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Research article

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Abstract

Using individual-level data primarily from the Canadian Community Health Survey for 2015, 2016 and 2017 and neighbourhood-level data from other sources, this paper examines the association between life satisfaction and neighbourhood characteristics. It shows that after taking into account individual characteristics such as age, health, community belonging, housing tenure and income, neighbourhood characteristics such as transit access, parks, green space and crime are associated with life satisfaction. However, the association between life satisfaction and neighbourhood characteristics is most evident for individuals in the bottom 20% of the family income distribution. These families likely have more limited neighbourhood choice and so are less affected by processes that tend to equalize life satisfaction across neighbourhoods and by selection effects that may bias the estimates of the relationship between neighbourhoods and life satisfaction.

Keywords: life satisfaction; well-being; neighbourhoods; neighbourhood effects

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Introduction

The neighbourhood effects literature is based on the premise that variation in the contexts in which people live results in differing outcomes. While there are large literatures examining the relationships that neighbourhood characteristics have with health outcomes and neighbourhood satisfaction, the relationship between neighbourhood characteristics and subjective well-being, particularly life satisfaction, has received much less attention. The latter relationship warrants investigation, given its relevance to a number of policy domains. For example, Canada's National Housing Strategy explicitly recognizes both housing and neighbourhoods as integral to the well-being of individuals, with public initiatives geared toward building "…housing that is fully integrated into the community–close to transit, close to work, and close to public services" (Government of Canada 2017, p. 4). Similarly, neighbourhood-level information is increasingly centre-stage in well-being initiatives that use either an indicator framework approach (e.g., the Canadian Index of Well-Being) or a subjective well-being approach (Helliwell, Shiplett and Barrington-Leigh 2018), and is especially relevant in a context of increasing policy emphasis on measures of well-being that are "beyond gross domestic product." The available evidence suggests that neighbourhood contexts (e.g., neighbourhood poverty and environmental quality) have an identified and substantial effect on health and well-being (Ludwig et al. 2012, 2013).[1]

Utilizing pooled cross-sectional survey data from three years of the Canadian Community Health Survey (CCHS) in combination with neighbourhood-level data from several sources, this study examines whether neighbourhood characteristics are associated with respondents' self-reported life satisfaction. This study makes several contributions to the literature. First, it draws together a robust set of individual- and neighbourhood-level characteristics into a single, empirical framework. Measures of neighbourhood population density and median family income are drawn from census and taxation data, measures of neighbourhood proximity to public transit and parks are drawn from open sources, a measure of neighbourhood green space is drawn from satellite imaging, and measures of neighbourhood crime are drawn from administrative sources. Second, the study defines and measures neighbourhoods on a relatively small scale. Until recently in Canada, researchers have mainly used census tracts (CTs) to define neighbourhoods. New data sources and integration techniques now allow neighbourhoods to be defined using dissemination areas (DAs). In Canadian census metropolitan areas (CMAs), the median population of CTs is 4,486, while that of DAs is 544.[2] This offers a finer geographic resolution than has generally been available to date. And, finally, a small step is taken toward addressing selection effects, based on the presumption that individuals in the lower end of the income distribution have less capacity to choose the neighbourhoods in which they live.

Across the entire sample, respondents in neighbourhoods with better access to the natural environment—measured in terms of green space and access to parks—have higher levels of life satisfaction than individuals in neighbourhoods with less access. This holds when individual characteristics, such as age, income and health status, are taken into account. There is no independent association between other neighbourhood characteristics and life satisfaction. However, these aggregate estimates across all respondents mask significant correlations between neighbourhood characteristics and life satisfaction among individuals in different segments of the income distribution.

1. To date, research has tended to focus on testing whether neighbourhoods influence concrete outcomes such as income and employment. Receiving less attention is the relationship between neighbourhoods and "softer" outcome measures such as subjective well-being (van Ham and Manley 2012). The relationship between neighbourhoods and subjective well-being has been addressed in several other studies, including by Ballas and Tranmer (2012) and Stokes (2019).
2. These are the median populations of CTs and DAs with areas and populations greater than zero (2016 Census of Population, authors' calculations).

The correlation between neighbourhood characteristics and life satisfaction is most evident among respondents in the bottom income quintile. Among this group, proximity to parks and public transit is positively associated with life satisfaction, while crime rates are negatively associated. By contrast, there are no significant correlations between neighbourhood characteristics and life satisfaction among respondents in the three middle income quintiles. And, among respondents in the top income quintile, green space and population density are positively associated with life satisfaction. The significance and strength of the correlations between neighbourhood characteristics and life satisfaction among respondents in the bottom income quintile may reflect their more limited capacity to select neighbourhoods that meet their needs.[3]

The remainder of the paper is organized as follows: a review of the literature, followed by a description of data and methods used for this study and multivariate estimates of the association between neighbourhood characteristics and life satisfaction, followed by a brief conclusion.

Literature review

While there are large literatures on the relationships between neighbourhood characteristics and health outcomes, less attention has been paid to broader measures of well-being—particularly life satisfaction. In studies to date, factors such as population density, income, ambient environmental characteristics, crime and access to transit are among the central variables considered.

Generally, population density (or related variables) has been found to be negatively related to life satisfaction. Berry and Okulicz-Kozaryn (2009) find that life satisfaction is lower in big cities than rural areas in higher-income countries. The *2020 World Happiness Report* provides extensive analysis of this, showing that urban residents "…are generally happier than rural dwellers in most countries, with these advantages being less, and sometimes reversed, in a number of the richer countries" (Helliwell et al. 2020; Burger et al. 2020.). In Canada, average life satisfaction is lower in urban areas than rural ones (Helliwell et al. 2019). At the neighbourhood level, Li and Kanazawa (2016), Cao (2016), and Ala-Mantila et al. (2018) find a negative association between density and life satisfaction or quality of life. Neighbourhood studies tend to introduce density alone, raising questions of interpretation as higher-density neighbourhoods bring with them both positive features, such as local services and public transit, and negative features, such as congestion and pollution. The set of neighbourhood characteristics included in this study allows the association between life satisfaction and density to be estimated net of several potentially confounding effects.

The expected association between neighbourhood income and life satisfaction is unclear. As Hou (2014, p. 1086) points out, the divergent effects of neighbourhood income on life satisfaction can run in two directions:

> "The association could be positive if people benefit from the improved resources, amenities and social capital in high income areas. The association could also be negative if people tend to emulate the life styles of their richer neighbours, i.e., 'keeping up with the Joneses.'"

