



**A literature review of social deprivation
and access to public & semi-public spaces
in the context of Auckland city centre**

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1 SOCIAL DEPRIVATION

Deprivation is a measurable 'lack of something'. Social deprivation, or relative deprivation, describes a state of observable and demonstrable disadvantage relative to the local community, wider society or nation to which an individual, family or group belongs (Townsend, 1987). Townsend distinguishes between material and social deprivation: "material refers to material apparatus, goods, services, resources, amenities and physical environment and location of life. Social refers to the roles, relationships, functions, customs, rights and responsibilities of membership of society and its subgroups" (Atkinson et al, 2014: 36).

Deprivation indices are a tool used to describe the population of a given geographic area, relative to other areas, from both social and material measures. These indices are used to determine the funding for health services, to inform population-based funding formulae (e.g. social services) and to describe populations and community groups for advocacy purposes (for extra resources and community-based services) (Atkinson et al., 2014).

1.1 DEPRIVATION MEASURES AND DESCRIPTORS

International research measures and indexes social deprivation in a few different ways. Table 1 summarises literature which apply concepts or indices of socioeconomic disadvantage, neighbourhood disadvantage or area deprivation. Some studies use composite multi-dimensional scales or separated indicators of socioeconomic status. Table 1 also notes the dimensions used in each study to measure or describe disadvantage or deprivation - including two NZ studies - to allow the comparison of NZ deprivation indices against international norms. Fu et al (2015a: Table 1) provide a similar table of definitions and deprivation indicators for a comparison between NZ, Canada and the United Kingdom deprivation indices.

Attar et al (1994) coined the term neighbourhood disadvantage to describe a group of neighbourhood indices, including poverty or income, education levels, employment, household headship and housing. Social economic status (e.g. Santiago et al, 2011) or neighbourhood socioeconomic disadvantage (e.g. Li & Liu, 2016) are terms that specifically describe the economic dimensions of communities. However, social deprivation relates to more than just socioeconomic status; disadvantage dimensions can include social, economic and environmental (structural/contextual) measures as well.

Table 1: Summary of socioeconomic disadvantage dimensions used in the literature.

	Neighbourhood socioeconomic disadvantage dimensions					
	Wealth Household income	Employment / Occupation	Headship of household	Education	Housing	Other
Li & Liu (2016)	Y (wealth)	Y (occupation)		Y	Y	
Jones-Webb & Wall (2008)	Y (median household income)	Y (unemployment)	Y (female)	Y (low educational attainment)		
Kim (2010)	Y (poverty)		Y (female)			
Grow et al. (2010)	Y (median household income)		Y (single-parent)	Y (adult female)		Race

Turrell et al. (2010)	Y (household income)	Y (occupation)		Y	Y (living arrangement)	
Singh & Ghandour (2012)	Y (household poverty status)			Y (parental education)	Y (poor or dilapidated)	Presence of litter, vandalism
Santiago et al (2011)	Y (low income / poverty levels)	Y (unemployment)		Y (attainment)		Residential mobility
Hackman et al (2012)	Y (below poverty rate)	Y (unemployed rate)	Y (female-headed household with no spouse)	Y (parental education)		Receiving public assistance, density of under 18-year olds
Attar et al (1994)	Y (poverty)	Y (unemployment / underemployment)			Y (substandard housing)	Limited resources, high crime rates
Brown et al (2013)	Y (income AND wealth)	Y		Y		
Alvarado (2016)	Y (median income AND poverty threshold)	Y (proportion of managers & professionals AND not in labour force proportion AND unemployment rate)			Y (median housing value)	
Shih et al (2013)	Y (neighbourhood poverty, mean income)	Y (mean unemployment)		Y (mean levels of education)	Y (crowded housing)	
Hughey et al (2016)	Y (percent below poverty threshold)	Y (percent unemployed)		Y (percent less than high school educated)	Y (percent of renter occupied housing)	Proportion of racial/ethnic minorities
Akresh et al (2016)		Y (unemployed males aged >16)	Y (female)	Y (without a high school degree)		Public assistance (e.g. welfare)
Weng et al. (2016)	Y (income)	Y (employment)		Y (education)	Y (housing)	Population structure (demography)
You (2016)	Y (income)	Y (occupation)		Y (education)	Y (housing arrangements)	Demographic structure
NZDep (Atkinson et al, 2014)	Y (income threshold, and benefit)	Y	Y (single-parent family)	Y (qualifications)	Y (home ownership, living space)	Communication , Transport

IMD (Exeter et al, 2017)	Y	Y		Y	Y (rental status, overcrowding)	Health, Crime, Access to services
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Social deprivation measures are widely used for public health related research, and some studies included in Table 1 relate social deprivation to urban parks and green spaces. However, there is limited research which directly relates urban public spaces and semi-public spaces to social deprivation.

Table 1 includes two New Zealand social deprivation indices NZDep and IMD. These indices describe area-level deprivation using different combinations of social, economic and environmental dimensions. They NZDep and IMD are generally comparable to other measures of social deprivation used in other countries. Dimensions or factors not included in the NZ measures include female-headed households, educational level of adult female, housing quality/condition, race or ethnicity.

1.2 SOCIAL DEPRIVATION IN NEW ZEALAND

NZ Social Deprivation Index

The NZ Social Deprivation Index (NZDep) has been the universal measure of area-level social deprivation in New Zealand for the last 20 years (Exeter et al, 2017). The latest index, NZDEP 2013, was developed by the University of Otago used the 2013 census data (Atkinson et al., 2014). NZDep measures relative area deprivation against nine dimensions (Table 2) for census mesh-block areas. A deprivation scale of 1-10 is used to categorize the level (%) of deprivation present in that community. Deprivation scores for Auckland city centre are shown in Figure 2. The NZDep dimensions are each weighed between 0.28 and 0.37 (Table 2), which represents their influence on the overall decile score. It is important to understand that the NZDep index is only a partial or proxy measure of social deprivation. Also, it is a relative measure from the least deprivation to the most deprivation. Area-based measures of deprivation are more likely to reflect aspects of the physical and social infrastructure of communities than a single variable measure, such as income (White et al., 2008).

A social deprivation index describes some factors that contributes to socioeconomic position. It should be noted that the NZDep only considers people aged 18-64 – that is, some sectors of society are excluded. A means-tested benefit does not include superannuation, student allowances or unemployment benefits. Since 2006, access to the internet has superseded access to a telephone as the measure for communication (Atkinson et al, 2014).

Figure 2: NZDep 2013 for Auckland Central

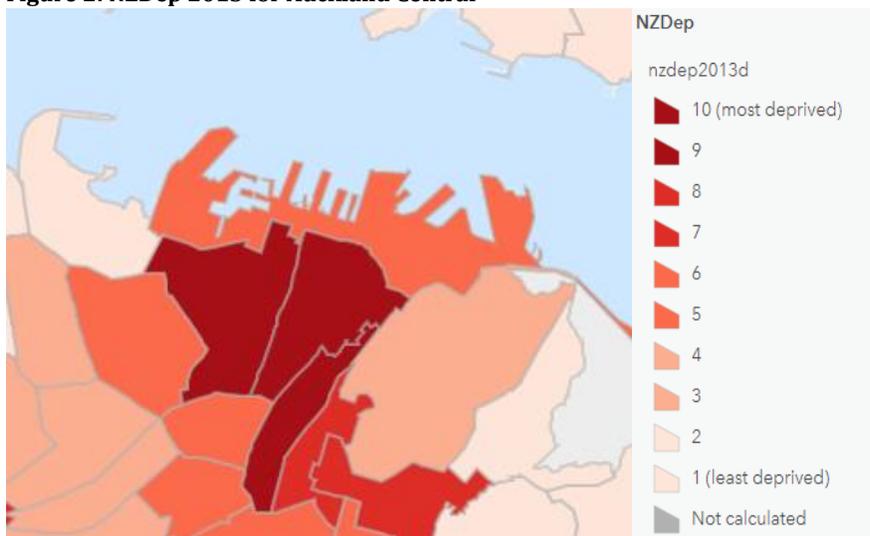


Table 2: Deprivation dimensions used for 2013 NZDep (Atkinson et al., 2014: 26)

Variable	Description	Weighting
Communication	People aged <65 with no access to the Internet at home	0.372
Income	People aged 18-64 receiving a means tested benefit	0.364
Income	People living in equivalised households with income below an income threshold	0.356
Employment	People aged 18-64 unemployed	0.338
Qualifications	People aged 18-64 without any qualifications	0.332
Support	People aged <65 living in a single parent family	0.317
Owned home	People not living in own home	0.322
Living space	People living in equivalised households below a bedroom occupancy threshold	0.303
Transport	People with no access to a car	0.286

NZ Indices of Multiple Deprivation

In 2017, the University of Auckland developed another measure called the NZ Indices of Multiple Deprivation (IMD). This measure provides more fine-grained data about deprivation in NZ communities due to a smaller data zones with an average population of 712 (Exeter et al., 2017). To measure forms of disadvantage, IMD uses data from government departments, 2013 census data and methods comparable to current international deprivation indices. It is comprised of 28 indicators grouped into seven dimensions of deprivation: Employment, Income, Crime, Housing, Health, Education and Access to services (Figure 3). Each dimension has a calculated weight, the proportional influence for each dimension, and the domain score and weight are applied across all dimensions to determine the IMD score for a population. The IMD presents social deprivation in quintiles where Q1 is least deprived and Q5 is most deprived. Figure 4 shows the IMD scores for Auckland city centre.

