



Titre: House size or walkability, what makes you more satisfied?
Understanding the relationship between housing characteristics,
local accessibility, and life satisfaction during the COVID-19
confinement period

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House size or walkability, what makes you more satisfied? Understanding the relationship between housing characteristics, local accessibility, and life satisfaction during the COVID-19 confinement period

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Abstract

The travel and activity restrictions related to COVID-19 dramatically changed the lives of Canadians, with important implications for well-being. This study analyzes the impacts of housing characteristics, local accessibility, and quality of active transport infrastructure on individuals' life satisfaction during the lockdown. Data was collected through a Canada-wide online survey fielded in November 2020 (n=618), during the second wave of the pandemic. The survey captured information on travel behavior and activities during lockdown and perceptions of neighborhood characteristics, together with self-reported life satisfaction and housing characteristics. An exploratory data analysis followed by an ordered logistic regression was performed to assess the determinants of life satisfaction during lockdown. Findings reveal that access to a private yard as well as park space and sidewalks which are wide enough to maintain social distancing were key determinants of life satisfaction, whereas dwelling size was not. Building on previous research on life satisfaction and travel behavior, this study highlights the benefits of providing high-quality neighborhood and transport infrastructure, as well as access to nearby outdoor spaces, specifically for those without access to a private yard. The findings are of relevance to support resilient cities that better meet the needs of all individuals.

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1. Introduction

The confinement periods associated with the COVID-19 had significant impacts on individuals' daily life and well-being worldwide (Ammar et al., 2020; Tavakoli et al., 2022). To limit the spread of the virus worldwide and regionally, countries around the world imposed various restrictions aimed at reducing social contacts. These included travel restrictions and limitations of out-of-home activities, enforced namely through lockdowns, curfews, working from home policies, and closing of public spaces such as schools, restaurants, and cultural venues. These restrictions inevitably resulted in changes in travel behavior, activity participation and social interactions (De Vos, 2020). With increased time spent at home and within the neighborhood, the impacts of housing conditions, nearby amenities and green spaces on life satisfaction became more salient. Usage of green space was found to be associated with the increase or maintenance of subjective well-being (Huerta & Utomo, 2021; Poortinga et al., 2021). Meanwhile density and small dwellings were associated with lower levels of well-being (Mouratidis & Yiannakou, 2022). Also, private gardens were found to compensate for the absence of public green space and their effect on well-being (Poortinga et al., 2021).

Recent transport and land use-related life satisfaction literature have shown that the quality of public amenities, green space and neighborhood physical condition (maintenance) increase neighborhood satisfaction and respondent well-being (Ciorici & Dantzler, 2018; Ruiz et al., 2019). Perceived accessibility of daily activities around home location is also associated with greater life satisfaction (Lättman et al., 2019). In other work, active transport was also shown to increase travel satisfaction and by extension well-being (Friman et al., 2017). The impact of density on quality of life was also studied in the context of Montreal, a Canadian city, before the pandemic but a significant small negative impact was found (Belikow et al., 2021). The same study showed that self-selection of home near green space and in a walkable neighborhood had a positive impact on wellbeing and quality of life (Belikow et al., 2021). In one study, the built environment was shown to have a greater impact on life satisfaction for the bottom 20% of Canadian income earners (Brown et al., 2021). However, the conditions of the pandemic changed how people used and interacted with their homes and surrounding environments. As people's movement was generally restricted, the influence of housing size and neighborhood amenities on well-being might have increased. As such, a gap exists in our knowledge of how such a change impacts the influence of these different factors.

The aim of this study is to analyze the relationship between individuals' life satisfaction across Canada, and housing characteristics such as a private yard, perceptions of local accessibility to places such as green space and quality of active transport infrastructure. .

2. Methods

Data were collected from a representative sample of Canadians (by province, age, and gender) using an online survey disseminated in November 2020, during the second wave of the COVID-19 pandemic in Canada. The survey captured detailed information regarding respondents' travel behaviour and activities during lockdown and their self-reported life satisfaction, along with housing characteristics and perceptions of local infrastructures and amenities. The survey was conducted through Léger Survey and received ethics approval from the Polytechnique Montréal ethics committee (CER-1920-60-D).