While many studies find evidence of negative association between neighbourhood income and life satisfaction (Luttmer 2005; Helliwell and Huang 2010; Dittmann and Goebel 2010), others find that these effects depend on the scale of neighbourhoods used in the analysis (see Barrington-Leigh and Helliwell 2008) and the covariates included in the model (Hou 2014).

3. Lower-income families may find themselves in more desirable neighbourhoods because of rent controls or the presence of social and affordable housing. Under these circumstances, the full benefit of these amenities is not fully reflected in housing costs and so they do not have to trade these off against other forms of consumption.

A growing number of studies document the relationships between ambient environmental characteristics at the local level and life satisfaction. For example, positive correlations have been documented between air quality and life satisfaction (Silva and Brown 2013; Ambrey, Fleming and Manning 2014) and green space and life satisfaction (Van Herzele and de Vries 2012; Ambrey and Fleming 2013; Krekel et al. 2016; MacKerron and Mourato 2013; Kopmann and Rehdanz 2013). There may be various mechanisms through which green space is correlated with well-being, including restorative benefits for mental health, opportunities for physical activity and social interactions, and neighbourhood satisfaction (Van Herzele and de Vries 2012; Zhang et al. 2017). Krekel and MacKerron (2020) find that green space (and blue space) is associated with increased well-being, particularly when time in such environments is spent with family or friends.

The relationship between crime and life satisfaction has been approached in several ways—specifically, the roles played by personal (1) experiences of and (2) perceptions of crime and (3) actual crime rates in the local area. A negative correlation between crime and life satisfaction was reported, with research undertaken using both individuals and nations as the unit of analysis. Higher rates of crime are associated with lower life satisfaction among residents at both the municipal (da Palma, Lopes and Monterio 2012; Medina and Tamayo 2012) and the national (Di Tella, MacCulloch and Nopo 2008) levels. At the national level, Helliwell and Wang (2011) show that perceived rates of crime are more important than actual rates of crime in explaining differences in subjective well-being across countries, reflecting important underlying differences in social trust. At the individual level, Ambrey, Fleming and Manning (2014, p. 877) find that "…real crime rates detract more from an individual's self-reported life satisfaction than perceived rates of crime," but go on to note that "perceived rates of crime have an adverse impact on life satisfaction beyond those associated with real crime…".

Evidence on commuting time and life satisfaction is mixed. While some studies have reported a negative correlation (Stutzer and Frey 2008), more recent evidence suggests that the relationship may not be as linear or as strong as previously thought (see Ingenfeld, Wolbring and Bless 2019) and can vary depending on whether commuting is done with family or friends (Krekel and MacKerron 2020). In this study, it is not the distance or duration of the commute that is the focus, but rather proximity to public transit. Here the emphasis is on public goods that may facilitate mobility on a daily basis. Recent studies in this area find a positive correlation between accessibility to transit and subjective well-being (Ma et al. 2018; Dong and Qin 2017; Delmelle et al. 2013).

Selection and spatial equilibrium effects

There are many factors that may bias or reduce the estimated association between neighbourhood characteristics and life satisfaction, but of particular concern are selection and spatial equilibrium effects. "Selection bias occurs when the selection mechanism into neighbourhoods is not independent from the outcome studied" (Bergström and Van Ham 2010, p. 2). If people with higher levels of life satisfaction select into neighbourhoods with, for instance, more green space, and this is not taken into account, the observed association between green space and life satisfaction could be attributable to selection rather than to any positive contribution of green space to well-being.

Spatial equilibrium effects result from the tendency for utility (life satisfaction) to equalize across neighbourhoods. Consider a neighbourhood that has better amenities (e.g., access to parks). Greater demand to live there would lead to higher land prices and, in turn, higher housing costs, restricting other forms of consumption via the household budget constraint. In theory, land prices would be bid up to a level such that utility would be equalized across neighbourhoods, as otherwise, an incentive to move into higher-amenity neighbourhoods would remain. So, in spatial equilibrium, no relationship between neighbourhood amenities (and disamenities) and life satisfaction is expected. This does not mean neighbourhood context does not affect life satisfaction. Rather, it is that households are willing to trade off the positive and negative effects of neighbourhoods on life satisfaction against other forms of

consumption. Of course, a spatial equilibrium will only hold if households have the means to move from neighbourhood to neighbourhood (Morrison 2014), among other factors.

Many households, such as those with lower incomes, may be unable to pay market prices in neighbourhoods that suit their needs and consequently may find themselves without preferred amenities. It is among these households that the relationships between neighbourhood characteristics and subjective well-being are expected to be strongest.[4] In this study, respondents are divided into family income quintiles to draw out the associations between neighbourhood characteristics and life satisfaction, while plausibly reducing the influence of selection on the estimates for lower-income households.[5]

Data and methods

The core of the analytical data file used for this study is composed of individual-level information drawn from the CCHS pooled across three years (2015, 2016 and 2017). The sample is limited to CCHS respondents living in the 29 CMAs for which a complete set of DA-level neighbourhood characteristics is available.[6] This yields a sample used in the regression analysis of 46,626 individuals, residing in 6,481 DA-level neighbourhoods, across 29 urban centres.

The relationship between life satisfaction (*ls*) and the characteristics of respondents and their neighbourhoods is modelled as follows:

$$ls_{ijt}^{c} = \alpha + \beta x_{ijt} + \delta z_{j} + \gamma_{m} + \rho_{t} + \varepsilon_{ijt},$$

where i indexes respondents, j dissemination areas and *t* survey years. x_{ijt} and z_{j} are individual- (e.g., health status) and dissemination area-level characteristics (e.g., population density). CMA binary variables, γ_{m}, are included to control for unobserved CMA-wide characteristics (e.g., climate or congestion) that might also influence life satisfaction. A time trend variable, ρ_{t}, is included to account for differences in responses to life satisfaction across survey years.[7] The model is estimated across respondents pooled together and classified by income classes (*c*), defined in terms of quintiles or aggregations thereof. The model is estimated using ordinary least squares.

To measure life satisfaction, respondents were asked the following question: "Using a scale of 0 to 10, where 0 means 'Very dissatisfied' and 10 means 'Very satisfied,' how do you feel about your life as a whole right now?" Most Canadians were relatively satisfied with their lives. Average life satisfaction was 8.1, with a standard deviation of 1.5. Just under 90% of Canadians (89%) reported a life satisfaction of 7 or more, with about 1% indicating a life satisfaction of 3 or less.