Aside from the resolution of the data, the primary differences between NZDep and IMD is in the different dimensions considered. Both indices include dimensions of income, employment, education and housing. IMD also incorporates a dimension for health, crime and access to services (such as GP, A&E, service stations and schools). The IMD domain ranks show that these additional dimensions included in the IMD have a lower influence on overall deprivation scores (2% access, 14% health and 5% crime). NZDep includes the dimensions of transport (access to a car) and communication (internet access). The IMD dimensions with the highest rank (28%) were employment and education, followed by income (14%) and housing (9%).

Figure 3: An overview of the New Zealand Index of Multiple Deprivation

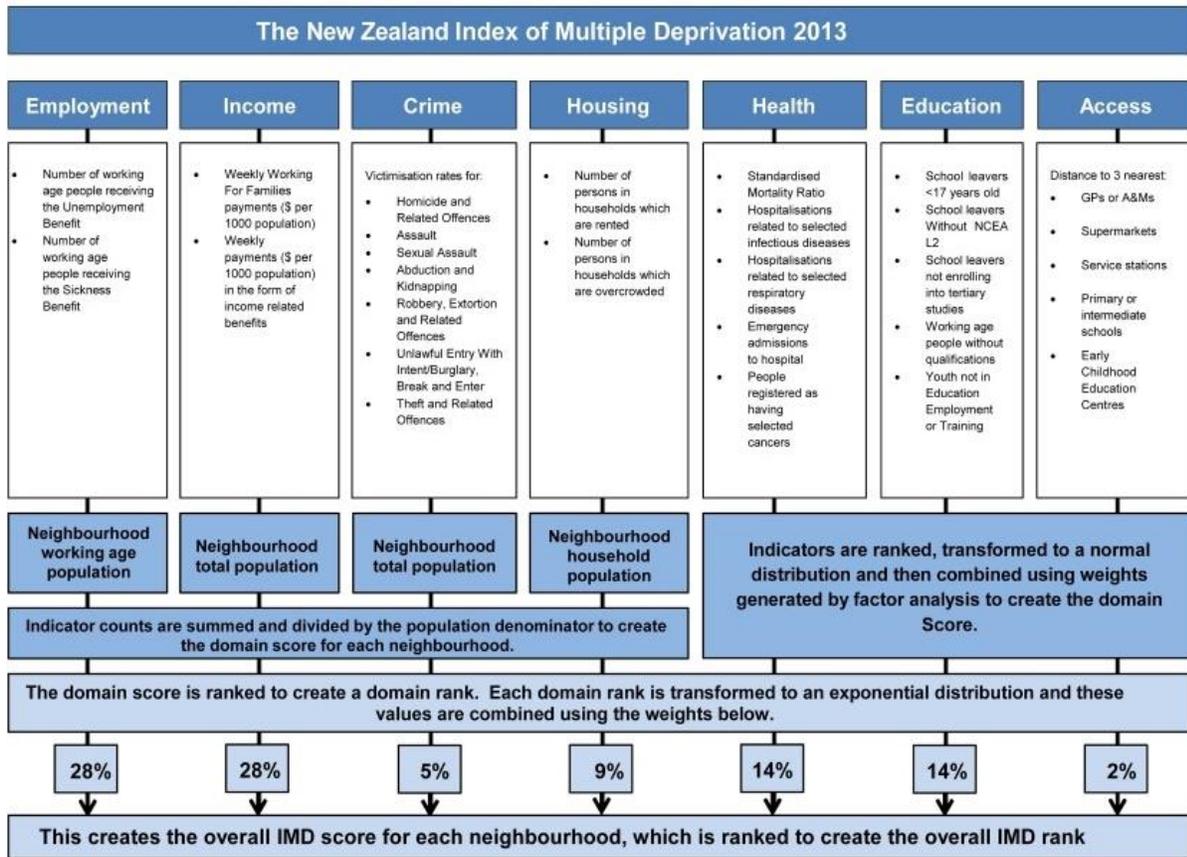


Figure 4: NZ IMD 2013 for Auckland Central



1.3 SOCIAL DEPRIVATION IN AUCKLAND'S CITY CENTRE

The 'Give us space' NSC11 project is interested in three areas, one of which is the Auckland central area. This paper focuses on the city centre area, which is a subset of the Waitemata Local Board (WLB). It consists of three census areas – Auckland Harbourside, Auckland Central East & Auckland Central West - that form a unique population when compared to the rest of Auckland.

The following demographic data is from the 2013 census, and relates to the city centre and wider WLB area (RIMU, 2014):

- 66.6% of residents in WLB were employed, which is above the Auckland average of 61.5%.
- Median personal (\$34,700) and household (\$80,000) income for adults in WLB were greater than the Auckland median incomes (\$29,600 and \$76,500).
- For education, 94.3% of adults in the WLB area have a formal qualification. Of those, 28.7% had a bachelor's degree or an equivalent Level 7 qualification. In Auckland only 17% of adults had a bachelor's degree or Level 7 qualification.
- Home ownership in Auckland (including properties held in trust) is 61.5% on average. WLB home ownership is 39.1% (16% who owned it in a family trust) and 19.4% in the city centre area.
- Home ownership in the WLB area declined from 44.2% to 39.1% in line with long-term trends, since the 2006 census.
- Households in WLB are predominantly one-family households (51.5%), compared to 69.8% of households across Auckland. (This includes single-parent families.)
- The second most prevalent household type, one-person households, was 30.7% for Waitemata, and 36.0% for the city centre.
- Other multi-person households, such as flats, were more prevalent in Waitemata (16.5%) and in the city centre (22.9%) compared to Auckland (5.2%).

Table 2 summarises NZDep data and processed IMD data for the three census area units for the WLB area: Auckland Harbourside, Auckland Central East and Auckland Central West (Exeter et al, 2017). The IMD decile scores for each dimension were extracted from a raw data file, compiled, averaged and rounded to integers to creates decile scores equivalent to the three census area units. Data processing and mapped scores for IMD dimensions are attached in Appendix 1. The IMD deprivation maps highlights the fine-grained variability of social deprivation scores within Auckland's the city centre.

Table 2: Summary of deprivation decile scores for Auckland Central Areas

IMD raw data scores are deciles, but total scores are mapped as quintiles

Census area unit	Auckland Harbourside	Auckland Central East	Auckland Central West
NZDep: Total Decile	6.0	10.0	9.0
NZ IMD: Employment	5.0	4.0	5.0
NZ IMD: Income	3.0	2.0	3.0
NZ IMD: Crime	9.0	8.0	8.0
NZ IMD: Housing	10.0	10.0	10.0
NZ IMD: Health	2.0	2.0	4.0
NZ IMD: Education	3.0	1.0	3.0
NZ IMD: Access	1.0	1.0	1.0
NZ IMD: Total Decile (Quintile)	5.0 (Q2)	4.0 (Q2)	6.0 (Q3)

1.4 DATA SUMMARY

For the Auckland city centre, with consideration for both the IMD and NZDep measures, we make the following conclusions:

- Across the city centre, education, income and access are in the least deprived category (IMD 1-3).
- Access ranks in the least deprived (IMD 1) in the city centre across all areas.
- Across the city centre, housing is the most deprived category (IMD 10). (The housing domain of IMD incorporates rental status and overcrowding as measures of deprivation, similar to NZDep.)
- Aside from in the central west area (IMD 4), health registers in the least deprived categories (IMD 1-3).
- With IMD, Auckland central west area is the most deprived out of the city centre area (IMD 6), particularly for crime and health. While under NZDep, the central east area is the most deprived (NZDep 10).
- NZDep suggests higher social deprivation in the central East and Central West areas, than IMD.
- While general indices rank Auckland Harbourside area (NZDep 6) as less deprived than other areas in the city centre (NZDep 9-10), however it is within the most deprived categories for crime (IMD 9) and housing (IMD 10).

