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Mixed-use development factors and how they influence decisions to purchase residential properties in Christchurch, New Zealand

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Abstract

Christchurch, one of New Zealand's major cities, has been dealing with a housing shortage after a series of major earthquakes struck in 2010 and 2011, causing extensive damage to the city. To address this issue, the City Council of Christchurch has begun to encourage mixed-use development, a development type with higher-density and diversity of land-use, in Christchurch's suburban areas where low population densities dominated prior to 2011. Thus, this study aimed to investigate how the residents of Christchurch and its surrounding districts assess the importance of various mixed-use factors (and other neighbourhood factors) when making decisions regarding residential properties to purchase. Furthermore, it aimed to examine people's liking for living near various activities, commonly associated with mixed-use development. In this study, an online survey was developed, and data from 247 people were analysed. The results suggest that while higher-density seems to be undesirable for many people, diversity of land-use, if carefully selected, might attract people to live in a mixed-use neighbourhood. Furthermore, mixed-use neighbourhoods should also address people's need for quietness and privacy and preferences of people with diverse socio-demographic characteristics.

1. Introduction

Higher-density mixed-use development was a prevalent component of urban settlements in ancient towns and cities of Greece and China, and in medieval European towns and cities (Levitt and Schwanke, 2003). However, since the mid-20th century, low-density single-use development has started to dominate urban areas worldwide. This trend was caused by complex intertwined factors. For instance, the industrial revolution brought heavy industrial activities considered incompatible with residential activities, and thus, zoning laws was introduced to control the segregation of land uses (Levitt and Schwanke, 2003). Subsequent advances in transportation and an increased number of households that can afford to buy detached houses on large sections have also contributed to more dispersed development patterns of land-use and low-density urban settlements. In turn, low-density and segregation of land-use have contributed to high car dependency, making cities less sustainable. To address urban and transport problems caused by segregation of land use, various movements for restoring mixed-used neighbourhoods appeared (e.g. Jacobs, 1961).

Mixed-use development seems to suggest a development type that mixes several land uses and therefore, it is often equated with multiple-use (Herndon, 2011). However, review of current literature reveals that mixed-use extends multiple-use (also called diversity of land-use) by considering integration, density and compatibility of land uses to create pedestrian-friendly environments (Levitt and Schwanke, 2003). Furthermore, a balanced mixture of activities is required to achieve vibrant urban environments (Levitt and Schwanke, 2003; Van den Hoek, 2008). Grant (2002) and Dale and Newman (2009) further argued that beside

land-use diversity, social (and cultural) diversity should be pertinent to mixed-use development. This implies mixing people with varying socio-demographic characteristics, for instance by providing different types of houses with various sizes, prices, property ownership and occupation arrangements (Rowley, 1996).

Density of development is a component of mixed-use needed to create a more compact built environment (Cervero and Kockelman, 1997; Rowley, 1996). Together with land-use diversity, high-density can reduce travel distance and time to reach local destinations. Therefore, it is believed that a (high-density) mixed-use neighbourhood supports walking, cycling and public transport use, and moreover, reduces car use and ownership. These benefits relate to two transportation components of mixed-use, namely destination accessibility and distance to public transport facilities (Ewing and Cervero, 2010).

The Christchurch City Council has begun to encourage mixed-use development by slowly widening suburban areas zoned to allow higher-density and increasing land-use diversity in those areas. This is needed to increase housing stock, especially with over 9,000 becoming uninhabitable and around 16,000 properties being severely damaged by the major earthquakes that struck Christchurch in 2010 and 2011. In line with the complexity of housing reconstruction and recovery process following major disasters observed in many areas worldwide, housing recovery in Christchurch proved complex and challenging. Since 2011, much of Christchurch has been in a transitional state, with many people living in temporary accommodation while their property was rebuilt or repaired. Due to the shortage of housing and reduced areas for rebuild, a substantial number of dwellings were allocated to be built in districts surrounding Christchurch and in the city's outer suburbs, where low-population density dominated prior to 2011 (Cairns, 2013). This means, new housing development projects in inner and outer suburbs are required to introduce higher density living, e.g. in the form of terrace houses. Development projects in existing residential neighbourhoods in the inner suburbs of the city were also done by increasing housing density and diversity of land use (i.e. mixed-use development) (Cairns, 2013; MacDonald and Carlton, 2016; Williams and Heather, 2011).

Considering that mixed-use development is relatively new for Christchurch's suburbs, this study aimed to investigate the potential for mixed-use development, by assessing the importance of various mixed-use factors in influencing people's decisions to purchase residential properties, and people's liking for living near various activities, commonly associated with mixed-use development. As some benefits of mixed-use development are related to transportation, some accessibility-related factors were included in the study. An online survey was developed, and it included rating 24 mixed-use and other neighbourhood factors (including transport accessibility factors) derived from the literature review, and 12 land uses or activities. The survey was undertaken by 298 people, and data from 247 people who completed the rating tasks were used for the analysis. The results highlight different aspects that must be considered in the planning and design of a mixed-use neighbourhood to make such a neighbourhood attractive for people.

The reminder of this paper is structured as follows: factors considered by people when making a decision to purchase a residential property will be discussed in Section 2. In Section 3, the data collection method and the sample will be described and the analysis methods will be outlined. The results will be presented and discussed in Section 4, and some conclusions will be drawn in Section 5.

2. Factors affecting house purchase decision

Several studies (e.g. Burnley et al., 1997; Garcia and Hernandez, 2007; Hunt, 2010; Kim et al., 2005; Lee and Waddell, 2010; Molin and Timmermans, 2003) have been done worldwide to investigate factors which affect people's decision to purchase a residential property. Several mixed-use factors, e.g. accessibility, are often included in the existing studies.

However, other mixed-use factors, e.g. density and location, are often treated as minor components or are not represented properly. Moreover, social and cultural diversity are rarely taken into account.

Hunt (2010) investigated house location decisions in Edmonton (Canada) using built environment factors (e.g. density, type of street, air quality and traffic noise), transport-related attributes (e.g. travel times and costs for shopping and commuting trips), funding sources (e.g. taxes) and house types. The results suggest that house type is the most important factor, followed by traffic noise, air quality, municipal taxes and type of street in front of the dwelling. Transport-related factors, despite being statistically significant, are less important than the other factors. These results are in contrast with the results of the study in Oxfordshire (UK) by Kim et al. (2005). They suggested that commuting cost is one of the most important factors considered when buying a property. Their findings also suggest that people prefer to live in a lower density neighbourhood than in a higher density one.

Cooper et al. (2001) conducted a study in Belfast (UK) using factors such as walking to a local public transport stop and waiting time, travel cost, the number of bedrooms and housing price. The results show that housing price appears to be statistically significant and more important compared to the other factors. Similarly, the results of the study by Molin et al. (1996) in Meerhoven (Netherlands) suggest that house price is the most important factor that people consider and tenancy type (rent vs. own) is as important as house-related factors (e.g. the number/size of rooms). Neighbourhood-related factors (e.g. density, diversity and accessibility) seem to be less important than the aforementioned factors. The importance of house price was also highlighted by Næss (2009) who investigated factors people considered when selecting a new house in Copenhagen (Denmark). The results also suggest that a private garden, proximity to recreational areas, proximity to friends and relatives seem to be considered important by more people, compared with distance to the workplace and accessibility to a public transport facility.