Individual-level information on life satisfaction and sociodemographic characteristics were drawn from the CCHS.[8] These included gender, age, household size, self-rated physical health, reported diagnoses of anxiety or mood disorders, housing tenure (i.e., owner or renter) and sense of belonging to the local

4. The extent to which lower-income households are constrained in their access to amenities, such as green space, outside their neighbourhood is a further consideration.
5. There is a parallel between this logic and Oreopoulos' (2003) identification strategy, which relies on the limited neighbourhood choice of households across public housing projects.
6. The six CMAs not included in the study are Barrie, Belleville, Brantford, Calgary, Saguenay and Winnipeg.
7. The estimates were qualitatively unchanged when year binary variables were used instead of the trend variable.
8. Documentation on the annual component of the CCHS is available at https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getInstanceList&Id=1263799.

community. In addition, information on the dwelling type (i.e., single detached or multi-unit), duration of residence at current address and family incomes of individuals was derived from the T1 Family File and Address Register, with income adjusted to account for family size. Table 1 provides information on these variables.

Descriptive statistics for individual characteristics are presented in Table 2. The average age (after weighting) of respondents was 46 years, with the majority (85%) living in households with more than one person, and the vast majority being employed. Given that the dataset is limited to CMAs, a relatively large proportion of respondents were immigrants (31%). Just over 70% of respondents owned their home and 54% lived in a detached dwelling. Most (81%) had lived at their address for more than one year, and about two-thirds reported having a somewhat strong or very strong sense of belonging to their community. Regarding health, just under 10% assessed their health as poor or fair, and a similar proportion reported having a mood or anxiety disorder.

Table 1
Variable definitions

Variable name	Variable definition	Source
Individual characteristics		
Gender	Respondent is male (excluded category: female)	CCHS
Age	Respondent's age in years	CCHS
Household size	More than one person residing in the respondent's household (excluded category: single-person households)	CCHS
Employment status	Respondent is unemployed (excluded category: employed)	CCHS
Anxiety or mood disorder	Respondent has an anxiety or mood disorder (excluded category: no anxiety or mood disorder)	CCHS
Self-rated physical health	Respondent's physical health self-rated on a five-point scale, ranging from poor or fair (single category) to excellent (excluded category)	CCHS
Community belonging	Respondent's sense of belonging to local community self-rated on a four-point scale, ranging from very weak to very strong (excluded category: very strong)	CCHS
Dwelling tenure	Respondent resides in a dwelling owned by a member of the household (excluded category: renter)	CCHS
Dwelling type	Respondent resides in a single detached dwelling (excluded category: multiple-unit dwelling)	T1FF
Time living in current residence	Respondent has been living in their current residence for a year or more (excluded category: living in current residence for less than a year)	T1FF
Immigrant status	Respondent is an immigrant (excluded category: non-immigrant)	CCHS
Income	Respondent's after-tax family income adjusted for family size (natural log transformed)	T1FF
Neighbourhood characteristics		
Median DA income	Median after-tax income of families adjusted for family size in the dissemination area (DA) (natural log transformed)	T1FF
Population density	Population-weighted density of the DA. The population share weighted sum of dissemination block population densities within a DA (natural log transformed)	Census
Access to parks	Binary variable indicating a park is present within the DA (excluded category: 'no park present'). Parks are indicated as present when a park is within 1 km of the centroid of any dissemination block (DB) found within a DA.	PMD
Green index	Access to green space measured on a scale of 0 to 1. Higher values represent dense green vegetation. Satellite-derived measure of green vegetation values averaged over the summer months from 2002 to 2011.	HAD/ CANUE
Crime	Measured as a rate per person in each DA and is converted to a binary variable indicating a high-crime DA ranking in the top 10% of property or violent crime rates (excluded category: 'not high crime')	CCJCSC
Access to transit	Binary variable indicating a high-transit-accessibility DA as those ranked in the 70th percentile or above. Accessibility is measured as the normalized value of DB proximity to transit using the average across DBs within each DA using DB populations as weights. The measure takes into account the frequency of transit trips to or from transit stops in DBs within a 1 km radius of the DB inverse-weighted by their distance from the DB.	PMD

Notes: CCHS = Canadian Community Health Survey; T1FF = T1 Family File; CCJCSC = Canadian Centre for Justice and Community Safety Statistics; PMD = Proximity Measures Database. CANUE = Canadian Urban Environmental Health Research Consortium.
Source: Statistics Canada.

Neighbourhood-level variables were measured at the DA level. However, information on even smaller geographic units, specifically dissemination blocks (DBs), was used in the construction of several DA-level variables. To better reflect the density that individuals experience in their immediate surroundings, population densities were calculated across DBs within a given DA and a population-weighted average was then calculated at the DA level (see Appendix 1 for more details). A similar approach was used to measure green space. Using satellite imaging data, exposure to green space was measured on a scale

of 0 to 1, with higher values representing denser green vegetation within 1,000 metres of a respondent's postal code. Green space values were then averaged across all postal codes associated with each DA, yielding DA-level estimates.[9] Access to parks was measured using a binary variable indicating whether there was a park within 1,000 metres of a DB in a respondent's DA. Access to transit was measured using an accessibility (proximity) score (see Table 1) and was reported as an index value ranging from 0 to 1, where 1 was the DB with the maximum number of trips and 0 was the DB with the least number of trips.[10] The DB index values were averaged to the DA level using DB populations as weights. A binary variable was used to indicate high transit access, defined as the top 30% of DAs in the distribution. Median "neighbourhood" income was calculated using the adult-equivalent adjusted family income across all families residing in each DA. DA-level rates of crime were calculated as the number of property and violent crimes reported in the DA, divided by its total population. DAs were sorted from lowest to highest on the basis of crime rates, with those in the top 10% of the distribution for violent or property crime defined as high-crime areas for the model. DA-level crime rates were reported only when 75% or more of crimes in a CMA were allocated to DAs.

Descriptive statistics for neighbourhood characteristics are presented in Table 2. The average population-weighted density across DAs is about 7,700.[11] On a scale of 0 to 1, access to green space yields an average index value of 0.48. The average transit accessibility index value in DAs below the 90th percentile is 0.006, which is one-fifth that of DAs at or above the 90th percentile, at 0.043. The average per capita incidence of property crime for DAs below the 90th percentile is 0.02, but sixfold higher, at 0.12, for DAs at or above the 90th percentile. Violent crime is less likely but shows a similarly large difference.

9. Data distinguishing between green space available to the public and that available only to residents or club members are not currently available.
10. The index value is calculated as follows: $[T_b - min(T)]/[max(T) - min(T)]$, where *Tb* is the number of transit trips observed in DB b. The index values reported here indicate that the level of accessibility observed in most DBs is far from the maximum, which would be expected, as transit systems tend to have a few highly connected nodes, with the remainder having relatively few trips.
11. While the average population of CMA DAs is just under 700, the population-weighted density can be much higher because DAs are relatively small in size (less than 1 km^2) and because this measure puts more emphasis on DBs with higher populations and likely higher densities.