The Auckland Central East and Central West populations are among the most deprived in New Zealand under NZDep (score 9-10), and are most deprived under some IMD dimensions (crime, housing) however the overall IMD quintile deprivation scores for these areas are mid-range.

The NZDep dimensions of communication (access to the internet) and home support (single-parent family) are not included in the IMD measure. Finer-grained data is not available to understand the impact of these dimensions on the overall NZDep scores (though relative dimension weightings are even, Table 1). As such, we have included communication (access to the internet) and home support (single-parent family) in this literature review, to consider how it contributes to social deprivation and how it might interact with public and semi-public space access in Auckland city centre.

A parallel literature review was done for health and access or availability to public spaces. While health is one dimension of social deprivation in the Auckland city centre area, to avoid repetitions health has not been a focus of this literature review. However, when linking social deprivation and public spaces, health (particularly mental health) often arises as an intermediate factor that mediates the interaction and association between the two. As such, associations with health are included as and where relevant.

NZDep, which considers access to a car as a measure of deprivation, might not truly reflect the mobility and accessibility that living in the city centre provides due to agglomeration, density and walkability (Mehrnaz & Lawrence, 2017). City centre residents can walk or use public transport to access services. Access to a private car is not critical to access core amenities and services. Thus, lack of access to a car may not contribute to higher social deprivation for city centre residents as it might do for other New Zealanders. However, poor transportation conditions can lead to spatial polarization in which lower income groups in peripheral areas face challenges to access quality services and facilities (Sabatini & Brain, 2008). Thus, accessibility by whatever mode is an important indicator of social equity (Lucas, 2012). For the Auckland city centre, access (distance to services) is not ranked among the most deprived quintiles with IMD. As such, the dimension of access, or transport disadvantage, is not included in this literature review into social deprivation and public spaces.

The Auckland city centre population is highly educated compared to wider Auckland. From social deprivation scores, education is ranked among the most deprived quintiles with IMD. As such, the education dimension is not included in this literature review into social deprivation and public space access.

Also, although crime scores high with IMD in the Auckland city centre, it has a low domain rank (5%) and thus very small influence over the general IMD quintile scores for social deprivation. NZDep does not include crime as a dimension of deprivation. Very few social deprivation or disadvantage measures include crime as a dimension: only Attar et al, 1994 (Table 1). IMD compiled dimensions that measured different forms of deprivation as directly as possible (Exeter et al, 2017). We consider that either crime is understood as a minor contributor to social deprivation or in fact it is more of a symptom than a cause (i.e. indirect)? For these reasons, the crime dimension was not explored for this literature review into social deprivation and public spaces.

Area-based measures of deprivation are more likely to reflect aspects of the physical and social infrastructure of communities than a single variable measure, such as income (White et al., 2008). So there is value at taking a holistic view of communities through social deprivation indices. We want to understand the impacts and interactions of social deprivation with access to semi-public and public spaces in Auckland city centre neighbourhood. This literature review takes the broad view, then focuses on four dimensions linked to higher levels of deprivation (high IMD and NZDep scores) in this area. This focused approach aims to give insight into how these social deprivation dimensions interact and influence public space and semi-public space access.

2 METHODOLOGY

The focus of this literature review is social deprivation and how it may affect access and availability to public and semi-public spaces. We consider social deprivation through four dimensions of particular interest for Auckland city centre. These dimensions are:

- housing overcrowding
- rental status
- communication (access to the internet)
- home support (single-parent families)

Databases searched include Engineering Village, Google Scholar, Science Direct and Urban Abstracts. Key words included public space, open space, semi-public space, public amenity, neighbourhood amenity, communal space, and built environment. To capture literature about social deprivation, we used similar terms like social disadvantage, neighbourhood disadvantage, socioeconomic disparity, concentrated disadvantage and area deprivation index, as well as key words like poverty, society, socioeconomic status. This literature search focused on papers from the last 5 years, 2013-2018, but included older sources where relevant. Key words by topic are summarised in Table 3. Key words such as Auckland, New Zealand, city centre, and inner city were applied to narrow the search and find local studies where relevant.

Table 3: Literature review key search words for dimensions of social deprivation

Topic	Keywords
Renting (Housing)	Rental status, private rental sector, home ownership, housing tenure, social housing, state housing, rental accommodation, rental dwelling
Overcrowding (Housing)	Crowding, overcrowding, bedroom occupancy threshold, living arrangement, crowded house, living space, multi-person households, apartment, environmental stress(or)
Single-parent families	Household headship, home support, sole-parent, single-parent, single mother, single father
Internet Access	Communication, social media, web access, internet access, WiFi, internet, ICT

The perspective of this review seeks to understand the implications of social deprivation for the Auckland city centre neighbourhood. Demographic information comes from the latest census in 2013. For any further study, we recommend using the 2018 census data and deprivation indices (once available). The city centre is in a

period of significant growth and change and so the critical dimensions of social deprivation in the city centre may change over time.

3 LITERATURE REVIEW

The city centre residential population has grown from less than 2,000 in 1991 (Friesen, 2009) to over 50,000 in 2013 (RIMU, 2014). As this population continues to rise, access and provision of public space for city centre residents becomes increasingly limited. It is important to distinguish here the difference between public open spaces, such as green spaces and beaches, and our focus on inner urban public spaces, such as pocket parks, civic plazas and squares. The 'bonus floor space' policy has provided Auckland city centre residents and visitors some public or semi-public spaces in exchange for additional floor areas for private developments. This policy was widely used in the 1980s and 1990s in Auckland. However, the quality and accessibility of these so-called 'public spaces' is contested. Corporate entities manage these public spaces, so that the use & patronage and opening hours of these 'public' spaces are limited, directly or indirectly.

Community advocacy groups such as Splice, in Auckland's city centre, are interested in how different members of the city centre community experience and access public spaces. They are aware that many apartment buildings in Auckland also lack 'bump spaces' for residents and neighbours to interact and build social bonds. Serendipitously 'bumping into someone' is reported as the most common way for apartment dwellers to interact (Foth & Sanders, 2005). Where private and semi-public environments are lacking, public spaces function as valuable 'living room' areas for local residents to relax, meet and interact. This literature review considers how those social deprivation dimensions ranked as 'most deprived' for Auckland city centre influence access to public spaces for this inner-city population.

3.1 SOCIAL DEPRIVATION INDICES

Social deprivation indices in New Zealand are used to understand socio-economic inequality, which informs research, resource allocation, and advocacy for the benefit of vulnerable communities. In New Zealand NZDep (Atkinson et al, 2014) and IMD (Exeter et al, 2017) are two deprivation indices currently used. Census data informs the dimensions used in area deprivation measures and so measurements of deprivation are constrained by both the construction of census questions and also the government interests in socio-demographic statistics. Fu et al (2015a) critique how census data and census questions are formed which may limit opportunities to assess social deprivation at a neighbourhood level. Further, many of the dimensions incorporated into area deprivation indices tend to be proxies for material deprivation and are less representative of social deprivation (Fu et al, 2015a).

From a political ecology perspective, Fu et al (2015a) raise another question about whether current deprivation indicators are actually meaningful for all ages and minority groups in the NZ population. Their paper argues that current measures of deprivation are implicitly Euro-centric and exclude minority groups based on gender, age and culture (Fu et al, 2015). For age, NZDep excludes people aged below 18 years old or those ≥ 65 years old (Atkinson et al, 2014). Furthermore, Fu et al (2015a; 2015b) propose that studies of deprivation and inequality would benefit from a greater understanding of power relations and processes, in order to inform social justice responses.

While social deprivation indices consider objective or quantifiable well-being indicators, Crothers et al (2017) raise the matter of subjective wellbeing indicators. They are a key tool for political social responsibility that stands beside fiscal responsibility, to show the (in)efficacy of government policies in society. Subjective well-being has three dimensions - life satisfaction, emotional well-being (affect), and eudaemonics (meaning & purpose) (Crothers et al, 2017) - which relate to various domains also, including material living conditions, leisure & social interactions, natural and living environment, health and economic and physical safety (ibid).

We can discern from these characteristics that subjective wellbeing indicators could contribute to the body of knowledge related to the built environment, public space access and social deprivation. New Zealand currently doesn't have a one overarching social wellbeing measure in action, though there are some active frameworks which cover individual geographic areas or life domains - Crothers et al provide a comprehensive list (2017; p. 5). The Ministry for Social Development 2016 'Social Report' Social Indicator Framework is a good starting point, however more work is needed to streamline existing frameworks to provide an indicator that could be viable and useful long-term (Crothers et al, 2017). The New Zealand Planning Council has done some work in this space (ibid). For example, in 2002, the Local Government Act was amended to include social, economic, environmental and cultural well-being – however this was removed in 2012.

For this study, we are limited to the current social deprivation indices based on the Townsend model (1987) and 2013 New Zealand census data.