The study by Earnhart (2002) on housing choices in Kansas (USA) included house-related variables (e.g. house price, lot size, and the number and size of bedrooms) and location-related factors (e.g. the chance of flooding and a natural view). The results suggest that people prefer to buy a house located in an area that has a good natural view. Additionally, house and lot sizes appear to be more important than other factors.

The results of the study by Burnley et al. (1997) on reasons for relocating to outer-areas of Sydney (Australia) suggest that people relocate mainly to get home ownership, a better place to raise a family, lower housing costs and a better quality house. Additionally, changes in marital status (e.g. married and divorced) and other personal reasons also play an important role in the decision to relocate. The results also suggest that the residential location choice is strongly affected by house affordability, design quality of the environment and proximity to friends/relatives. Lee and Waddell (2010) investigated households' decisions to relocate in Seattle (USA) by using house and location factors (e.g. house price, house type and work accessibility) and socio-demographic characteristics. Their results suggest that older households, households with children and home owners are less likely to move. In line with the results of the study by Burnley et al. (1997), renters or young households with no children seem to be more likely to move. Moreover, when an alternative property offers lower commuting cost and better accessibility to a workplace, people find relocating a more attractive option.

Garcia and Hernandez (2007) conducted a study on factors influencing the decision to purchase a house in Spain. House attributes (e.g. price and location) and socio-demographic characteristics (e.g. income and household size) were used as the explanatory variables. The results show that income is the most important factor that influences property decisions, with an increase in income indicating a higher probability of owning a property in urban areas and a lower probability of owning a property in rural areas or renting a property.

Several studies have been done in New Zealand, investigating different factors involved when selecting a house and highlighting the complexity of those factors. The study by Filippova (2009), Filippova and Rehm (2011), and Rehm and Filippova (2008) focused on investigating the effect of aesthetic water views, proximity to cell towers, and school zones on residential house prices in Auckland. Furthermore, Levy and Lee (2004) and Levy et al. (2008) investigated the dynamics and emotions involved in the internal family decision-making process when considering purchasing a residential property. Maré and Coleman (2011) conducted a study using New Zealand 2006 Census data. The results suggest that "own-group" attraction seems to play an important role in people's choice of residential location in Auckland, with qualification, income, ethnicity or country of birth being more important factors than people's preferences for local amenities, such as access to transport and distance to school.

Additionally, several studies have been done to investigate New Zealanders' preference for medium and high density housing. Walton et al. (2008) investigated relationships between population density and perceived quality of neighbourhood in Auckland, focusing on people's attitudes towards factors such as noise, neighbours, accessibility, and transport services. The results confirmed that residents made some trade-offs between various factors, e.g. accessibility, building aesthetics, and security, but the effect of population density was not statistically significant. Furthermore, Haarhoff et al. (2012) conducted a study that examined residents' preferences for medium-density neighbourhoods in selected outer areas of Auckland. The results of this study suggest that Aucklanders' preference to live in a (detached) house remains strong. However, residents do not mind medium density living and they support a diverse range of housing types and sizes in their neighbourhood. Additionally, residents are satisfied to be in close proximity to a town centre with many facilities and services, even though some of them are not easily accessible by modes other than car. Allen (2015) conducted a qualitative study to investigate trade-offs that people make when choosing medium density housing in several suburbs of Auckland. The results, to a large extent, confirmed the results of the study by Haarhoff et al. (2012), however the results also show an even division of residents who prefer living in a detached house and in a low-rise apartments or terraced housing.

As shown above, most existing New Zealand studies were done in Auckland. Note that Christchurch, being the third largest city in New Zealand, is fundamentally different to Auckland with regard to urban structure and population density. Nunns (2014) estimated the population-weighted density of Auckland to be over 1.5 times of Christchurch. Population-weighted density is a method proposed by Nunns (2014) to calculate population density taking into account the proportions of people living in large, medium and low density areas in the city. The differences in the results of the existing studies and the lack of research done in Christchurch, particularly after the earthquakes, highlight the need to carry out this study.

3. Data collection and analysis

3.1. Data collection

Considering the research objective, the target population was the residents of Christchurch and its surrounding districts. A market research company assisted this study by distributing a link to access the survey to over 2,000 panel members in Christchurch. Data collection was done in May and June 2016, and 298 people undertook the survey. However, only the data from 247 people who completed the rating tasks were used for the analysis.

The survey asked the respondents to rate the importance of 24 neighbourhood factors (derived from the literature review) in influencing the respondents' house purchase decisions. In addition, the respondents were also asked to rate their liking for living close (within 500 metres radius) to each of 12 'land uses' commonly associated with mixed-use development (e.g. shops and offices). In the survey, the respondents were asked to rate

each factor using a 5-point Likert scale, from 'very unimportant' to 'very important' for the neighbourhood factors and from 'very displeased' to 'very pleased' for the land uses or activities.

Additionally, several questions were asked to identify the respondents' socio-demographic characteristics (e.g. age, number of children and household income). Whenever possible, the representativeness of the sample was checked by comparing the characteristics of the sample with the latest (2013) New Zealand census data, focusing on the Canterbury region. The summary of this can be found in Table 1.