Table 2
Descriptive statistics: Individual characteristics (selected variables)

Variable name	Proportion across classes (percent)	Mean	Standard deviation
Gender			
Male	48	...	...
Female	52	...	...
Age (years)	...	**46**	**18**
Household size		...	...
One person	15	...	...
More than one person	85	...	...
Employment status			
Unemployed	3	...	...
Employed	97	...	...
Mood or anxiety disorder			
Has a disorder	12	...	...
No disorder	88	...	...
Self-rated physical health			
Poor or fair	9	...	...
Good	27	...	...
Very good	38	...	...
Excellent	26	...	...
Community belonging			
Very weak	7	...	...
Somewhat weak	26	...	...
Somewhat strong	51	...	...
Very strong	16	...	...
Dwelling tenure			
Renter	28	...	...
Owner	72	...	...
Dwelling type			
Multi-unit dwelling	46	...	...
Detached dwelling	54	...	...
Time living in current residence			
Less than a year	19	...	...
A year or more	81	...	...
Immigration status			
Not an immigrant	69	...	...
Immigrant	31	...	...
Population density (count)	...	7,746	15,770
Green index	...	0.480	0.090
Average property crime rate (per person)			
DAs below the 90th percentile	...	0.020	0.010
DAs at or above the 90th percentile	...	0.120	0.160
Average violent crime rate (per person)			
DAs below the 90th percentile	...	0.006	0.004
DAs at or above the 90th percentile	...	0.029	0.027
Access to transit			
Below the 70th percentile	...	0.006	0.005
At or above the 70th percentile	...	0.043	0.030

... not applicable

Note: DA = Dissemination area.

Source: Statistics Canada, authors' calculations.

The correlations between life satisfaction and the explanatory variables, as well as the correlations among explanatory variables themselves, are presented in Table 3. All of the individual- and neighbourhood-level variables are significantly correlated with life satisfaction at the 5% level. The strongest correlations are with health, with a positive correlation of 0.29 between self-rated physical health and life satisfaction, and a negative 0.23 correlation between a reported mood or anxiety disorder and life satisfaction. Family income, community belonging and homeownership all have positive correlations of around 0.15. Across neighbourhood characteristics, life satisfaction is positively correlated with DA average income ($r = 0.14$), green space ($r = 0.09$) and access to parks ($r = 0.03$), and negatively correlated with population density ($r = -0.07$) and high crime rates ($r = -0.04$). Surprisingly, access to transit is also negatively associated ($r = -0.06$) with life satisfaction.

Table 3
Pearson correlations across the dependent and independent variables

Variable name	Life satisfaction	Male	Age	Household size	Unemployed	Mood or anxiety disorder	Health	Community belonging	Homeowner	Dwelling type	Time living in neighbourhood	Immigrant status	Family income	DA median family income	Population density	Access to parks	Green index	Transit accessibility	Property crime
Life satisfaction	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Male	-0.01 *	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Age	-0.02 *	-0.02 *	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Household size	0.12 *	0.04 *	-0.22 *	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unemployed	-0.08 *	0.04 *	-0.08 *	0.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mood or anxiety disorder	-0.23 *	-0.10 *	-0.04 *	-0.07 *	0.05 *	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Health	0.29 *	0.01 *	-0.11 *	0.05 *	-0.02 *	-0.13 *	...	...	...	...	...	...	...	...	...	...	...	...	...
Community belonging	0.14 *	0.00	0.11 *	0.01	-0.01 *	-0.04 *	0.07 *	...	...	...	...	...	...	...	...	...	...	...	...
Homeowner	0.15 *	0.01	0.10 *	0.23 *	-0.05 *	-0.09 *	0.05 *	0.03 *	...	...	...	...	...	...	...	...	...	...	...
Dwelling type	0.12 *	0.03 *	0.00 *	0.23 *	-0.03 *	-0.04 *	0.03 *	0.02 *	0.46 *	...	...	...	...	...	...	...	...	...	...
Time living in neighbourhood	0.04 *	0.01	0.14 *	0.05 *	-0.03 *	-0.02 *	-0.01	0.03 *	0.23 *	0.14 *	...	...	...	...	...	...	...	...	...
Immigrant status	-0.04 *	0.01	0.04 *	0.06 *	0.01 *	-0.10 *	-0.01 *	0.08 *	-0.09 *	-0.15 *	-0.05 *	...	...	...	...	...	...	...	...
Family income	0.17 *	0.04 *	0.04 *	0.12 *	-0.09 *	-0.09 *	0.08 *	-0.02 *	0.33 *	0.26 *	0.10 *	-0.15 *	...	...	...	...	...	...	...
DA median family income	0.14 *	0.02 *	0.02 *	0.14 *	-0.04 *	-0.04 *	0.08 *	0.01 *	0.41 *	0.39 *	0.10 *	-0.18 *	0.34 *	...	...	...	...	...	...
Population density	-0.07 *	0.00	-0.06 *	-0.13 *	0.01	0.00	-0.01 *	-0.02 *	-0.30 *	-0.42 *	-0.08 *	0.22 *	-0.13 *	-0.33 *	...	...	...	...	...
Access to parks	0.03 *	0.00	-0.03 *	0.05 *	0.01	-0.01 *	0.01 *	0.02 *	0.10 *	0.08 *	0.02 *	0.00	0.08 *	0.17 *	-0.10 *	...	...	...	...
Green index	0.09 *	0.01 *	0.04 *	0.13 *	-0.02 *	-0.02 *	0.03 *	0.00	0.27 *	0.34 *	0.08 *	-0.18 *	0.13 *	0.35 *	-0.62 *	0.07 *	...	...	...
Transit accessibility	-0.06 *	0.00	-0.02 *	-0.15 *	0.01	0.01 *	0.01	-0.01	-0.33 *	-0.39 *	-0.09 *	0.16 *	-0.11 *	-0.34 *	0.53 *	-0.16 *	-0.46 *	...	...
Property crime	-0.04 *	-0.01 *	0.00	-0.10 *	0.01	0.04 *	-0.02 *	0.00	-0.14 *	-0.12 *	-0.07 *	-0.02 *	-0.06 *	-0.21 *	0.06 *	0.00	-0.20 *	0.14 *	...

... not applicable

* indicates significance at ($p < 0.05$)

Note: DA = Dissemination area.

Source: Statistics Canada, authors' calculations.