3.2 SOCIAL DEPRIVATION AND PUBLIC SPACE ACCESS

There is some interesting work from the Netherlands which considers diversity and socioeconomic differences as they relate to neighbourhood public spaces, social relations and community life. A study from Utrecht University refutes the dominant view that social cohesion in diverse, deprived areas is low (Tersteeg & Bolt, 2018). Looking at a diverse and deprived neighbourhood in Rotterdam – Feijenoord (also Feyenoord) – this study found that residents connected socially on many levels, such as by household type, ethnicity or lifestyle. Different income groups in mixed-income neighbourhoods saw each other in local public spaces, but they rarely met or developed positive connections beyond that (Tersteeg & Bolt, 2018). The observation in Feijenoord was that different income groups commonly used different neighbourhood spaces. Language barriers turned out to frustrate interpersonal communication, to make people feel excluded in semi-public and public spaces, leading to feelings of frustration between nearby neighbours (Tersteeg & Bolt, 2018): many Feijenoord residents of poor socioeconomic background are migrants who don't speak Dutch. Peterson's work in the same neighbourhood (2016) highlighted the value of weak social ties and fleeting encounters in semi-public spaces such as the library or community centre. These weak ties have collective social benefits to life in Feijenoord, and contributed to people feeling more accustomed to diversity, developing light or deeper relationships, and feeling 'at home' and safer in their neighbourhood (Peterson, 2016). An earlier study by Pinkster (2014) observed how in deprived restructuring neighbourhoods (lowest tier of Dutch housing market), such as Feijenoord, middle-income residents disaffiliated themselves from the neighbourhood and strategically avoided local public spaces. Watt described this as an 'exclusionary spatial strategy' (2006, cited by Pinkster, 2014).

Auckland city centre is a diverse and seemingly deprived neighbourhood, though quite different from Feijenoord. However, the studies of Feijenoord raise the question: do similar situations and interactions occur in Auckland city centre, around public and semi-public spaces? A study of neighbourhood spaces in Auckland city centre could provide insight about how different economic groups or households use public spaces, and relate to one another. To counteract the segregation of social networks based on income, Tersteeg & Bolt (2018) identify the need to facilitate inclusive meeting spaces. In Feijenoord, local schools, community centres and sports clubs already function to connect diverse people, while mostly those connections are within a low-income individuals. The frustrations of a language barrier are likely a reality for city centre residents in Auckland. In the Waitemata Local Board area, 97% of people spoke English, and over 3% spoke Sinitic, Northern Chinese, French or Korean (RIMU, 2014). Multi-lingual signage or other language support for recent migrants could improve the social environment of public and semi-public spaces in 'hyper-diverse' contexts such as Auckland city centre.

One New Zealand study found an association between increasing area-level deprivation and improved access to some public spaces such as parks and recreational centres, but no such association for beaches (Pearce et al, 2007). While Witten et al (2008) found no link in their study between neighbourhood access to public open

space and physical activity in New Zealand, after controlling for neighbourhood deprivation. Both studies consider public open space through a health lens, with consideration for social deprivation, which demonstrates a theme observed throughout this literature review: health factors seem to be an intermediate factor between social deprivation and public spaces access. This is particularly the case for housing. Studies with direct links between deprivation and public spaces, or consideration of the two exclusive of health factors is uncommon in the literature. As such, this literature search seeks to extend the body of knowledge about the interactions between social deprivation and public space access. As previously mentioned, we take a topical perspective on social deprivation to unearth interactions and impacts of specific dimensions of deprivation on public spaces access: crowding, rental status, communication (internet access) and home support.

3.3 CROWDING

Both IMD (Exeter et al, 2017) and NZDep Atkinson et al, 2014) included household crowding as a dimension of social deprivation. Similarly, the UK Townsend index (1987) and Carstairs & Morris index (1991, as cited by Fu et al, 2015a) include household overcrowding as a deprivation indicator. The subject of housing overcrowding (synonymous with crowding) refers to household occupancy exceeding capacity or under-sized housing. Crowding also relates to privacy, housing affordability, culture or ethnicity and the wider consideration of housing density. NZ social deprivation indices employ the Statistics NZ (2018) definition of crowding: a situation where the number of people living in a household exceeds the capacity of the household to shelter and service the occupants adequately. This includes the need for each adult (excluding couples) to have a separate bedroom. Children under five may share a bedroom (no more than two), or children under 18 of the same sex may share a bedroom. Thus, overcrowded households are those that would require one or more extra bedrooms to accommodate occupants adequately, based on the relationships between household members and their ages (Exeter et al, 2017). Conversely, by comparison, Nigeria has no formal definition of crowding (Adebayo & Iweka, 2016) while in Norway crowded housing is defined as either living in a one-room flat or living in a dwelling where the number of rooms (not counting kitchen and bathroom) are lower than the number of members in the household (Nordvik, 2015). Overcrowding, or crowding of the private home, typically weighs higher in deprivation indices than other housing-related measures like rental status (Exeter et al, 2017).

Beyond the home, and crowding as dimension of social deprivation indices, the literature also considers crowding in public contexts. Both public and private crowding can interfere with privacy through what Park & Evans describe as an 'over achieved social interaction' (2016: p. 455). Domestic crowding statistics inform social and urban planning policies, relating to planning of services, amenities and the allocation of resources. This reflects our societal value for privacy and a space for personal 'retreat' as well as the known or assumed association we hold with wellbeing and personal 'space' (Park & Evans, 2016). Beyond formal definitions of crowding, a number of studies also use a 'perception of crowding' or 'perceived crowding' measure to understand housing stresses and impacts. Perceptions of crowding demonstrate noticeable differences at the intersections of gender, age or socioeconomic constraints (which prevent some from finding more suitable housing) (various cited by Campagna, 2016: p. 253).

In 2013, about half of New Zealand's crowded homes were in Auckland (Goodyear & Fabian, 2014). Of that population, people aged 20-24 were most likely to live in a crowded house, especially among Asians of that age (ibid). This statistic is relevant to the city centre area, with a lower median age (30.4yrs) and higher Asian population (53.3%) than the rest of Auckland (RIMU, 2014). The proportion of crowded households in Auckland has risen since 1991, and Waitemata (city centre area) has seen the greatest increase: from 6.5% to 9.2% in 2013 (Goodyear & Fabian, 2014). While most crowded homes are in the south Auckland region, Waitemata is the eighth most crowded Local Board area in Auckland. Local research and NGO data suggest that crowding in Auckland is severely underestimated (Rankine, 2005). Auckland Regional Public Health Service reported that "the most crowded households are often the most reluctant to tell officials about their living arrangements, especially if they include over-stayers and illegal immigrants" (Rankine, 2005: 18).

Ethnicity and culture are important to consider in the context of crowded housing. Goodyear and Fabian's report (2014) on Auckland housing trends found that ethnicity was the most important factor to explain differences in crowding. Consistently, Pacific peoples experienced the highest levels of crowding, regardless of age, with further variances between specific Pacific ethnic groupings. Past studies have shown how the perception and acceptable levels of crowding can differ between various cultural groups too (Rapoport, 1975). Compared to Auckland studies, Adebayo & Iweka's study (2016) of household crowding in Lagos, Nigeria found no significant correlation between the extent of crowding and the ethnicity of the household head. Policy makers and housing authorities in Nigeria struggled to define or control what constitutes proper or acceptable sleeping arrangements, because this varies so widely among households' ethnic and cultural identifications. The crowding dimension of deprivation may also reflect different kinship structures and kin obligations among low-income, non-European families (Pene et al., 1999 as cited by Fu et al, 2015a), which appear as 'deprived' from the Eurocentric nuclear-family framework of deprivation indices (Fu et al, 2015). Pacific families often have obligations to accommodate extended family members when or if they need a place to stay. But, the built environment and the typical design of housing in New Zealand is not suitable for large families. House designs have largely focused on accommodating 'nuclear' family structures, which create overcrowded situations in Pacific communities such as Tokelau families. In Tokelau, homes are generally open, single room dwellings that accommodate multiple 'nuclear' families (Pene et al, 1999 as cited by Fu et al, 2015a). Another critique of deprivation indices related to ethnicity pertains to the definition of a household. In a three generational household in New Zealand - common in Pacific communities - grandparents are treated as a separate family unit (Atkinson et al., 2014). Again, this privileges the nuclear family structure (Fu et al, 2015a). In Auckland city centre, the diversity of the population and high deprivation related to crowding measured by IMD, for example, suggests there is value in first considering ethnic and cultural norms for housing before applying crowded housing or social deprivation to policy development.