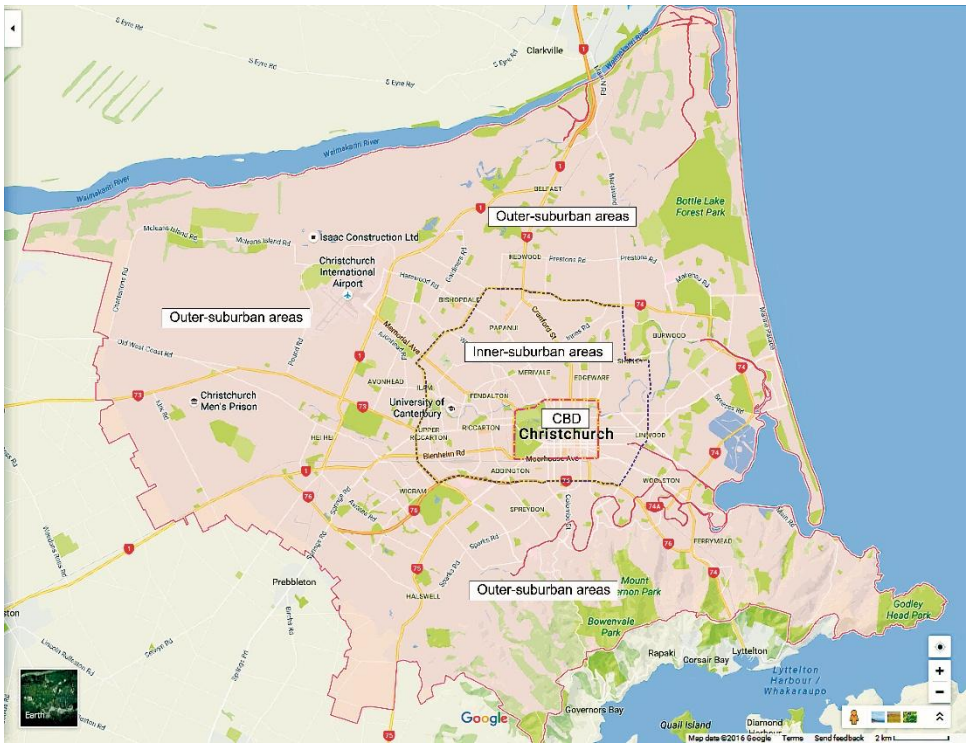
Table 1 Description of the sample

Style	Sample Description (Descriptive Statistics)	New Zealand Census 2013 for Canterbury Region
Gender	Male: 28.7% [54]; Female: 70.7% [133]; Other: 0.5% [1]. [N=188]	Male: 51%; female: 49%. [N=539,436]
Living condition	Living alone: 27.1% [67]; Living with a partner: 72.9% [180]. [N=247]	NA.
Number of dependent children	0 child: 55.8% [120]; 1 child: 13% [28]; 2 children: 19.5% [42]; 3 children or more: 11.6% [25]. [N=215]	Couple with and without (dependent) children 0 child: 52.2%; 1 child: 18.2%; 2 children: 19.7%; 3 children and more: 9.5%. [N=124,732]
		One parent with (dependent) children 1 child: 59.7%; 2 children: 29.2%; 3 children and more: 11.1%. [N=21,630]
Age	20-24 yrs: 1.9% [4]; 25-29 yrs: 7.5% [16]; 30-34 yrs: 15.1% [32]; 35-39 yrs: 11.3% [24]; 40-44 yrs: 9.0% [19]; 45-49 yrs: 11.3% [24]; 50-54 yrs: 9.4% [20]; 55-59 yrs: 10.8% [23]; 60-64 yrs: 8% [17]; >64 yrs: 15.6% [33]. [N=212]	20-24 yrs: 9.8%; 25-29 yrs: 8.5%; 30-34 yrs: 8.2%; 35-39 yrs: 8.8%; 40-44 yrs: 10.3%; 45-49 yrs: 10.1%; 50-54 yrs: 10.3%; 55-59 yrs: 9.1%; 60-64 yrs: 8.4%; >64 yrs: 16.5%. [N=393,882]
Household income	Below $29,999: 7.0% [15]; $30,000-$49,999: 18.7% [40]; $50,000-$69,999: 15.4% [33]; $70,000-$89,999: 19.6% [42]; ≥$90,000: 39.3% [84]. [N=214]	NA. Statistics New Zealand reports the average weekly salary, which was $1802 based on the 2013 census data (or equivalent to around $93,962 per year).
Home location	CBD: 0.8% [2]; Inner suburb: 16.2% [40]; Outer suburb: 64% [158]; Other towns: 19% [47]. [N=247]	NA.
Work location	CBD: 14.3% [35]; Inner suburb: 21.2% [52]; Outer suburb: 43.3% [106]; Other towns/all around Christchurch: 14.3% [35]; Not working/retired: 6.9% [17]. [N=245]	NA.

In general, females were over represented in the study. The age category of 20-24 years old was under-represented while the age category of 30-34 years old was over-represented. The remaining age categories were relatively comparable in sizes. It should be noted here that although the age category of 20-24 years old was under-represented, it might not substantially affect the results of this study as the average age of a first home buyer in New Zealand was 34 (Parker, 2014). Furthermore, 0.8% of the respondents lived in the CBD of Christchurch, while 16.2% and 64% of them lived in the outer and inner suburbs

respectively, and 19% lived in the surrounding towns and districts. It should be noted that the inner suburbs were defined as areas having direct borders with the CBD (see Figure 1). It can clearly be seen that areas considered as outer suburbs are larger than those defined as inner suburbs.

Figure 1: Christchurch CBD, inner suburbs and outer suburbs



3.2. Data analysis

Descriptive statistics were used to describe the data, e.g. in terms of socio-demographic characteristics of the sample and the frequency of selecting each rating category. Furthermore, to identify whether or not respondents' preferences for mixed-use factors differ across socio-demographic characteristics, non-parametric tests, i.e. the Kruskal–Wallis and Mann−Whitney tests were used. The Mann−Whitney test is used to compare two independent samples, using an ordinal measurement scale, to test whether or not two samples means are equal. The Kruskal–Wallis test is an extension of the Mann−Whitney test, as it allows researchers to compare more than two independent samples. In this study, the Kruskal–Wallis test was initially conducted, using each factor of the socio-demographic characteristics and each neighbourhood/mixed-use factor. If the results of the test were statistically significant, implying that respondents in some categories of a socio-demographic factor perceived a neighbourhood or mixed-use factor differently, the Mann−Whitney test was done to identify where the differences occurred, focusing on pairs of samples.

4. Results and discussions

Mixed-use development characteristics include density of development, diversity of land-use, destination accessibility (including accessibility by public transport) and social diversity. Each of these characteristics is discussed below, followed with other neighbourhood factors considered important when making house purchase decisions. In general, large agreement was found in the rating responses of the respondents for the mixed-use factors included in the survey, as shown in the quartiles in Table 2. Some disagreement was found in the ratings of a few factors (i.e. presence of lower-valued property, travel time to children's

school, walking time to the nearest public transport stop, public transport frequency, and travel time to the CBD). Note that an aggregate variable called 'all mixed-use' was created, taking into account the median values of the ratings of all mixed-use factors for each of the respondents. The quartiles of this new variable show good agreement with the respondents' ratings. In general, the respondents considered mixed-use factors important in their decision-making process or they were neutral about these factors.

Table 2 Descriptive statistics: Rating responses of mixed-use factors [N=247]

Mixed-use factors	Mixed-use characteristics	Rating (%)					Q1	Q2	Q3
		VU	U	N	I	VI			
Neighbourhood density	Density	2.4	6.9	31.6	46.2	13.0	N	I	I
Neighbourhood diversity	Diversity	3.2	15.8	46.2	30.4	4.5	N	N	I
Socio demographic and economic status of the neighbours	Social diversity	3.6	10.5	42.9	34.4	8.5	N	N	I
Presence of properties having much lower value than your own property	Social diversity	5.7	20.2	44.9	22.3	6.9	U	N	I
Presence of properties having much higher value than your own property	Social diversity	4.5	20.2	51	21.1	3.2	N	N	N
Travel time to workplace	Accessibility	3.2	10.9	30	40.5	15.4	N	I	I
Travel time to a local shopping centre	Accessibility	2.8	12.1	32.8	42.9	9.3	N	I	I
Travel time to children's school	Accessibility	18.2	13	18.6	35.6	14.6	U	I	I
Walking time to the nearest public transport stop	Accessibility	9.7	20.6	25.9	35.2	8.5	U	N	I
Public transport frequency	Accessibility	10.1	21.1	27.9	30.4	10.5	U	N	I
Travel time to friends or relatives	Accessibility	3.6	15.4	38.9	36.8	5.3	N	N	I
Travel time to the CBD	Accessibility	6.9	21.9	35.6	30.8	4.9	U	N	I
All mixed-use							N	N	I