On balance, the correlations between neighbourhood characteristics and life satisfaction are relatively weak. But, as noted above, the tendency toward the equalization of utility (life satisfaction) across space is expected to push the association between neighbourhood characteristics and life satisfaction toward zero, except among sub-populations who lack the capacity to move into neighbourhoods that meet their needs. Descriptive evidence provides some support for this hypothesis, with correlations between life satisfaction and DA-level crime and access to parks strongest among individuals in the bottom income quintile (see Table 4). This is not the case in terms of population density, access to public transit and green space.

Table 4
Pearson correlations between life satisfaction and neighbourhood characteristics, by income category

	Neighbourhood characteristics					
Income category	DA median family income	Population density	Transit accessibility	Crime	Access to parks	Green index
	correlations					
Low income	0.094 *	-0.045 *	-0.029 *	-0.076 *	0.053 *	0.056 *
Middle income	0.089 *	-0.064 *	-0.056 *	-0.019 *	0.011	0.075 *
High income	0.060 *	-0.035 *	-0.013	-0.015	0.010	0.068 *

* significantly different from reference category ($p < 0.05$)

Note: DA = Dissemination area.

Source: Statistics Canada, authors' calculations.

In terms of the correlations among neighbourhood characteristics themselves (see Table 3), population density is strongly and negatively correlated with access to green space ($r = -0.62$), and less strongly but still negatively correlated with park accessibility ($r = -0.10$). Access to green space and parks are related, but the correlation between them is relatively weak ($r = 0.07$). They appear to capture different aspects of the natural environment and, as shown below, appear to have independent effects on life satisfaction. Population density is strongly and positively associated with transit access ($r = 0.53$). This is consistent with density stimulating greater local demand for and supply of transit services, which are more efficiently provided in densely populated areas. Finally, neighbourhood income is positively correlated with both green space and parks, and negatively correlated with density, transit access and crime.

Model estimates

The multivariate analysis proceeded in two steps. First, the model was estimated with only individual characteristics included as explanatory variables. This model was run for the full sample of respondents, as well as for respondents in the bottom, middle three, and top family income quintiles. This established a baseline set of results. In the second step, the models were augmented with the neighbourhood characteristics discussed above.

Across the full sample, the effect of individual characteristics on life satisfaction broadly matches that in the literature. Life satisfaction is lower for those with poorer physical and mental health, and weaker social supports in the home and the community (as measured by household size and community belonging) (Table 5). The well-established U-shape relationship between age and life satisfaction is observed, with life satisfaction declining up to about early middle age and increasing thereafter. Life satisfaction is modestly lower among men than women and among immigrants than people born in Canada. Economic circumstances are correlated with life satisfaction, as evident in the positive correlations with family income, homeownership and living in a detached dwelling, and the negative correlation with unemployment.

Table 5
Life satisfaction as a function of individual characteristics for the full sample and across income classes

	All		Lower income (Q1)		Middle income (Q2 to Q4)		Higher income (Q5)	
	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error
Male	-0.111 **	0.019	-0.081	0.053	-0.128 **	0.025	-0.090 **	0.033
Age	-0.013 **	0.003	-0.032 **	0.007	-0.010 **	0.004	-0.004	0.005
Age squared	0.000 **	0.000	0.000 **	0.000	0.000 **	0.000	0.000 *	0.000
Multi-person household	0.268 **	0.024	0.223 **	0.061	0.266 **	0.028	0.288 **	0.066
Unemployed	-0.403 **	0.084	-0.502 **	0.162	-0.346 **	0.094	-0.255	0.160
Mood or anxiety disorder	-0.527 **	0.032	-0.662 **	0.076	-0.492 **	0.043	-0.427 **	0.059
Health (reference: excellent)								
Fair or poor	-2.266 **	0.051	-2.348 **	0.106	-2.233 **	0.071	-1.915 **	0.108
Good	-1.030 **	0.027	-0.965 **	0.081	-1.086 **	0.033	-0.930 **	0.049
Very good	-0.488 **	0.022	-0.380 **	0.074	-0.511 **	0.027	-0.509 **	0.038
Community belonging (reference: very strong)								
Very weak	-0.950 **	0.054	-1.139 **	0.123	-0.909 **	0.067	-0.874 **	0.136
Somewhat weak	-0.617 **	0.032	-0.721 **	0.089	-0.651 **	0.039	-0.469 **	0.058
Somewhat strong	-0.333 **	0.029	-0.323 **	0.085	-0.377 **	0.035	-0.240 **	0.050
Lived in neighbourhood one year or more	-0.004	0.026	0.062	0.061	-0.015	0.032	-0.057	0.058
Immigrant	-0.068 **	0.025	-0.069	0.066	-0.082 **	0.031	-0.023	0.047
Homeowner	0.129 **	0.028	0.001	0.064	0.102 **	0.034	0.236 *	0.093
Detached dwelling	0.059 **	0.022	0.175 **	0.061	0.045 †	0.027	0.005	0.047
ln(Family income)	0.141 **	0.015	0.058	0.037	0.207 **	0.046	0.078	0.055
				numbers				
Observations	46,626	...	8,887	...	28,129	...	9,610	...
R-squared	0.286	...	0.305	...	0.265	...	0.225	...

... not applicable

* significantly different from reference category ($p < 0.05$)

** significantly different from reference category ($p < 0.01$)

† significantly different from reference category ($p < 0.10$)

Notes: ln = natural logarithm. All models include a time trend and census metropolitan area fixed effects. The reference categories are as follows: male = female; multi-person household = single-person household; unemployed = employed; mood or anxiety disorder = no mood or anxiety disorder; lived in neighbourhood one year or more = lived in neighbourhood less than one year; immigrant = Canadian-born; homeowner = renter; detached dwelling = multi-unit dwelling. Low-income families are defined as those in the first quintile (Q1), middle-income families are in the second through fourth income quintiles (Q2 to Q4), and higher-income families are in the fifth quintile (Q5). The coefficient on age squared for the full sample is 0.000176 (standard error = 0.0000276). Robust standard errors clustered on the respondent's dissemination area are reported.

Source: Statistics Canada, authors' calculations.

Results from separate models that were run for each of the three income quintile categories yield some weaker relationships between life satisfaction and individual characteristics among higher-income groups. The coefficients on unemployment and community belonging are weaker among individuals in the middle three and top family income quintiles than among those in the bottom quintile. Similarly, living in a detached dwelling (relative to multi-unit housing) is positively associated with life satisfaction for individuals in the bottom quintile but not for those in higher quintiles. This result holds even after taking into account homeownership, which follows the opposite pattern. For lower-income households, there may be negative externalities associated with living in multi-unit housing, such as noise or poor repair, that higher-income households are not affected by. Homeownership is positively and significantly correlated with life satisfaction among individuals in middle and top income quintiles, but not among those in the bottom quintile.