Overcrowding also relates to the size and space within a dwelling. Yoman & Akerhurst's study (2015) 'The housing we'd choose: Housing preferences, choices and trade-offs in Auckland' found that survey respondents put significant importance on dwelling size. Furthermore, respondents were willing to trade off location in favour of having a dwelling of acceptable size, even if this was an attached housing unit or apartment (Yoman & Akerhurst, 2015). Internal space standards for high density living vary between countries. The Auckland Design Manual (2018) says that bedrooms should be designed for "two people per bedroom, as well as their fittings and furniture" to comfortably accommodate sleeping, reading, computer use and clothes storage for up to two people. For example, a 3.2m minimum dimension provides space in a bedroom for additional furniture and various room layouts (Auckland Design Manual, 2018). However, the Auckland Design Manual is a non-statutory document, which means that there is no requirement for developers to comply with these design standards.

The spatial design of living environments, including elements related to crowding, influence health among residents. Chambers, Banfa and Machry's (2018) study in the Bronx, New York looked at the influence of apartment units space on daily life, activities and interactions among residents. The preliminary study (Banfa & Chambers, 2014), while not conclusive, suggested that in crowded apartments, where there is lower interconnectivity, residents could be more likely to participate in sedentary activities if, for example, sedentary activities represent social interactions (e.g. playing cards, watching TV). Because of this link to sedentary activity, crowding is also associated with obesity (Chambers et al, 2010). The more recent study found a significant association with depressive symptoms among low-income Hispanic/Latino women living in circulation-centred apartments (where central rooms were lobbies or corridors), compared to living-centred apartments and regardless of household type (Chambers et al, 2018). No particular association with apartment layout was found for male residents in this community. This study suggests that female residents may be more likely to rely on social support to counter depression. That is to say, the communal living rooms in circulation-centred apartments would be more isolating, with fewer opportunities for unplanned social interactions (Chambers et al, 2018). In the same area, Evans and colleagues (1996) studied apartment layout in low-income

housing and impact on depressive symptoms. They found a moderate association between room depth and crowding & stress. However, this relationship was balanced by behavioural coping mechanisms, like social withdrawal, that people adopt to deal with crowding and to achieve retreat and privacy.

In the city centre, more families are choosing to live in apartments because they are more affordable compared to the traditional stand-alone home (Carroll et al, 2011). But there are drawbacks to high-density living, such as poor-quality apartment design and lack of play space for children, both inside and outdoors (ibid). Among medium-density housing in Auckland, Gray (2013) found that the most important form of outdoor space for residents was private outdoor space (compared to public outdoor space). If we extrapolate this to high-density living, this could include balcony areas (private), and semi-public communal spaces such as rooftops, courtyards and lounge areas.

Housing affordability is a significant issue in Auckland, which is linked with overcrowding. 'Alatini found a relationship with our "unaffordable housing market and the overcrowding of households" in his thesis on the Tongan community in Otara (2004: 133). Multi-person households are most prevalent in the city centre compared to the rest of Auckland (RIMU, 2014). For renters, particularly multi-person households, they can achieve a more affordable living arrangement with more people in the household: but, this creates crowding (Statistics NZ, 2013). While people might choose to live in crowded homes to save money, this choice has consequences such as lack adequate privacy, psychological stresses, or obesity risks (as previously discussed).

Crowding is an environmental stressor that causes psychological stress in both private and public contexts. Despite varying cultural norms and perceptions of crowding, the same amount of physiological stress from crowding occurs among different ethnic groups, regardless of whether or not they perceive themselves as crowded (Lepore et al, 1991; Evans et al, 2000a). One study has found that stress experienced from crowding is the same regardless of household income also (Evans et al, 2000b). Campagna (2016) linked stress in the crowded home environment to a lack of retreat and inadequate home comfort. The ability to escape from environmental stressors can be especially pertinent for those who live in a crowded house. Fewer accessible outdoor spaces and opportunities for solitude in multi-dwelling units intensify crowding effects and induce more undesirable and uncontrollable social interactions (Jones-Rounds et al, 2013). Jones-Rounds et al (2013) suggest that improvements to neighbourhood quality can mitigate for some of the effects of poor quality housing, such as crowding in the home environment. To achieve 'retreat' outside the home, Park & Evans (2016) recommend easily accessible semi-public or outdoor places and walkable streets. This could include locating amenities close to pathways, such as a mailroom that opens to an apartment complex lounge, a bike rack next to multi-dwelling unit's gardens and, cafés, pubs, restaurants along neighbourhood streets (Figure 5). Immediate access from units to semi-public 'third spaces' along with walkable streets creates enhanced accessibility for residents. This co-location of semi-public spaces in dense housing developments can enhance community wellbeing and behaviour (Park & Evans, 2016) to mitigate against environmental stressors like crowding.

Park & Evans (2016) recommend multiple semi-public and third places in close proximity to apartment buildings, to support more frequent visits and better buffering of environmental stimuli from public spaces (Figure 5). By considering multiple spatial scales, designers can create a privacy-connectivity gradient from the private home to outdoor public spaces, employing semi-public spaces as a mediator between the private and public spaces (Park & Evans, 2016). Kemeny (2016) discerns a similar function for thresholds, the spaces that exist between public and private spaces. Park & Evans (2016) implore designers and planners to consider how to facilitate both social interaction and solitude (opportunities to be alone and restore), to mitigate against the psychological effects of crowding.

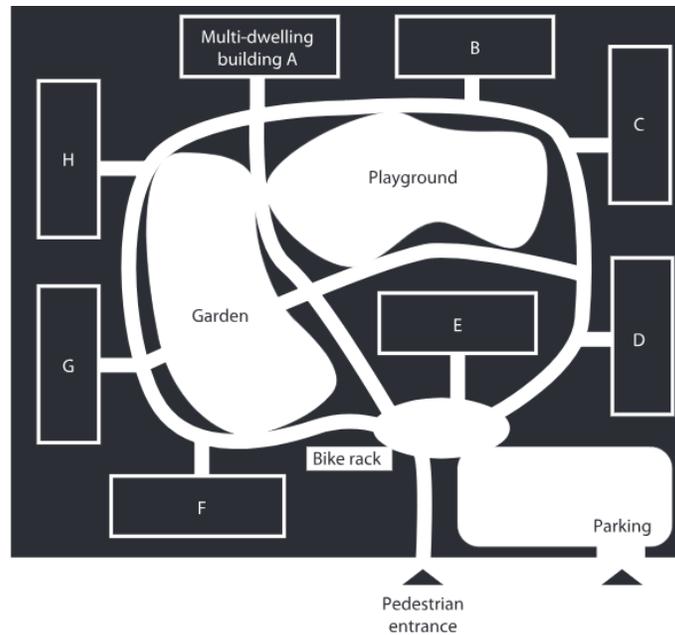


Figure 5: Layout of semi-public spaces in a multi-dwelling housing complex (Park & Evans, 2016: p. 464)

Higher density housing is often associated with crowding, or at least the perception of a crowded living environment or poor quality urban housing. Alexander et al. (1988) and Rapoport (1975) said that the human experience of density through overcrowding and lack of privacy is very difficult to quantify or can only be represented by 'physical measures' of density such as people or buildings per hectare. The Statistics NZ definition of crowding relates to the household only and does not consider housing density. But, it seems relevant to consider housing density from the literature, as it relates to crowding for the Auckland city centre context. Studies of higher density housing have identified problems such as lack of open space, inadequate dwelling size and storage space, housing affordability and dwelling designs for single or two-person households as opposed to families (Carroll et al, 2011; Dixon & Dupuis, 2003). In Auckland, high-density urban development is promoted on the grounds of sustainability, to prevent further sprawl, and for enhanced liveability (Haarhoff et al, 2016). High density living is not the *cause* of crowded housing, as defined by Statistics NZ (2018), but dense residential environments are often perceived as less liveable or desirable than lower density alternatives (Carroll et al, 2011; Howden-Chapman, 2015). Thus, the design of high-density living environments influences perceptions (and sometimes the realities) of crowding and its effects, for both private dwelling units and public & semi-public spaces. Kemeny's thesis entitled 'New York Apartments: Holes for Life' (2016) considered the internal spaces of historic apartments and how spatial porosity of high-density and mixed-use buildings brings about openness and conditions for social exchange. Spatial porosity encompasses the concepts of access, activity and thresholds. Thresholds are crucial in-between spaces that separate private and public spaces (Kemeny, 2016) and can exercise a mediation function as semi-public spaces (Park & Evans, 2016). Kemeny (2016) challenges the traditional separation between the intimacy of private life and the sociability of public life by demonstrating the value of thresholds to support openness and social exchange. In a similar vein, Raman (2010) found that we could rectify some of the negative social impacts of high-density urban living through better neighbourhood design. Effective design of thresholds or semi-public spaces can perhaps capture the benefits of high-density living and mitigate for consequences of high-density living and/or crowded housing. Planning documents, such as the Auckland Plan (2012), contain an 'implicit causal assumption' that higher density can enhance liveability and quality of life (Raman, 2010). But liveability is not necessarily achieved with density (Haarhoff et al, 2016), good urban design is required.