VU = Very unimportant; U = Unimportant; N = Neutral; I = Important; VI = Very important.
Q1 = Quartile 1 (25% percentile); Q2 = Quartile 2 (median); Q3 = Quartile 3 (75% percentile)

4.1. Density of development

Table 2 shows that 13%, 46.2%, 31.6%, 6.9% and 2.4% of the respondents considered density of development very important, important, neutral, unimportant and very unimportant respectively. Further analysis was done to identify if there are differences in the rating of neighbourhood density by respondents with different socio-demographic characteristics. For this, the Kruskal−Wallis test was carried out and the results, in terms of statistical significance, are presented in Tables 3, 5, 6 and 7, with highlighted cells in the tables indicating significant differences at a 5% significance level. Note that details of the Kruskal−Wallis test results are shown in Appendices 1-3, again with highlighted cells indicating significant differences at a 5% significance level. The results show that the differences in the rating scores of density by respondents in different categories of age, gender, age, living condition and house location were not statistically significant. The only significant difference in the rating scores was observed in the categories of income. To find out the pairs of income categories with significant differences in the rating scores, the Mann−Whitney test was conducted. The results of the test show that there are significant differences in the mean rank of the respondents with income ≤$29K and those with income ≥$90K, and the respondents with income $30K-$49K and those with income ≥$90K, implying that respondents with lower income seem to consider neighbourhood density as less important than those with high income. Some correlation between income and density have been found in many existing studies (e.g. Iverson and Cook, 2000; Pendall and Carruthers, 2003). It should be noted here that as mentioned by Pendall and Carruthers (2003), who investigated density and income segregation in US Metropolitan Areas from 1980 to 2000, the connection between built environment (e.g. density) and socio-demographic characteristics (e.g. income) might be more complex than is initially believed.

Table 3 Kruskal−Wallis Test (Asymptotic Significance): Mixed-use factors

Mixed-use factors	Child[1]	Sex[2]	Age[3]	Inc[4]	Spouse[5]	HLoc[6]
Neighbourhood density	0.122	0.476	0.129	0.005	0.065	0.137
Neighbourhood diversity	0.311	0.222	0.292	0.098	0.550	0.426
Socio demographic and economic status of the neighbours	0.976	0.142	0.683	0.278	0.940	0.177
Presence of properties having much lower value than your own property	0.257	0.633	0.155	0.918	0.930	0.513
Presence of properties having much higher value than your own property	0.404	0.308	0.193	0.855	0.171	0.067
Travel time to workplace	0.712	0.199	0.080	0.956	0.791	0.563
Travel time to a local shopping centre	0.089	0.713	0.015	0.083	0.552	0.071
Travel time to children's school	0.000	0.022	0.000	0.966	0.076	0.740
Walking time to the nearest public transport stop	0.011	0.104	0.006	0.000	0.219	0.032
Public transport frequency	0.012	0.109	0.000	0.000	0.179	0.014
Travel time to friends or relatives	0.014	0.029	0.063	0.068	0.071	0.084
Travel time to the CBD	0.001	0.966	0.002	0.557	0.020	0.003

[1]Having at least one dependent child [N=215] (No [120]; Yes [95]).
[2]Gender [N=187] (Male [54]; Female [133]).
[3]Age category [N=212] (20-29 [20]; 30-39 [56]; 40-49 [43]; 50-59 [43]; ≥60 [50]).
[4]Household income [N=214] (<$29K [15]; $30K-$49K [40]; $50K-$69K [33]; $70K-$89K [42]; ≥$90K [84]).
[5]Living condition [N=247] (With a spouse [180]; alone [67]).
[6]Home location [N=247] (CBD and inner suburb [42]; Outer suburb [158]; Other towns [47]).
Details of the Kruskal−Wallis test results are shown in Appendix 1.

Introducing higher-density living in Christchurch's suburbs has been a part of the Christchurch City Council's plan to increase housing stock (Cairns, 2013), and more properties in suburbs were rezoned to allow higher-density development (e.g. townhouses and apartments). However, residents dislike higher-density living in their neighbourhood and many were concerned that their communities would turn into 'ghettos' (Law, 2016). Furthermore, people's interest in purchasing terraced houses in outer suburbs and surrounding districts (e.g. Halswell, Wigram, Prestons, Kaiapoi, Rolleston, and Pegasus in North Canterbury) seems to have declined, often forcing developers to reduce property prices there (McDonald, 2017).

A high-density neighbourhood in outer suburbs is often considered undesirable, as people who relocate to outer suburbs tend to expect to live in a low-density neighbourhood. This, however, undermines the conceptual idea behind mixed-use: to build a compact neighbourhood. The results of a study in Canada suggest that mixed-use development projects tend to be more successful when they are located in inner suburbs or the CBD, and are done by gradually and incrementally revitalizing the existing urban areas (Grant, 2002). However, as 'greenfield' land remains cheap, development of inner-city mixed-use neighbourhoods tends to be less popular. Additionally, many people also prefer low-density living and want to remain attached to their cars (Grant, 2002).

4.2. Diversity of land-use

Table 2 shows that 4.5%, 30.4%, 46.2%, 15.8%, and 3.2% of the respondents considered diversity of land use very important, important, neutral, unimportant and very unimportant respectively. The results of the Kruskal−Wallis test also show that the differences in the rating scores of this factor by respondents with different socio-demographic characteristics were not statistically significant (Table 3). Additionally, analysis of respondents' liking for different types of activities (Table 4) shows that respondents have stronger preferences for some types of facilities (e.g. a park) than others (e.g. a rail station). Note also that respondents seem to have diverse views on living near a bar and children's playgrounds, as shown by the quartiles (Table 4).

Most of the respondents indicated that they would be very pleased (50.2%) or pleased (38.9%) to live near a park, and only a few of them would be very displeased (0.8%) or displeased (0.8%) to live near such a facility. 64.8% and 51.8% indicated that they would be very pleased or pleased to live near a playground and a school respectively. 64.4% would be very pleased or please to live near a supermarket and 51% would be very pleased or pleased to live near a restaurant. However, only 17% of the respondents indicated that they would be very pleased or pleased to live near offices, and most of them (67.6%) indicated neutrality. Furthermore, 38.1% indicated that they would be very displeased or displeased to live near a rail station. Interestingly, a substantial number of the respondents do not seem to mind living near a bus exchange or a bus stop on a high frequency route, as 41.3% indicated that they would be very pleased or pleased and 34% indicated neutrality. These results, to some extent, are in line with the framework of synergy (Levitt and Schwanke, 2003), indicating that residential activities are moderately supported by offices, strongly supported by retail/entertainment, and very strongly supported by cultural/civic/recreation. However, substantial numbers of the respondents remained neutral about living near offices (67.6%), clothing shops (61.5%) and an entertainment centre (44.5%), although, a supermarket (64.4%) and restaurant (51%) seem to be desirable functions in a neighbourhood. The results also show that most functions associated with cultural/civic/recreation (e.g. park, playground, and school) were found to be desirable, supporting the findings of Levitt and Schwanke (2003).