Building on the individual-level covariates in Table 5, neighbourhood measures were progressively introduced through a series of models that began with just one neighbourhood variable and concluded with all variables included (models 2 to 6, Table 6). For all respondents in the sample, models 2 and 3 included median DA family income and weighted population density, respectively. DA-level neighbourhood income is positively and significantly correlated with life satisfaction (0.086), while population density is negatively correlated (-0.015), albeit with a weak level of significance. But while DA income and population density are associated with life satisfaction, on their own they capture so many—and, at times, cross-cutting—neighbourhood characteristics that they shed relatively little light on the specific aspects of neighbourhoods that contribute to life satisfaction.

Table 6
Life satisfaction as a function of individual and neighbourhood characteristics for the full sample

	Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error
ln (DA median family income)	0.086 *	0.040	...	...	...	...	0.067	0.043	0.053	0.043	0.048	0.043
ln (Population density)	...	...	-0.015 †	0.009	...	...	-0.010	0.009	0.007	0.012	0.007	0.012
Access to transit	...	...	...	...	-0.019	0.024	-0.004	0.026	0.005	0.026	0.010	0.026
Crime	...	...	...	...	-0.022	0.029	-0.014	0.030	-0.001	0.031	-0.003	0.031
Access to parks	...	...	...	...	0.036 †	0.020	0.033 †	0.020	...	...	0.034 †	0.020
Green index	...	...	...	...	...	...	...	...	0.493 **	0.189	0.495 **	0.189
						numbers						
Observations	46,626	...	46,626	...	46,626	...	46,626	...	46,626	...	46,626	...
R-squared	0.286	...	0.286	...	0.286	...	0.287	...	0.287	...	0.287	...

... not applicable

* significantly different from reference category ($p < 0.05$)

** significantly different from reference category ($p < 0.01$)

† significantly different from reference category ($p < 0.10$)

Notes: ln = natural logarithm. DA = Dissemination area. All models include the individual variables reported in Table 5 (Model 1), which also include a time trend and census metropolitan area fixed effects. The reference categories for binary variables are as follows: access to transit = DAs ranked below the 70th percentile; crime rate = DAs below the top 10th percentile for violent or property crime; access to parks = no park present in the DA. Robust standard errors clustered on the respondent's dissemination area are reported.

Source: Statistics Canada, authors' calculations.

Turning to these aspects, Table 6, Model 4 began by including access to transit, access to parks and crime rates in the model without controls for DA income and population density. Only park access is positively and significantly correlated with life satisfaction, although significant only at the 10% level. Model 5 added DA income and DA population density back in. The association between parks, transit access and crime and life satisfaction remain qualitatively unchanged, but the coefficients on DA income and density themselves are no longer significant. A portion of the association between these variables and life satisfaction is accounted for by these more specific variables. Whether green space and access to parks are included in the model separately (models 5 and 6) or together (Model 7), they have no qualitative effect on the other neighbourhood variables. Both measures of access to natural areas are positively and significantly associated with life satisfaction, with neither seemingly influenced by the other. In this respect, they appear to be measuring different aspects of the natural environment associated with life satisfaction.[12] By contrast, there is no consistent relationship between access to transit, crime, income levels, or population density and life satisfaction in the fully specified model run on the full sample. Again, this is not surprising as these results are likely affected by families seeking to equalize their life satisfaction across space and by selection effects.

As a step toward addressing these issues, the models were run for respondents in each family's income quintile category. Beginning with DA median income and population density (Table 7), the point estimates are quite similar across the lower- and middle-income quintiles, with neighbourhood income positively correlated with life satisfaction and population density negatively correlated. However, these relationships are significant only for the middle-income quintiles, perhaps attributable to the far larger sample for this group (see models 2 and 3 in panels A and B). For higher-income families (Panel C), there is no significant association between neighbourhood income levels and population density and life satisfaction, and the coefficients have the opposite signs of the other two income quintile groups.

In Model 4, the correlations between specific neighbourhood characteristics and life satisfaction are estimated with neighbourhood income and density excluded from the models. For individuals in lower-income families, crime is negatively associated with life satisfaction, while access to parks is positively associated. Both are statistically significant (see Table 7, Panel A, Model 4). These results are consistent with the expectation that the risk (or experience) of crime reduces life satisfaction, while access to parks and green space increases it. Access to transit is positively but insignificantly correlated with life satisfaction among individuals in the bottom income quintile in this model.

Among individuals in middle-income families, only transit is significantly associated with life satisfaction and, contrary to expectations, its association is negative. As will become apparent, this result is sensitive to the inclusion of population density and income in the model. Neither crime rates nor access to parks have a significant association with life satisfaction among individuals in middle-income families. This is also the case among individuals in higher-income families.

12. If green space accessibility was an additive function of park and non-park accessibility, the interpretation of the coefficients of the model is more complicated. To illustrate, consider that green space accessibility (*g*) and park accessibility (*k*) enter the estimation equation as $\beta_1 g + \beta_2 k$. To simplify matters, assume that green space accessibility is in fact an additive function of private (non-park) green space access (g^p) and park accessibility, $g = g^p + k$. As such, they would enter the estimation equation as $\beta_1 \left(g^p + k \right) + \beta_2 k = \beta_1 g^p + \left(\beta_1 + \beta_2 \right) k$. Hence, the effect of park access would be the sum of β_1 and β_2. That the coefficients remain unchanged when entered into the model on their own or together suggests they are sufficiently different measures of access to the natural environment that they are not implicitly additive measures.

When neighbourhood income and population density are included in the models (Table 6, Model 5), access to transit is positively and significantly associated with life satisfaction for lower-income families. Access to transit is no longer significantly correlated with life satisfaction among middle-income families, plausibly because, without population density in the model, access to transit captures the negative effects of density on life satisfaction. Indeed, when DA income is added without DA population density, the results for access to transit remain negative and significant.[13]

To test whether access to green space has a different effect on life satisfaction compared with park access, the two are substituted in Model 6. Unlike access to parks, there is no significant association between green space and life satisfaction among individuals in lower-income or middle-income families; however, access to green space is positively and significantly associated with life satisfaction among individuals in higher-income families. This may be because they have the means to purchase larger properties with more green space and this acts as a substitute for public parks that are more important for lower-income families, who are less likely to have their own yards.

13. Substituting DA population density for DA income results in model estimates that are qualitatively unchanged from those reported in Model 5 for lower- and middle-income families. These results are not reported but are available upon request.