Liveability is a term used to describe place-based quality of life, both subjectively and objectively (Raman, 2010). The previous Mayor of Auckland held a vision for 'the world's most liveable city'. For Jacobs & Appleyard

(1987) liveability included the concept of an environment without nuisance or overcrowding. Physical attributes of liveable environments include active public space, walkable streets, pedestrian amenity, close proximity to amenities and quality spaces & built environment that are safe and easy to use (various cited by Buys et al, 2013). Satisfaction with housing also contributes to overall quality of life and ultimately liveability. Liveability and housing satisfaction is thus multi-faceted and occurs across different scales (Marans & Cooper, 2000).

At the household scale, various physical elements relate to liveability and can mitigate for poor quality housing. In an Australian study (Buys et al, 2013), residents of inner city high-density housing associated more comfortable, liveable and aesthetically pleasing living spaces to spaces with natural light that provided not only sunlight and heating, but also with a 'feeling' of more open space. Gray's thesis (2013) documented how balconies were vital private outdoor spaces for residents of medium density housing developments in Albany, Auckland. Private outdoor spaces are a vital link to the outdoor environment. Buys et al (2013) found that balconies, as private open space, were often residents' favourite aspects of their inner city. The co-housing model (Williams 2005) is a relevant example of how alternative approaches to designing a housing complex can provide opportunities for social interaction and enhance wellbeing in high-density living environments. Depending on the unit design, verandahs or balconies can be very important spaces for social relations and buffer zones that transition between public and private space (Williams, 2005). Again, we see how threshold or semi-public spaces play a critical role in the liveable built environment. Raman (2010) brought social sustainability into the liveability debate when he discussed how design guides fail to address the impacts of layouts and building form on human behaviour and socio-demographic characteristics, as identified by Jacobs (1961), Levitas (1986) and Hillier & Hanson (1984).

Liveability can also extend beyond the home to include the surrounding neighbourhood, or town centre and its services and amenities (Haarhoff et al, 2016, 2012, 2013). In addition, Buys et al (2013) observed how participants were most satisfied with where they lived when it provided good access to amenities and services. Amenities and services, placed within walkable environments allow people to be self-sufficient and have meaningful place-identity, attachment and ownership (Perkins, 1995). So, while social deprivation measures reflect household and personal housing factors like crowding, it also reflects neighbourhood dimensions such as access (Exeter et al, 2017) which collectively contribute to lived experiences and overall liveability. Jones-Rounds et al (2013) and Raman (2010) suggest how quality neighbourhood design can offset the negative impacts of crowded neighbourhoods (high-density living) and crowded or poor-quality housing.

3.4 RENTAL STATUS

The rental status (housing tenure) is a common dimension of deprivation indices such as NZDep and IMD, as well as the Townsend Index (1987). For New Zealand, this rental status includes social renting, from Housing New Zealand or other social housing providers, and renting from private landlords. Local Board demographic data considers home ownership, partial ownership, trust ownership or 'dwelling not owned' (RIMU, 2014). Greater detail of statistics about rental status, such as private, social housing or other, are not collected, it seems. It is unclear if national census or survey data still includes categories like sector of landlord, household composition, sources of income support and tenure of households: the demographic profile on 'Renting Households' from Statistics NZ (2002) has not been updated since 2002. Across NZ, 42% of people identified as renters, and those aged 20-34 were most likely to be living in rental accommodation (Witten et al, 2017). Of the 31,000+ households in the Waitematā Local Board, 60.9% are rented in some way (not owned or partially owned) compared to 48.5% in the rest of Auckland (RIMU, 2014). Home ownership in the Waitematā area declined from 44.2% to 39.1%, since the 2006 census, in line with long-term trends.

There is very little recent literature that directly considers the interplay between rental housing status and access to public and semi-public spaces. So we take a step back and consider the impacts of rental

accommodation on communities and individuals to gain general insights and links with other topics such as health, social and spatial implications of rental housing tenure with regard to public open space.

For New Zealanders, home ownership has long been the ultimate or ideal housing situation: the 'kiwi dream' as we know it (Howden-Chapman, 2015). The aspiration is to achieve mortgage-free tenure later in life (Keeling, 2014). While home ownership is an established cultural norm, increasingly it is unaffordable and unattainable, and long-term or permanent renting is increasing (Keeling, 2014). Between 2001 and 2013, the proportion of renters nationally rose by 14% (Witten et al, 2017). With our ageing population, falling home ownership will increasingly affect older people – and it is affecting older people (Nana et al, 2009) - extending housing insecurities into later life. Ideally, we need new approaches to policy, planning & design and community advocacy services in all sectors of the housing market, so that the needs of renters are not obscured by the majority needs of home owners (Keeling, 2014). Renters should be able to attain the wellbeing and health benefits attributed to home ownership (Szabo et al, 2017) which come along with factors such as stable tenure, quality housing and a place that is 'home'.

Rental housing is a transient or flexible living situation in New Zealand, which has implications on community wellbeing. The Residential Tenancies Act 1986 does not provide security of tenure for tenants (Witten et al, 2017). Consequently, the current average length of a rental tenancy in New Zealand is one year (Witten et al, 2017). While flexibility with renting suits some households with work or life-stage mobility, rental housing tenure undermines the wellbeing of many households, particularly those with children (Productivity Commission, 2012: p. 40). Studies have found that communities with a higher rental population are transient and consequently have less community satisfaction (Rohe & et al., 2013; Badland et al, 2017). Conversely, majority home ownership contributes to enhancing civic involvement and neighbourhood stability (Rohe & Stewart, 1996). For older people in particular, various studies have demonstrated how owning a home enables people to develop a sense of security, to feel in control of their lives and to engage in social participation (various cited by Szabo et al, 2017: p. 2)

The 2017 BRANZ survey of housing condition (White et al.) showed clear differences between the condition of rental and owner-occupied housing in New Zealand. Rental properties were in poorer condition, for both inside and outside the house, including more dampness, mould and poorer maintenance (White et al, 2017). By perception, housing condition was also rated lower by residents of rental housing, compared to those in owner occupied housing (White et al, 2017). Among New Zealand dwellings assessed by BRANZ (2017), 31% of rentals were damp to some extent, compared to just 11% of owner-occupied dwellings. Mould was also more prevalent in rental properties. Mould is a key indicator of air quality, which suggests potential harmful effects to household health (White et al, 2017). Owner-occupied houses are twice as likely to be 'well-maintained', and half as likely to be 'poorly maintained' compared to rental housing. That is to say, across the board, rental properties have a lower level of maintenance compared to owner-occupied properties. Rental transience might also contribute to poorer housing conditions due to a limited 'ability and willingness to undertake repairs and maintenance' by tenants (White et al, 2017: p. 8).

As with crowded housing, rented housing circumstances are also associated with physical and mental health risks. A longitudinal New Zealand study found a significant association with psychological distress between housing circumstances of tenure, crowding and housing affordability, (Pierse et al, 2016). To combat this, Pierse et al (2016) suggest that targeted interventions on specific socioeconomic deprivation indicators (referring to NZDep) and severe household crowding are more likely to reduce psychological distress, than interventions targeting tenure (rental) and housing affordability. A European study (Jones-Rounds et al, 2013) with similar scope found that poor quality housing – more common in rental dwellings - and poor quality neighbourhood combined to effect significantly more stress for residents than either factor (home or neighbourhood) alone. A number of Australian studies provide insights about health factors related to rental housing, that are relevant to New Zealand. One study observed a positive association between living in a rental property and community dissatisfaction or poor self-rated health (Badland et al, 2017). Baker et al. (2014)

found a two-way relationship between physical & mental health, and the housing people can afford. This effect is pronounced for vulnerable people such as older renters (Baker et al, 2014: Bentley et al, 2011).

Among older people, the poor health outcomes associated with rental accommodation intensify. Rental housing is increasingly prevalent among older New Zealanders, particularly the 65-74 age group (Keeling, 2018). A long-term study from New Zealand looked at the impact of housing tenure on psychological wellbeing of older people. This research demonstrated clear benefits of home ownership to psychological health and wellbeing (Szabo et al, 2017). It also corroborated the results of similar longitudinal and cross-sectional studies (Kearns et al., 2000 and Howden-Chapman et al., 2011 cited by Szabo et al, 2017). Szabo et al (2017) found that, over time, homeowners experienced improved quality of life and decreased depression symptoms in contrast to tenants where lower quality of life and higher depression levels remained stable over time and into old age. In addition, tenants living in rural areas reported significantly higher quality of life and fewer depression symptoms compared to tenants in urban areas (Szabo et al, 2017). Supported by a large body of literature, Szabo et al (2017; p. 7) underline the negative influences of both urban living and rental housing to mental health and quality of life.