Table 4 Descriptive statistics: Rating responses of activity types [N=247]

Factors used in the survey	Rating (%)					Q1	Q2	Q3
	VD	D	N	P	VP			
Restaurant	4.9	11.7	32.4	43.7	7.3	N	P	P
Bar	15.4	21.9	34.4	25.1	3.2	D	N	P
Clothing shop	2.8	10.5	61.5	21.9	3.2	N	N	P
Supermarket	4.5	11.7	19.4	44.1	20.2	N	P	P
Park	0.8	0.8	9.3	38.9	50.2	P	VP	VP
Children's playground	0.4	3.6	31.2	35.2	29.6	N	P	VP
Office	2.8	12.6	67.6	14.6	2.4	N	N	N
Entertainment centre (e.g. cinema)	8.5	22.3	44.5	21.1	3.6	D	N	N
School	2	8.9	37.2	33.2	18.6	N	P	P
Nursery/day care	1.6	8.9	51.4	27.1	10.9	N	N	P
Bus exchange or bus stop on high frequency route	7.3	17.4	34	32.4	8.9	N	N	P
Rail station	19.4	18.6	41.7	16.2	4.0	D	N	N
All activites						N	N	P
VD = Very displeased; D = Displeased; N = Neutral; P = Pleased; VP = Very pleased. Q1, Q2, Q3: See note in Table 2								

The results of the Kruskal−Wallis test (Table 5) show a significant difference in the mean rank scores of respondents with and without children regarding living near a bar, with respondents without children having a stronger preference for living near such a facility than those with children. Respondents with children and respondents living with a spouse/partner seem to have stronger preferences for living near a children's playground, school and nursery/day care. Females seem to have stronger preferences than males for living near a supermarket and park.

Furthermore, there seems to be some significant differences in the mean rank scores of respondents in different age categories (Table 5), especially with regard to living near a supermarket, playground, school and nursery/day care. The results of a further analysis using the Mann−Whitney test show that respondents in their 20-ies and 30-ies seem to have a stronger preference for living near a supermarket than those in their 40-ies and ≥60-ies. Those in their 20-ies, 30-ies, 40-ies, and 50-ies seem to also have a stronger preference for living near a playground than those in their ≥60-ies. Furthermore, those in their 30-ies seem

to have a stronger preference for living near a school than those in their 40-ies, 50-ies and ≥60-ies; and those in their 40-ies also seem to have a stronger preference for living near a school than those in their ≥60-ies. Furthermore, respondents in their 30-ies seem to have a stronger preference for living near a nursery/day care than those in their 20-ies, 40-ies, 50-ies and ≥60-ies. These results show that people's preferences for different types of activities are to some extent correlated with their life-cycle.

The results of the Kruskal−Wallis test (Table 5) also show that there are some significant differences in the mean rank scores of respondents in different income categories, in particular with regard to living near a park and bus exchange. The results of the Mann−Whitney test show that respondents with income of $70K-$89K and ≥$90K seem to have a stronger preference for living near a park than those with income of $30K-$49K. Additionally, the results also show that respondents with income ≤$29K seem to have a stronger preference for living near a bus exchange than those with income of $50K-$69K, $70K-$89K and ≥$90K; and those with income of $30K-$49K seem to have a stronger preference for living near such a facility than those with income ≥$90K. These results seem logical, as according to New Zealand Statistics and based on 2013 Census data, access to motorized vehicles increases with household income and a substantial proportion of households with income <30K do not have access to a car (Statistics New Zealand, 2013).

Table 5 Kruskal−Wallis Test (Asymptotic Significance): Activities

Activities	Child[1]	Sex[2]	Age[3]	Inc[4]	Spouse[5]	HLoc[6]
Restaurant	0.719	0.703	0.201	0.317	0.712	0.613
Bar	0.047	0.079	0.057	0.398	0.622	0.243
Clothing shop	0.825	0.681	0.950	0.167	0.883	0.388
Supermarket	0.473	0.029	0.004	0.246	0.906	0.672
Park	0.335	0.011	0.328	0.024	0.069	0.764
Children's playground	0.000	0.167	0.003	0.338	0.002	0.435
Office	0.266	0.888	0.706	0.622	0.419	0.565
Entertainment centre (e.g. cinema)	0.121	0.729	0.166	0.366	0.915	0.132
School	0.000	0.127	0.000	0.893	0.007	0.437
Nursery/day care	0.001	0.223	0.000	0.963	0.016	0.138
Bus exchange or bus stop on high frequency route	0.332	0.622	0.546	0.008	0.858	0.207
Rail station	0.451	0.725	0.242	0.059	0.516	0.095

[1,2,3,4,5,6] See note in Table 3. Details of the Kruskal−Wallis test results are shown in Appendix 2.

The results of the literature review suggest that when diversity of land-use is combined with density, extra care must be taken. Activities that are seemingly safe (e.g. a shoe repair shop or dry cleaner) may impose a health hazard on the neighbouring residents (e.g. toxic fumes from chemical solvents) (Angotti and Hanhardt, 2001). Regulations cannot completely control the exposure to hazardous substances because of difficulties in estimating the cumulative and interactive effects of different pollutants. In several mixed-use neighbourhoods located in the outer suburbs of Auckland, residents complain about untidy businesses; the presence of neighbouring activities that produce noises, smells, smoke and steam; traffic congestion; and lack of parking (Research Solution, 2001). Hence, careful thought and consideration must be given to the design of mixed-use neighbourhoods, especially those with high-density and diversity, so that the safety and health related risks are kept within acceptable levels.

4.3. Social diversity

Social diversity was represented in the survey using socio-demographic and economic status of the neighbours, and presence of properties having higher and lower values than the respondents' properties. Table 2 shows that most respondents do not seem to mind having higher or lower value properties in their neighbourhoods, as more than 40% indicated

neutrality and less than 30% considered each factor as very important/important or very unimportant/unimportant. Note that the quartiles in Table 2 show that respondents seem to be relatively neutral about having much higher-valued properties in their neighbourhood. However, their views towards having much lower-valued properties seem to be more variable. Furthermore, the socio-demographic and economic status of the neighbours was considered very important or important by more respondents (i.e. 42.9%). The results of the Kruskal−Wallis test (Table 3) also show that the respondents in different categories of socio-demographic characteristics seem to have fairly similar views towards these factors, as the differences in the mean rank values were not statistically significant.

Regulations often require a mixed-use development project to allocate a certain percentage of houses for lower-income households. In Christchurch for instance, post-earthquake zoning rules have required developers to build houses with a mixture of housing densities (e.g. detached and terrace houses) in bigger subdivisions (McDonald, 2017). However, high-income residents often resent having lower-income households in their neighbourhood and prefer being segregated from them, as observed by Dale and Newman (2009). High-income residents often do anything to push the lower-income households away from their neighbourhood. Resentment results in decreasing social diversity, which in turn increases housing prices and further forces low-income tenants and renters to move out of the neighbourhoods (Angotti and Hanhardt, 2001). While the results of the survey show that a substantial portion of the respondents considered social diversity factors very unimportant or unimportant, or remained neutral about this, it is still important to include plans on how to keep a mixed-use development project accessible to diverse groups of people (Newman and Wyly, 2006).