Table 7
Life satisfaction as a function of individual and neighbourhood characteristics by income class

	Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error
Panel A: Lower income (Q1)												
ln (DA median family income)	0.121	0.112	...	...	...	...	0.058	0.122	0.054	0.119	0.033	0.118
ln (Weighted population density)	...	...	-0.030	0.027	...	...	-0.041	0.029	-0.020	0.038	-0.014	0.037
Access to transit	...	...	...	...	0.095	0.058	0.135 *	0.062	0.145 *	0.064	0.160 *	0.064
Crime rate	...	...	...	...	-0.199 **	0.071	-0.194 *	0.077	-0.168 *	0.081	-0.175 *	0.081
Access to parks	...	...	...	...	0.139 **	0.052	0.130 *	0.052	...	...	0.131 *	0.051
Green index	...	...	...	...	...	...	...	...	0.833	0.548	0.845	0.543
						number						
Observations	8,887	...	8,887	...	8,887	...	8,887	...	8,887	...	8,887	...
R-squared	0.305	...	0.305	...	0.307	...	0.307	...	0.307	...	0.308	...
	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error
Panel B: Middle income (Q2 to Q4)												
ln (DA median family income)	0.113 *	0.055	...	...	...	...	0.090	0.059	0.080	0.060	0.079	0.061
ln (Weighted population density)	...	...	-0.029 *	0.012	...	...	-0.017	0.012	-0.008	0.015	-0.008	0.015
Access to transit	...	...	...	...	-0.071 *	0.033	-0.045	0.034	-0.039	0.035	-0.038	0.035
Crime rate	...	...	...	...	0.041	0.038	0.051	0.039	0.058	0.039	0.058	0.039
Access to parks	...	...	...	...	0.013	0.026	0.009	0.027	...	...	0.009	0.027
Green index	...	...	...	...	...	...	...	...	0.272	0.241	0.271	0.242
						number						
Observations	28,129	...	28,129	...	28,129	...	28,129	...	28,129	...	28,129	...
R-squared	0.265	...	0.265	...	0.265	...	0.265	...	0.265	...	0.265	...
	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error	coefficient	standard error
Panel C: Higher income (Q5)												
ln (DA median family income)	-0.061	0.066	...	...	...	...	-0.047	0.069	-0.078	0.068	-0.079	0.068
ln (Weighted population density)	...	...	0.021	0.016	...	...	0.019	0.018	0.046 *	0.021	0.046 *	0.021
Access to transit	...	...	...	...	0.027	0.047	0.004	0.051	0.022	0.052	0.025	0.052
Crime rate	...	...	...	...	0.023	0.053	0.017	0.055	0.033	0.054	0.032	0.054
Access to parks	...	...	...	...	0.010	0.034	0.009	0.034	...	...	0.012	0.034
Green index	...	...	...	...	...	...	...	...	0.773 *	0.309	0.776 *	0.310
						number						
Observations	9,610	...	9,610	...	9,610	...	9,610	...	9,610	...	9,610	...
R-squared	0.225	...	0.225	...	0.225	...	0.225	...	0.227	...	0.227	...

... not applicable

* significantly different from reference category ($p < 0.05$)

** significantly different from reference category ($p < 0.01$)

Notes: ln = natural logarithm. DA = Dissemination area. All models include individual variables reported in Table 5 (Model 1), which also include a time trend and census metropolitan area fixed effects, and are estimated by income class. Lower-income families are in the bottom income quintile (Q1), while middle-income families are in the second through fourth income quintiles (Q2 to Q4), and higher-income families are in the top income quintile (Q5). The reference categories for binary variables are as follows: access to transit = DAs ranked below the 70th percentile; crime rate = DAs below the top 10th percentile for violent or property crime; access to parks = no park present in the DA. Robust standard errors clustered on the respondent's dissemination area are reported.

Source: Statistics Canada, authors' calculations.

Model 7 includes the fully specified model. For families in the lowest income quintile, three of the six neighbourhood characteristics are significant. Access to parks and transit are positively associated with life satisfaction, while neighbourhood crime rates are negatively associated with life satisfaction. The significance of park access is consistent with findings elsewhere in the literature (see Van Herzele and de Vries 2012; Ambrey and Fleming 2013). Access to green space, population density and median DA income have no significant association with life satisfaction for individuals in lower-income families. For individuals in middle-income families, there is no association between neighbourhood characteristics and life satisfaction.

Contrary to expectations driven by spatial equilibrium, for individuals in the top family income quintile there is a positive association between green space and density and life satisfaction. The positive effect of density is surprising given that the literature has typically found a negative association. Plausibly, the consumption opportunities that higher-density neighbourhoods bring (e.g., restaurants and retail) may explain the positive association. The positive association with green space is interesting particularly because it remains even after access to parks is taken into account. It may be picking up the effect of access to private forms of green space, such as larger properties, that higher-income families are more able to afford. Lastly, while plausible, a cautious interpretation of the results for individuals in higher-income families is warranted, as these results imply either that the benefits that accrue to respondents from green space and density are not fully taken into account in housing costs, or there are stronger selection effects and other sources of endogeneity that may bias the estimates.

Finally, Model 7 (Table 7) is modified with the inclusion of two interaction terms, which are presented in Table 8.

First, Panel A presents regression results for the interaction terms differentiating respondents with respect to both dwelling type and access to parks. Ambrey and Fleming (2012) find that individuals who reside in multi-unit dwellings, specifically high-rise apartments, are among those who benefit most from the provision of public green space. In this context, access to parks is expected to be more strongly correlated with life satisfaction among residents of multi-unit buildings. This is indeed the case. Among individuals in the bottom income quintile, life satisfaction is 0.195 points higher among residents of multi-unit dwellings who have access to parks than among residents of multi-unit dwellings without such access. Life satisfaction is higher among residents of detached units, regardless of whether they have park access. None of the categories for the interaction term are significant among individuals in middle- and higher-income quintile groups.

And second, Panel B presents regression results from a model that includes an interaction term differentiating respondents in terms of access to public transit and parks. The hypothesis is that parks will be less strongly correlated with life satisfaction among individuals with lower income who have access to public transit, indicating greater opportunity to access parks beyond their immediate neighbourhood. Among individuals in lower-income families, life satisfaction is highest among those with access to both parks and transit, and lowest among those with access to neither. Life satisfaction of those with access to one or the other fall within this range. In this respect, neighbourhood amenities appear to have a cumulative impact on life satisfaction. Regarding the hypothesis, it is not apparent that transit access helps to mitigate the effect of a lack of local park access on life satisfaction. Whether respondents had high or low access to transit, those with park access had higher life satisfaction.