For Auckland city centre, the rising rental population and poorer rental housing condition, points to a greater risk and prevalence of stress among this population. The Auckland Central West area, around Hobson Street for example, could be a high-risk area for psychological stress because it is a low amenity neighbourhood with a high proportion of rental residents in mixed quality housing. While the city centre population has a younger age structure, it is still advisable to pay specific attention to the long-term effects of rental accommodation (security of tenure etc) in this population. To address housing related stressors for renters, we must also consider both housing and neighbourhood quality (including public and semi-public spaces).

In the BRANZ Housing Condition Survey (2017) larger households (3+ persons) were more common among rental households, compared to owner-occupied households that were normally smaller (1-2 persons). This tendency toward larger households suggests that a combination of rental and crowded households is likely. Thus, it could be worth investigating any combined effect on residents and neighbourhoods affected by both housing circumstances.

Some studies have found an association between renting circumstance and ethnicity. In New Zealand, Pacific and Maori people were the most likely to live in rental accommodation (Witten et al, 2017). Szabo et al (2017) found that regardless of housing tenure - owning or renting - people of non-Māori descent reported higher quality of life. There is a strong body of literature from the United States demonstrating the disproportionate experiences of Latino and African American minorities in rental housing. Closer to home, in Sydney, MacDonald et al (2016) found clear evidence that Indian and Muslim Middle Eastern residents were treated differently than Anglo-Australians in several areas of the rental dwelling search process. At the neighbourhood level, the study observed a belief among agents that one ethnic group is more likely to complete rental transactions in particular neighbourhood contexts than others, distinguished by their ethnic composition and by certain types of social goods (MacDonald et al, 2018). Neighbourhood social goods that were associated with minority communities included higher crime and lower employment (undesirable) but also, greater density of proximate employment and greater active and public transport links (desirable) (MacDonald et al, 2018). The consequence of this was enhanced ethnic segregation, social exclusion and a perpetuation of racial inequality. Compared to North American studies, however, the Sydney study didn't find any significant association between housing discrimination or ethnic segregation and socioeconomic inequality. Auckland city centre has a diverse population similar to Sydney, with minority ethnic communities. A study of rental discrimination could provide insight into how or if ethnicity and discrimination contributes to social deprivation in the Auckland city centre.

3.5 ACCESS TO THE INTERNET

A lack of access to the internet or phone is one dimension of social deprivation as defined by NZDep (Atkinson et al, 2014). Similar deprivation indices from the UK and Canada did not include access to internet as a social deprivation indicator (Fu et al, 2015a). This could be because they were developed (1987-1991) before the 'digital age'. The 2006 NZDep measured telecommunication deprivation in terms of access to a telephone. In 2013, this measure was changed to access to the internet, for those aged <65 only (because of a strong age effect). The internet access dimension has the highest weight of all the deprivation dimensions in NZDep 0.372 (ibid). The communication dimension was not included in the New Zealand IMD. As such, we lack finer details about the level of communication deprivation in the city centre population. In 2012, over 80% of New Zealanders aged 15 to 54 had internet access at home, and recently used the internet (Statistics NZ, 2012), which reflects the age factor related to digital communication (Atkinson et al, 2014). When measuring age-friendliness of communities, WHO (2015) uses internet access as a supplementary indicator of age-friendliness (core indicators involve equity, inclusivity and accessibility – including public spaces access). Households in main urban areas, such as Auckland City Centre, report the highest levels of internet access (83%) compared to other locations around New Zealand (80-64%) such as rural and minor urban areas (Statistics NZ, 2012). Statistics NZ collects this data supposedly every three years; however, data more recent data could not be found.

Phone and internet access allows people to stay connected with one another, to build and maintain social relationships. However, access to the internet represents more than just social communication; it provides economic opportunities, contributes to economic growth (Apatov et al, 2018), gives access to information & knowledge and engagement in social, economic and leisure activities (Anderson & Whalley, 2015). We also understand that internet access improves the standard of living, life capabilities and wellbeing of people in the developed nations (Wise, 2014; Apatov et al, 2018). Internet access is an 'essential of life' (Saunders et al, 2008: cited by Wise, 2014) which is considered as much a part of daily life as the telephone was in 1996 (Atkinson et al, 2014). The internet has influenced people's social networks (Hampton et al, 2011), how they engage with political, voluntary and other community activities in society (Boulianne, 2009) and interactions in the workplace and at home (Quan-Haase & Wellman, 2006). In virtual space, the internet has functions comparable to the physical functions of public and semi-public spaces. In the urban context, public and semi-public spaces are social places where people, meet and interact or choose to spend leisure time. Equally, social media and online messaging sites provide access to a virtual social environment that can also influence physical interactions and relationships in space.

It is worth noting that the 'access to the internet' deprivation measure relates to internet access at home or on personal devices. In addition, city centre residents have the benefit of a number of free WiFi hotspots available to use for everyday online activities, up to 30 minutes per day (Heart of the City, 2015). Locations include, Britomart Transport Centre, Aotea Square, Queen Street, Queens Wharf, Viaduct Harbour, Wynyard Quarter and Auckland Art Gallery (Heart of the City, 2015). Auckland Council provide public internet (WiFi) and computer access for inner city residents at the Central City Library located on Lorne Street and WiFi at the Ellen Melville Centre. Britomart Precinct has free WiFi in its public spaces too (Britomart, 2016). As such, any measured telecommunication deprivation among city centre residents might be mitigated by publically available internet via WiFi in public places. In Auckland city centre, the library is a semi-public place where residents can use computers, with free internet access, for up to 60 minutes at a time (Auckland Libraries, 2018). Even if residents don't have a library card, they can be given access to computers and the internet as a 'guest'.

A Glasgow study highlighted the role of libraries to provided public internet access in deprived or marginalised communities, where residents might not have a smartphone or similar device for accessing the internet (Anderson & Whalley, 2015). For 28% of users in Glasgow, the library was their only means of internet access, reflecting that internet affordability might be an issue. Anderson & Whalley (2015) provide an extensive

literature review on the barriers and drivers of internet access for a household. They summarise that “users are less likely to use the internet if they are older, from an ethnic minority, female, have no children or are from a deprived area” (ibid, 2015: p. 523). Similarly, a Canadian study found that in outdoor public spaces, the majority demographic WiFi users in public spaces were single, White, male young adults (Hampton et al, 2010).

From a social perspective, WiFi access in public spaces influences interactions and activities in physical and virtual space. Hampton et al (2010) observed public spaces in Canada with free wireless internet and found that the majority of wireless internet users in public spaces were alone (78.5%). Also, internet use in public spaces largely limited participation in the public realm (ibid). Of the users present in groups, 61% were actively socializing with co-located ties, i.e. people within the immediate group (however this varied with internet use within the group). Hampton et al (2010) observe that the “public sociability afforded by wireless internet use resembled the parochial rather than the public realm” where people surround themselves with people such as friends and workmates (Hampton et al, 2010: 710). As well as interacting within those around them, 66% of public WiFi users also used the internet to communicate with social ties that were not physically present through email (65%) or instant messaging (17%), for example (Hampton et al, 2010). With combined online and offline contact, WiFi users maintained a high number of connections while in urban public spaces. For strangers to cluster into the same public space to use WiFi, the context of the space has an important role. Factors such as population density, urban design, surveillance/harassment, each contribute pedestrian traffic and visitors to the public space (Hampton et al, 2010). Also, Hampton et al (2010) observed that the character of the space affected how WiFi use influences the public space, as well as the local culture.

Thus, for the Auckland city centre context it is worth considering any demographic trends to public space use with free WiFi access, characteristics of these public spaces (where successful) and local culture effects – which all influence the interactions and activities in public spaces. Is there a similar inequality and lack of user diversity in Auckland city centre spaces with free WiFi, as found in Canada and Glasgow?