4.4. Destination accessibility

In the survey, destination accessibility was represented by travel times to the CBD, workplace, children's schools, friends' and relatives' houses, and a local shopping centre. In addition, walking time to the nearest public transport facility and public transport frequency were included as the components of accessibility by public transport.

Table 2 shows that travel time to a workplace is rated as very important or important by 55.9% of the respondents, and only 14.2% indicated that the factor is very unimportant or unimportant. 52.2% and 50.2% considered travel time to a local shopping centre and children's schools very important and important. 42.1% and 35.6% respectively considered travel times to friends and relatives and to the CBD very important or important. Walking time to the nearest public transport stop and public transport frequency were considered very important or important by 43.7% and 40.9% of the respondents respectively.

However, the results of the Kruskal−Wallis test (Table 3) show that the respondents in different categories of socio-demographic characteristics seem to have fairly different views towards these accessibility factors, as some differences in the mean rank values were statistically significant. The results of the Mann−Whitney test show that respondents with children seem to consider travel time to children's school more important than those without children, and females seem to also consider this factor more important than males. Furthermore, respondents in their 30-ies seem to consider this factor more important than those in their 50-ies and ≥60-ies; and those in their 40-ies also seem to consider this factor more important than those in their ≥60-ies. With regard to travel time to friends and relatives, the results show that respondents with children and female respondents seem to consider this factor more important than those without children and male respondents.

With regard to accessibility to the CBD and local shops, the results of the of the Mann−Whitney test show that respondents without children and respondents living alone seem to consider travel time to the CBD more important than those with children and respondents living with a partner/spouse. Respondents in their 20-ies seem to also consider it more important than those in their 30-ies and 40-ies. Furthermore, respondents in their 50-

ies and ≥60-ies seem to also consider this factor and travel time to local shops more important than those in their 30-ies. Respondents in their ≥60-ies seem to consider accessibility to local shops more important than those in their 40-ies. Respondents living in the CBD and inner suburbs seem to also consider accessibility to the CBD more important than those living in outer suburbs and other towns; and those living in outer suburbs seem to consider this factor more important than those living in other towns.

With regard to public transport accessibility, the results of the Mann−Whitney test show that respondents without children seem to consider walking time to the nearest public transport stop and bus frequency more important than those with children. Additionally, those in their 50-ies and ≥60-ies seem to consider both factors more important than those in their 30-ies, and respondents in their ≥60-ies seem to also consider bus frequency more important than those in their 40-ies. Furthermore, both accessibility factors seems to be considered more important by lower income respondents (household income of ≥$29K) than by higher income households (household income of $50K-$69K, 70K-$89K and ≥$90K). Respondents with household income of $30K-$49K seem to also consider these factors more important than those with income of $70K-$89K and ≥$90K. Interestingly, the results of the Mann−Whitney test also show that respondents living in outer suburbs seem to consider walking time and bus frequency more important than those living in other towns.

In Canada, residents living in neighbourhoods in outer-suburban areas often express their concerns over the length of public transport trips to the city centre (Grant, 2002). Additionally, residents living in mixed-use neighbourhoods in the outer suburbs of Auckland complain about the poorer level of service of public transport (Research Solution, 2001). From the point of view of the public transport provider, delivering a good level of service for public transport users living in outer-urban areas is considered not economically viable.

4.5. Location and type of development

Location (e.g. inner or outer suburbs) and type of neighbourhood (e.g. mixed-use or single-use) were included in the rating task, as they are related to mixed-use development. Table 6 shows that 82.2% and 83.8% of the respondents considered both factors very important or important, and less than 5% considered each of these factors very unimportant or unimportant. The results of the Kruskal−Wallis test (Table 6) show that the differences in the mean rank values of categories of socio-demographic characteristics were not statistically significant, implying that the rank scores were relatively similar across different categories of socio-demographic factors.

Table 6 Descriptive statistics for location and neighbourhood type: (a) Rating responses [N=247] and (b) Kruskal−Wallis Test (Asymptotic Significance)

a.Rating responses	Rating (%)					Q1	Q2	Q3
	VU	U	N	I	VI			
Location	0.4	3.2	14.2	54.7	27.5	I	I	VI
Type of neighbourhood	1.2	3.2	11.7	56.3	27.5	I	I	VI
b. Kruskal−Wallis Test (Sig)	**Child[1]**	**Sex[2]**	**Age[3]**	**Inc[4]**	**Spouse[5]**	**HLoc[6]**		
Location	0.087	0.904	0.159	0.668	0.767	0.770		
Type of neighbourhood	0.162	0.070	0.564	0.340	0.615	0.790		
VU, U, N, I, VI, Q1, Q2, Q3: See note in Table 2; [1,2,3,4,5,6] See note in Table 3. Details of the Kruskal−Wallis test results are shown in Appendix 3.								

Mixed-use development projects can take occur in inner-urban and outer-urban areas, in a city centre or in a ‘greenfield’ site. The location often determines the size of a mixed-use project and the suitable development approach (e.g. conserving the existing mixed-use settings, gradually and incrementally revitalizing the existing city or town centres, or systematically developing or redeveloping larger areas or plots) (Rowley, 1996). It has also been noted above that location can play an important role in people’s acceptance of higher-density living (Grant, 2002). Furthermore, at a city scale, urban environment can always be

considered mixed-use, although its quality may vary from one city to another (Rowley, 1996). Depending on which level of mixed-use is proposed, different mixtures of uses can be emphasized. For instance, within streets and street blocks, local grocery shops can be mixed with houses, while within districts, a more complex mixture of use must be carefully planned.

4.6. Other neighbourhood factors

Table 7 shows that neighbourhood factors were considered very important or important by many respondents, e.g. quietness and privacy (87.9%), neighbourhood safety (87.4%) and proneness to flooding (83.4%). In fact, these factors were perceived to be important by more respondents than the mixed-use factors. Furthermore, noise, the type of road in front of the property, the amount of traffic in the neighbourhood and air quality were considered very important or important by at least 70% of the respondents.

Table 7 Descriptive statistics for location and neighbourhood type: (a) Rating responses [N=247] and (b) Kruskal−Wallis Test (Asymptotic Significance)

b.Rating responses	Rating (%)					Q1	Q2	Q3
	VU	U	N	I	VI			
School quality	10.9	17.8	16.2	31.2	23.9	U	I	I
Natural views	1.6	8.5	35.2	34.0	20.6	N	I	I
Perceived neighbourhood safety	1.2	1.2	10.1	52.2	35.2	I	I	VI
Proneness to flooding	2.4	4.5	9.7	33.6	49.8	I	I	VI
Quietness and privacy	0.8	1.6	9.7	54.3	33.6	I	I	VI
The amount of traffic in the neighbourhood	0.8	6.1	16.2	47.0	30.0	I	I	VI
The type of road in front of the property (e.g. main urban roads, etc.)	1.2	5.7	16.2	47.0	30.0	I	I	VI
Air quality	0.4	4.9	24.3	49.4	21.1	N	I	I
Noise	1.2	3.6	17.4	49.0	28.7	I	I	VI
Travel cost to workplace	4.0	14.2	30.0	39.7	12.1	N	I	I

b. Kruskal−Wallis Test (Sig)	Child[1]	Sex[2]	Age[3]	Inc[4]	Spouse[5]	HLoc[6]
School quality	0.000	0.123	0.000	0.918	0.131	0.911
Natural views	0.028	0.505	0.036	0.607	0.920	0.009
Perceived neighbourhood safety	0.253	0.005	0.254	0.018	0.502	0.897
Proneness to flooding	0.083	0.417	0.047	0.930	0.040	0.317
Quietness and privacy	0.144	0.547	0.085	0.344	0.966	0.155
The amount of traffic in the neighbourhood	0.848	0.332	0.033	0.455	0.421	0.037
The type of road in front of the property (e.g. main urban roads, etc.)	0.556	0.893	0.305	0.021	0.627	0.173
Air quality	0.005	0.480	0.000	0.784	0.469	0.858
Noise	0.069	0.706	0.118	0.865	0.828	0.241
Travel cost to workplace	0.918	0.132	0.461	0.529	0.366	0.551