Table 8
Life satisfaction as a function of individual and neighbourhood characteristics by family income class with park-transit and park-dwelling type interaction terms

	Low income		Middle income		High income	
	coefficient	standard error	coefficient	standard error	coefficient	standard error
Panel A: Dwelling type and parks						
Detached, no parks	0.226 **	0.075	0.033	0.036	0.033	0.063
Multi-unit, parks	0.195 **	0.066	0.032	0.041	0.039	0.062
Detached, parks	0.236 **	0.087	0.023	0.038	0.034	0.061
Multi-unit, no parks (reference group)	...	...	...	...	...	...
			number			
Observations	8,887	...	28,129	...	9,610	...
R-squared	0.308	...	0.266	...	0.227	...
	coefficient	standard error	coefficient	standard error	coefficient	standard error
Panel B: Transit and parks						
Low transit, no parks	-0.328 **	0.091	0.018	0.054	-0.061	0.065
High transit, no parks	-0.222 *	0.087	-0.031	0.057	-0.066	0.068
Low transit, parks	-0.260 **	0.089	0.017	0.054	-0.072	0.065
High transit, parks (reference group)	...	...	...	...	...	...
			number			
Observations	8,887	...	28,129	...	9,610	...
R-squared	0.308	...	0.266	...	0.227	...

... not applicable

* significantly different from reference category ($p < 0.05$)

** significantly different from reference category ($p < 0.01$)

Notes: All models correspond to Model 7 in Table 7, with dwelling type-parks and transit-parks substituted for dwelling type and parks, and transit and parks in panels A and B, respectively, and are estimated across families by income class. Lower-income families are in the bottom income quintile (Q1), while middle-income families are in the second through fourth income quintiles (Q2 to Q4), and higher-income families are in the top income quintile (Q5). Low and high transit are based on the transit access binary variable defined in Table 1. Robust standard errors clustered on the respondent's dissemination area are reported.

Source: Statistics Canada, authors' calculations.

Conclusions

Using life satisfaction responses provided by over 46,000 survey respondents in almost 6,500 neighbourhoods across 29 Canadian CMAs, this study provides evidence of the association between the subjective well-being of individuals and selected characteristics of the neighbourhoods in which they live. Consistent with the expectations that individuals select into neighbourhoods that meet their needs and preferences (i.e., spatial equilibrium effects), there were no significant correlations between neighbourhood characteristics and life satisfaction among individuals across the middle 60% of the family income distribution. In short, for the majority of respondents, the results are consistent with them trading off positive (and negative) neighbourhood characteristics captured in higher (and lower) land prices with other forms of consumption and, in the process, equalizing, on average, life satisfaction across heterogenous neighbourhoods. An unexpected result was the positive correlations between life satisfaction and population density and green space among individuals in the top 20% of the distribution. The factors or processes underlying these correlations warrant further exploration. It may be, for example, that neighbourhood green space is capturing the benefits of living in neighbourhoods with large, well-foliaged yards or proximity to natural environments, an interpretation consistent with emerging evidence on relationships between natural environments and health. Alternatively, green space may be capturing the effects of wealth or other factors.

Among individuals in the bottom 20% of the family income distribution, whose financial capacity to trade off the cost of living in a more amenity-rich neighbourhood with other forms of consumption is weaker, strong correlations between neighbourhood characteristics and life satisfaction are observed. In this group, access to public transit and access to local parks are both positively correlated with life satisfaction. And among individuals in the bottom quintile, life satisfaction is significantly higher among those who have access to both public transit and parks than it is among those with access to neither or just one of these amenities. This underscores the importance of housing as "more than just a roof over our heads," as highlighted in Canada's National Housing Strategy, recognizing the need to align housing programs with public investments across areas such as "…job creation, skills training, transit, early learning, healthcare, and cultural and recreational infrastructure" (Government of Canada 2017, p. 5).

A strong negative correlation between crime and life satisfaction is observed among individuals in the bottom 20% of the family income distribution. Whether this reflects personal experiences of crime, feelings of insecurity or mistrust of others cannot be assessed with the data used for this study. Looking ahead, the data needed to address these issues could be constructed by appending neighbourhood-level variables to the Canadian Housing Survey (CHS) rather than the CCHS. CHS respondents were asked about their perception of crime and their sense of safety in their neighbourhood. This, in combination with actual rates of crime, would allow a more fulsome analysis of the intersection between subjective and objective measures of crime and well-being to be examined.

This study also highlights the relationship between neighbourhood-level variables themselves. Population density and median income are neighbourhood characteristics often used in research, and, in the absence of other neighbourhood-level variables, become proxies for a potentially wide range of characteristics. This is evident in the results above. While there is a significant negative correlation between population density and life satisfaction and a significant positive correlation between median income and life satisfaction, both correlations become non-significant when other neighbourhood characteristics are added. With ongoing development and increasing access to neighbourhood-level variables, there is increasing scope to be selective in variables included in research designs and less need to proxy such characteristics using density and income measures.

Ongoing development of neighbourhood-level information continues to open up new opportunities for geospatial research. For example, Statistics Canada has recently developed an index of income mixing at the neighbourhood level in collaboration with Canada Mortgage and Housing Corporation. This will facilitate research on whether the outcomes of individuals in lower-income families are correlated with residence in neighbourhoods characterized by more or less “income mixing.” Another example is an experimental estimate of neighbourhood-level social capital that is in development.

Finally, this analysis demonstrates the utility of the life satisfaction question. This is the primary measure of subjective well-being recommended by the Organisation for Economic Co-operation and Development and is a headline indicator in the Government of Canada’s Quality of Life Framework. In this study, the measure yielded correlations with individual- and neighbourhood-level characteristics that were largely consistent with the literature and with expectations. The measure performed well in this context, serving to provide a valuable umbrella measure of well-being, reflecting the factors that support and improve people’s lives as well as those that diminish well-being.

Appendix

Appendix 1: Data

Weighted population density

The weighted population density (see Craig 1984) of each DA (D_{DA}) is measured using the population-weighted density of its constituent dissemination blocks (DBs)—that is, $D_{DA} = \sum_{DB \in DA} \left(p_{DB} / p_{DA} \right) D_{DB}$, where p_{DB} and p_{DA} are the populations of each DB and DA, respectively, and D_{DB} is the population density of each DB. It provides a measure of the population density that the average resident experiences within the constituent DBs of each DA. Population density is measured in this way because many DAs contain DBs with few residents (e.g., DBs containing open land or commercial zones). This can reduce the population density of a DA considerably even though most residents live in blocks whose population densities are relatively high. In essence, population-weighted density better represents the density of residential built-up areas across DAs that are heterogeneous with respect to residential and non-residential land uses. It is important to keep in mind, however, that this is not a perfect representation of residential density, which would require drawing boundaries around residential streets, excluding all other land uses. It does allow for better representation of the effect of residential density on life satisfaction, as compared with standard density, which would take into account non-residential land uses.

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