There are concerns about a growing digital divide, where existing inequalities are exacerbated by digital inequalities (OECD, 2017 & World Bank 2016, as cited by Apatov et al, 2018; Sylvester et al, 2017). Digital inequalities for internet access occur based on factors such as age (Yu et al, 2016; Frimel, 2014; Atkinson et al, 2014) or, social deprivation, economic disadvantage or poverty (Yu et al, 2016; Wise, 2014; Apatov et al, 2018). A study of older adults in the USA found that reliable internet access was less common among older adults that were economically, socio-culturally or physically deprived (Yu et al, 2015). In Australia, one study found a clear disparity in internet access among deprived and impoverished Australians (30.8%), compared to the general population (83.0%) (Wise, 2014). Affordability (including perceptions of affordability) was also a notable barrier to internet access among disadvantaged people in Australia (Wise, 2014). However, in New Zealand, Apatov et al found that deprived areas, particularly densely populated urban areas, benefitted most from the recent fibre internet upgrades (Apatov et al, 2018) and thus have potential for high internet connectivity. Their study concluded that the New Zealand fibre internet roll-out programme, which focused on the most densely populated areas, has in fact decreased the digital divide due to digital inequality. From this, we might conclude that internet access is unlikely to be a major contributing factor to any high NZDep deprivation scores for the dense Auckland city centre neighbourhood.

In New Zealand, Apatov et al (2018) found a weak, but still evident, link between ethnicity and fibre internet access. Māori are slightly less likely to get fibre than other New Zealanders, although within urban areas Maori are more likely to benefit. However, this is largely because in urban areas Maori are a minority and fibre access is the best (Apatov et al, 2018).

Third places are informal gathering places, outside of the home or workplace, where people engage in civic life (Oldenburg, 1989). Third places play an important role in democracy, building social cohesion, creating a sense of identity, and providing psychological support outside of home and work (Oldenburg, 1989). Additionally, these spaces support social equality - accessible and inclusive regardless of demographic, socioeconomic or

cultural differences. People all over the world are routinely connecting to virtual spaces through mobile social media while they are in public third places such as coffeehouses, pubs, plazas, and hair salons (Kleinman, 2006). Wang et al (2017) suggest the need for third place theory to include both physical, virtual and physical-virtual integrated places. Forlano (2008) was able to establish 'third places' from WiFi hotspots. Virtual or digital elements have changed how people behave and interact in the public domain. People seek out both virtual and physical third places, as such Wi-Fi hot spots have become one of the most important features provided by traditional (physical) third places, and one of the key considerations people have when looking for a third place (Kleinman, 2006). As we see in Auckland, third places with WiFi include libraries, transport stations and civic buildings (Heart of the City, 2015).

The extent of internet access deprivation or digital divide among the Auckland city centre population is unclear. There is high connectivity to the internet available in the city centre, as well as in public places through free WiFi hotspots. Civic spaces such as the Central City Library are critical for deprived individuals that don't have access to a computer, smartphone or cannot afford an internet plan. While public spaces, semi-public spaces and third places have a social role in communities, we need to expand our concept of the social environment to include the virtual realm online.

3.6 SINGLE PARENT FAMILY

NZ Dep 2013 (Atkinson et al, 2014) and the Canadian deprivation index include solo parent families or home support as a deprivation indicator (Pampalon et al, 2009 as cited by Fu et al, 2015a). The definition of single parent families used here is unclear: it can refer to single parents with dependent children under 18, or those with children dependent or not (Collings et al, 2013). Households in Waitematā Local Board are predominantly one-family households (51.5%), compared to 69.8% of households across Auckland - including single-parent families. The second most prevalent household type, one-person households, was 30.7% for Waitematā, and 36.0% for the city centre.

The distinction of a single parent family as deprived reflects a certain idea of the 'ideal' family. Fu et al (2015a) comment on the Eurocentric view taken in our social deprivation indices that privilege nuclear family structures, and conversely consider single parenthood as an indicator of social and or material deprivation.

Studies show physical and mental health influence what housing people can afford, and vice versa. This effect is pronounced for vulnerable people such as single parent households (Baker et al, 2014). A recent New Zealand study found that single parents experience higher levels of psychological stress (15.7-9.1%) compared to partnered parents (6.1-4.1%) (Collings et al, 2013). The effect of gender in this study was statistically significant: single mothers experienced higher rates of psychological distress, even when controlled for by age and ethnicity. Crucially, Collings et al (2013) found that socioeconomic deprivation is a key contributor to single parent mental health. Single mothers experience greater socioeconomic deprivation than single fathers (Collings et al, 2013). Collings et al (2013) call for public policy and social service agencies to put mental health on the agenda so they can provide better support to vulnerable single parent families. From a built environment perspective, we can consider how public and semi-public spaces contribute to mental wellbeing (e.g. Park & Evans, 2016) and how public space design and provision can positively support vulnerable or deprived communities.

With regard to social wellbeing, sole-parent households consistently have poorer outcomes, particularly in the areas of Economic Standard of Living and Social Connectedness (Crothers et al, 2017). Also, solo parents with low income, low material well-being and, or living in an area of high social deprivation result in relatively poor social well-being outcomes across most domains in the MSD 'Social Report' 2016 (as cited by Crothers et al, 2017).

4 CONCLUSION

This literature review began by considering deprivation indices and social disadvantage measures used in the international literature, in relation to public space access, and indices that influenced New Zealand indices. The NZ Dep (Atkinson et al, 2014) and IMD (Exeter et al, 2017) indices were analysed for the Auckland city centre census area mesh blocks: Harbourside, Auckland Central West and Auckland Central East. Auckland Central East and Central West areas are among the most deprived in NZ according to the NZDep social deprivation index. By comparison, the IMD indicator ranks city centre areas mid-range in terms of deprivation. This literature review has explored the deprivation dimensions related to high deprivation (crowding and rental status), and those excluded from one or the other index (internet access and single parent families).

IMD and NZDep are formulated slightly differently, and thus present different scores for the same area based on a largely similar data set. Fu et al (2015a) critique the eurocentric hegemony of social deprivation indices in New Zealand for how they inadequately deal with gender, ethnic and cultural minorities and reflect age biases. European New Zealanders benefit from a social order that is founded on their cultural beliefs, practices, institutions and processes. Fu et al (2015a) also highlight the inherent constraints with census questions and statistics of interest to government which influence what data is available to develop an index of deprivation. Alternative measures related to subjective wellbeing may provide additional data about community deprivation. In any case, both NZ social deprivation indices were developed using 2013 census data: developing indices from the 2018 census would be recommended for any future work, and reformulating deprivation indices.

The purpose of deprivation indices is to highlight the most deprived communities, relative to the rest of the population, so that policies, planning and community advocacy services can be provided to improve social equality (Townsend, 1987, Atkinson et al, 2014). We are particularly interested in the interactions between dimensions of high deprivation and public space access in the Auckland city centre community. There is limited literature which makes a direct connection between deprivation and inner city public space access, especially in the New Zealand context.

Studies from the Netherlands demonstrate the value of diversity in deprived communities, and that inclusive community meeting places such as schools and sports clubs are valuable social spaces where different people can meet and interact.

We find that culture and ethnicity are important factors to be considered when interpreting social deprivation scores, particularly when considering what constitutes crowding or inequality in the rental process, for example. Cultural competency is required in housing design, and neighbourhood design in New Zealand. Living in urban areas and renting are compounding factors for rental disadvantage. Studies about internet access in public spaces or fibre broadband demonstrated that ethnicity is one factor that often links with digital disadvantage. However, it is unclear to what extent deprivation of internet access is present (if any) in the Auckland city centre community.

Literature suggests that older people are more likely to experience disadvantage with relation to internet access, and have increasing risks with renting later in life due to insecure housing tenure and housing unaffordability.

Further literature search is required around the topic of single parent families and social deprivation, as it relates to public space. Single parents, especially single mothers, have greater mental health risks associated with their living environment. However, some research suggests that deprivation indices which favour the nuclear family unit may not adequately or appropriately represent the level of disadvantage (if any) caused crowded housing or single parent family situations.

Health, particularly psychological stress, seems to be a common factor between socially deprived communities (poorer mental health) and the built environment. We suggest that health could be considered a mediating factor, where by seeking quality public spaces we can support mental health and wellbeing.

Also, the social circumstances that lead to deprivation have associations with the social aspects of the built environment. For example, thresholds and semi-public spaces mediate between public and private realms and have a key social and wellbeing function. The virtual social environment provided by the internet is perhaps a new 'third place' that adds to the valuable social infrastructure that supports disadvantaged communities. In the physical environment, free WiFi in public spaces and internet access in spaces such as public libraries provide social, economic and leisure opportunities for deprived people.

A quality built environment, both housing and neighbourhoods, can improve mental health and mitigate for the effects of social deprivation. Good design can include consideration of the role of communal spaces, optimal layout of public and semi-public space to support social interactions, walkability and incorporating private outdoor spaces for wellbeing (e.g. balconies), natural light.

There are opportunities in Auckland to study the use of WiFi in public spaces, to study interactions in neighbourhood public spaces to add to the body of knowledge related to social deprivation and the social built environment. The literature suggests that well-considered urban design and architecture can contribute to quality neighbourhoods and quality housing, particularly in high density areas, and mitigate against social and material deprivation.

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