VU, U, N, I, VI, Q1, Q2, Q3: See note in Table 2; [1,2,3,4,5,6] See note in Table 3. Details of the Kruskal−Wallis test results are shown in Appendix 3.

The results of the Kruskal−Wallis test (Table 7) show that the differences in the mean rank values of categories of several socio-demographic factors were not statistically significant, implying that some of the rank scores differed significantly across different categories of socio-demographic factors. The results of the Mann−Whitney test show that school quality seems to be considered more important by respondents with children than those without. Furthermore, respondents in their 20-ies, 30-ies and 40-ies seem to consider this factor more important than those in their ≥60-ies. On the other hand, natural views and air quality seem to be considered more important by respondents without children; and by respondents in their 50-ies compared with those in their 20-ies and 40-ies. Respondents in their ≥60ies seem to also consider natural views more important than those in their 40-ies. Additionally, this factor seems to be considered more important by those living in other towns than those

living in CBD/inner suburbs and outer suburbs. This seems logical, as other towns surrounding Christchurch have beautiful sea or mountain views. Similarly, respondents in older age groups (50-ies and ≥60-ies) seem to also consider air quality a more important factor than those in younger age groups (i.e. 20-ies, 30-ies and 40-ies).

Females seem to consider neighbourhood safety more important than males. Additionally, respondents with household incomes of $50K-$69K, $70K-$89K and ≥$90K seem to consider this factor more important than those with incomes of $30K-$49K. Proneness to flooding seems to be considered more important by older age groups (50-ies and ≥60-ies) than those in their 30-ies. This factor seems to also be considered more important by respondents living alone, than those living with a partner/spouse.

The results of the Mann−Whitney test show that the amount of traffic in the neighbourhood is considered a more important factor by respondents in their 50-ies and ≥60-ies than those in their 20-ies. Furthermore, this factor is also considered more important by those living in outer suburbs than those living in the CBD/inner suburbs. The type of road in front of the property seem to be considered more important by respondents in higher income categories (i.e. $70K-$89K and ≥$90K) than by those with lower income levels of ≤$29K, $30K-$49K, and $50K-$69K.

The results suggest that to be successful, mixed-use development should address people's need to have quietness and privacy and to feel safe. This will provide a challenge, as a higher-density is often associated with less privacy and noisier neighbourhoods. Innovative design (and material) solutions might be used to reduce noise coming from the neighbouring properties and to address security and privacy issues. Design might also help generate synergies from various uses (e.g. placing restaurants near offices), and create a safe environment for children to play outdoors (Haarhoff et al., 2012).

5. Conclusions

This study aimed to investigate the liking of residents of Christchurch and its surrounding districts for living in a mixed-use neighbourhood. This was done by examining how people evaluate the importance of mixed-use and other neighbourhood factors when making decisions regarding residential properties to purchase and how pleased they would be to live near different land uses.

The results suggest that there is much to do to make mixed-use development an attractive option for the residents of Christchurch and its surrounding districts. Furthermore, the results also suggest that people's preferences for mixed-use factors and their liking for different activity types in a neighbourhood seems strongly correlated with their socio-demographic characteristics. For instance, the results suggest that accessibility to public transport (e.g. through the presence of bus exchange or bus stop and bus frequency) seem to be considered more important by lower income groups and the elderly. Accessibility to different activity locations seems to be important factor for many people when making house purchase decisions, with people having different socio-demographic characteristics considering certain activities more important than others. This highlights locations within the city that might be more amenable to mixed-use development. For instance, areas in inner or outer suburbs, close to good schools, might be more suitable for mixed-use development targeting families with school-age children. Further analysis should be done to identify the amount of time that people are willing to spend to travel to each of those destinations, especially by foot, bicycle and public transport. Density of development seems to be considered more important by high-income groups, whereas those with lower income seem to make trade-offs between density and accessibility. However, considering that most people seek to have quietness and privacy, mixed-use development projects should be designed more carefully to accommodate this need, e.g. through better architectural design and building materials that can reduce the noise coming from neighbours and passing traffic.

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Appendix 1
Kruskal−Wallis Test – Mean Ranks of Mixed-Use Factors

	Categories	N	Density	Diversity	Socio-demo status	Lower valued prop.	Higher valued prop.	TT to workplc.	TT to local shops	TT to school	Walking time to PT stop	PT freq.	TT to friends/ relatives	TT to CBD
Child [N=215]	No children	120	102.56	111.55	108.1	112.03	110.87	109.33	114.03	82.78	117.33	117.25	116.76	120.08
	With children	95	114.87	103.51	107.87	102.92	104.38	106.33	100.39	139.85	96.22	96.31	96.94	92.74
Sex [N=187]	Male	54	98.15	86.95	102.53	96.78	99.76	86.39	91.85	80.19	84.24	84.33	81.26	93.75
	Female	133	92.32	96.86	90.54	92.87	91.66	97.09	94.87	99.61	97.96	97.92	99.17	94.1
Age [N=212]	20-29 yrs	20	97.2	105.13	105.08	91.85	92.275	135.48	116.58	106.175	100.6	107.33	130.2	131.7
	30-39 yrs	56	95.61	100.45	105.91	94.5	98.26	103.94	89.06	129.5	85.18	80.1	105.86	84.72
	40-49 yrs	43	99.79	94.8	100.16	107.29	107.71	107.26	96.13	115.44	102.51	102.92	87.88	96.43
	50-59 yrs	43	120.38	115.72	102.57	118.87	105.43	112.08	115.41	101.48	119.35	116.9	105.33	117.16
	60-above	50	116.25	115.96	116.56	114.48	121.3	92.33	123.26	77.5	125.12	129.88	114.76	120.3
Inc [N=214]	≤$29K	15	80.13	122.77	92	115.9	114.17	107.9	140.97	110.1	153.17	151.73	134.17	130.83
	$30K-$49K	40	84.91	99.78	94.05	105.2	109.45	111.08	113.21	105.99	131.71	129.16	115.6	104.39
	$50K-$69K	33	109.18	99.68	104.59	100.52	99.36	108.2	105.18	113.68	108.98	113.67	107.73	112.39
	$70K-$89K	42	108.98	126.67	114.68	109.87	112.57	101.21	112.25	103.7	100.14	99.69	115.57	104.89
	≥$90K	84	121.74	101.94	114.23	108.65	106.04	108.6	97.34	107.23	90.91	90.77	94.76	104.2
Spouse [N=247]	Living with a spouse/ partner	180	128.76	122.86	124.2	123.77	127.5	123.3	122.45	128.76	120.71	120.39	119.3	117.83
	Living alone	67	111.2	127.05	123.47	124.62	114.59	125.87	128.16	111.2	132.83	133.71	136.63	140.57
HLoc [N=247]	CBD and inner suburb	42	119.27	136.15	140.15	120.49	102.89	133.81	130.46	119.15	123.71	118.65	121.31	151.01
	Outer suburb	158	120.08	121.11	122.53	127.53	127.16	121.21	128.3	126.56	130.95	132.65	130.21	123.71
	Other town/city	47	141.39	122.85	114.52	115.28	132.22	124.61	103.78	119.73	100.9	99.69	105.53	100.83

