
Commute via car	Equal variances assumed	47.969	.000	40.981	55653	0.000	.4898	.0120	.4664	.5133
	Equal variances not assumed			41.249	30683.065	0.000	.4898	.0119	.4666	.5131
Distance to parks	Equal variances assumed	407.450	.000	-6.371	55689	.000	-.075	.012	-.098	-.052
	Equal variances not assumed			-6.653	33462.870	.000	-.075	.011	-.097	-.053

Near family/friends	Equal variances assumed	238.780	.000	16.942	55653	.000	.201	.012	.178	.224
	Equal variances not assumed			17.349	31887.838	.000	.201	.012	.178	.224
Safe nhood	Equal variances assumed	152.280	.000	28.667	55653	.000	.282	.010	.263	.301
	Equal variances not assumed			28.481	29827.635	.000	.282	.010	.262	.301
Attractive nhood	Equal variances assumed	141.963	.000	38.997	55653	0.000	.400	.010	.380	.420
	Equal variances not assumed			39.147	30502.909	0.000	.400	.010	.380	.420
Schools	Equal variances assumed	9.353	.002	9.040	55689	.000	.127	.014	.099	.154
	Equal variances not assumed			9.035	30300.787	.000	.127	.014	.099	.154
Affordable	Equal variances assumed	442.351	.000	-6.911	55689	.000	-.065	.009	-.084	-.047
	Equal variances not assumed			-7.241	33718.376	.000	-.065	.009	-.083	-.048
Warm and dry	Equal variances assumed	76.807	.000	4.025	55617	.000	.038	.009	.019	.056
	Equal variances not assumed			4.154	32347.414	.000	.038	.009	.020	.056
Architectural features	Equal variances assumed	36.429	.000	-8.843	55689	.000	-.102	.012	-.124	-.079
	Equal variances not assumed			-8.959	31232.052	.000	-.102	.011	-.124	-.079
Quiet street	Equal variances assumed	433.503	.000	48.336	55689	0.000	.541	.011	.519	.563
	Equal variances not assumed			49.105	31420.055	0.000	.541	.011	.519	.562