Appendix 2
Kruskal−Wallis Test – Mean Ranks of Activities/Land Uses

	Categories	N	Restrnt.	Bar	Clothing shop	Supermrkt.	Park	Playgrnd.	Office	E'ment. centre	School	Nursery/ day care	Bus exchange	Rail station
Child [N=215]	No children	120	109.28	115.24	107.27	110.57	104.75	90.56	111.48	113.53	87.24	96.05	111.52	110.72
	With children	95	106.39	98.86	108.92	104.76	112.11	130.03	103.61	101.02	134.23	123.1	103.56	104.57
Sex [N=187]	Male	54	109.28	115.24	107.27	110.57	104.75	90.56	111.48	113.53	87.24	96.05	111.52	110.72
	Female	133	106.39	98.86	108.92	104.76	112.11	130.03	103.61	101.02	134.23	123.1	103.56	104.57
Age [N=212]	20-29 yrs	20	133.15	141.08	110.25	132.28	96.7	117.4	120.6	128.15	108.13	107.55	112.58	112.15
	30-39 yrs	56	105.45	105.81	108.13	123.04	109.68	124	105.34	114.83	135.21	139.55	111.2	97.4
	40-49 yrs	43	104.92	104.8	105.8	84.63	100.67	108.99	109.1	101.84	109.85	94.17	110.44	117.43
	50-59 yrs	43	108.85	107.72	109.22	104.38	120.12	106.62	101.63	93.52	95.24	102.62	92.91	95.52
	60-above	50	96.36	93.85	101.44	98.3	100.16	80.3	104.11	103.68	80.5	83	107.11	114.47
Inc [N=214]	≤$29K	15	119.97	131.4	119.83	125.87	105.4	94.53	119.6	126.8	96.2	99.4	150.97	141.5
	$30K-$49K	40	102.44	107.35	121.59	112	83.06	95.8	106.81	114.35	111.83	111.03	123.1	119.8
	$50K-$69K	33	97.74	107.77	108.83	108.52	107.23	120.74	100.44	114.45	111.32	106.48	98.24	94.24
	$70K-$89K	42	98.58	95.85	93.56	116.76	109.86	114.13	101.18	104.65	109.5	110.23	101.57	103
	≥$90K	84	115.98	109.02	105.04	97.05	118.44	106.87	111.6	99.48	104.96	106.3	98.91	103.03
Spouse [N=247]	Living with a spouse/ partner	180	124.96	122.68	124.36	123.69	128.56	132.28	125.86	123.72	131.15	130.11	124.48	125.72
	Living alone	67	121.42	127.54	123.04	124.84	111.75	101.76	119.01	124.75	104.8	107.58	122.72	119.38
HLoc [N=247]	CBD and inner suburb	42	133.02	134.98	133.71	124.57	126.04	113.88	132.35	142.96	112.43	108.24	125.04	129.86
	Outer suburb	158	121.52	118.49	123.93	126.18	125.3	127.97	123.12	119.57	127.49	129.77	128.41	117.4
	Other town/city	47	124.28	132.71	115.56	116.17	117.82	119.7	119.51	121.94	122.61	118.68	108.23	140.95

Appendix 3
Kruskal−Wallis Test – Mean Ranks of Other Neighbourhood Factors

	Categories	N	Loc.	Neigh. type	School quality	Natural views	Safety	Flooding	Quietness/ privacy	Traffic	The type of road	Air quality	Noise	TC to workplace
Child [N=215]	No children	120	113.77	103.32	82.27	115.91	104.15	113.98	112.93	108.68	110.07	117.8	114.32	107.63
	With children	95	100.72	113.92	140.51	98.01	112.86	100.45	101.77	107.15	105.39	95.63	100.02	108.47
Sex [N=187]	Male	54	93.33	84.08	84.69	90.06	78.48	89.4	90.64	88.37	93.22	89.91	91.83	85.07
	Female	133	94.27	98.03	97.78	95.6	100.3	95.87	95.36	96.29	94.32	95.66	94.88	97.62
Age [N=212]	20-29 yrs	20	115.53	104.2	120.38	88.68	116.13	91.93	91.6	78.3	94.95	94.93	98.88	121.2
	30-39 yrs	56	99.85	111.17	129.96	104.13	115.7	94.64	98.97	98.46	95.95	86.85	94.07	106.02
	40-49 yrs	43	93.1	95.28	116.3	90.56	93.24	100.01	98.29	103.29	108.44	93.98	101.22	101.09
	50-59 yrs	43	110.5	105.53	99.24	124.87	109.35	120.08	122.64	118.57	111.31	126.19	118.49	115.36
	60-above	50	118.42	112.67	72.49	114.2	101.3	119.51	114.07	119.16	117.13	126.98	117.7	98.19
Inc [N=214]	≤$29K	15	106.3	103.57	109.7	113.73	113.47	101.37	122.1	92.6	83.23	110.97	107.5	119.9
	$30K-$49K	40	96.83	94.1	101.73	105.58	82.7	102.14	92.7	106.79	96	109.33	104.21	118.19
	$50K-$69K	33	107.86	112.14	106.38	93.17	118.06	106.52	105.09	95.91	91.67	98.14	102.36	108.11
	$70K-$89K	42	115.25	103.06	114.31	113.19	120.85	111.42	110.52	108.27	123.45	115	115.71	106.55
	≥$90K	84	108.78	114.98	106.89	110.09	107.42	109.58	111.38	114.67	115.55	105.94	106.98	100.43
Spouse [N=247]	Living with a spouse/ partner	180	125.26	123.27	128.07	124.27	122.32	118.78	124.11	126.08	125.25	122.14	124.56	121.61
	Living alone	67	120.62	125.97	113.07	123.28	128.51	138.02	123.72	118.43	120.63	128.99	122.51	130.41
HLoc [N=247]	CBD and inner suburb	42	117.83	130.04	121.95	109.61	120.26	131.49	112.05	100.05	108.67	119.02	116.19	132.24
	Outer suburb	158	125.47	122.12	125.42	120.06	124.23	125.65	123.04	129.15	124.85	124.66	121.92	120.58
	Other town/city	47	124.59	124.94	121.05	150.1	126.57	111.77	137.9	128.11	134.83	126.22	137.96	128.15