The following question was used to capture self-reported life satisfaction on a seven-point Likert-scale (strongly dissatisfied to strongly satisfied): "Think about your daily life DURING the confinement period. Taken all together, how satisfied are you with your life as a whole?" Reported life satisfaction before the confinement period was also asked to assess the respondent disposition to be happy and act as a control variable for other unmeasured influences. Additionally, individuals were asked a series of five-point Likert-scale (going from strongly agree to strongly disagree)

questions regarding their neighborhood (Table 1). These four elements were hypothesized as potential determinants of life satisfaction during lockdown, as they might have been more conducive to supporting active trips and outdoor activities. Along with current household income, a question was included to capture any change in household income during the pandemic, knowing that several households experienced a loss of income during the pandemic. Finally, a series of questions was asked to collect information about individuals, household and housing characteristics.

Table 1. Statements on neighborhood characteristics.

My neighbourhood has enough park space for me to get outside and practice social distancing.
I have a local grocery store that I can walk to.
I have local shops that I can walk to (e.g., pharmacy, convenience stores).
The sidewalks in my neighbourhood are wide enough to allow pedestrians to safely pass each other.

An exploratory analysis of the data was first conducted to explore potential associations between individual and household characteristics, neighborhood perceptions, housing, and life satisfaction. With respect to house size, individuals were asked to report both the surface area and the number of bedrooms, the latter being more commonly used in some Canadian regions to report house size. Given the high number of missing responses for the surface area, the number of bedrooms was used as a proxy for house size in this study. Then, an ordered logistic regression modelling the reported life satisfaction during lockdown was performed. The four neighborhood variables were recoded to a three-point scale (strongly disagree/disagree, neutral, strongly agree/agree) to reduce the number of degrees of freedom and facilitate the interpretation of the results. The variables were tested for correlation using the spearman correlation test and were found to not be strongly correlated (ρ under 0.25). A stepwise approach was also adopted to assess the stability of the model and avoid multicollinearity issues when including new variables. The assumption of proportional odds was confirmed by a parallel assumption test.

3. Findings

3.1. Exploratory data analysis

Table 2 presents the summary statistics of the variables considered in the analysis. First, less than half (47%) of respondents reported high levels of life satisfaction (scores of 5, 6, or 7) during lockdown, while 30% reported dissatisfaction (scores of 1, 2 or 3). Notably, 34 % of the respondents experienced a decrease in their level of income. With respect to local amenities and infrastructure, most people (78%) strongly agreed/agreed that there was enough park space to practice social distancing, while this proportion drops to 50% for sidewalk width. As for the presence of amenities (shop and grocery store) within walking distance, similar numbers were observed, with respectively 63 % and 67 % of the respondents who strongly agreed/agreed with the statement.

Table 2. Descriptive statistics of the variables considered in the analysis.

	Count	%
Observation	618	100
Life satisfaction during		
Extremely dissatisfied	27	4%
2	58	9%
3	104	17%
Neutral	139	22%
5	146	24%
6	124	20%
Extremely satisfied	20	3%

Life satisfaction change		
0	31	5%
-1	240	39%
-2	135	22%
-3	98	16%
-4	58	9%
-5	34	6%
-6	6	1%
-7	3	0%
Positive change	13	2%
Income change group		
Stable	372	60%
Small decrease (<10%)	65	11%
Somewhat decrease (10 - 30%)	69	11%
Strong decrease (30 - 50%)	32	5%
Major decrease (50-80%)	16	3%
Complete or near-complete loss (>80%)	22	4%
No income	42	7%
Number of bedrooms		
1	74	12%
2	154	25%
3	210	34%
4	142	23%
5	30	5%
6	6	1%
7	2	0%
Access to a private yard		
Yes	137	22%
No	481	78%
Shared space		
Yes	136	22%
No	482	78%
Household size		
Min	1	
1st qu.	2	
Median	2	
Mean	2.579	
3rd qu.	3	
Max.	10	
Sidewalks are large enough		
Strongly agree	174	28%
Agree	131	21%
Neutral	139	22%
Disagree	62	10%
Strongly disagree	112	18%
There is enough park space		
Strongly agree	331	54%
Agree	151	24%
Neutral	92	15%
Disagree	19	3%
Strongly disagree	25	4%
Presence of shop at walking distance		
Strongly agree	279	45%
Agree	138	22%
Neutral	68	11%

Disagree	36	6%
Strongly disagree	97	16%
Presence of a grocery store at walking distance		
Strongly agree	269	44%
Agree	118	19%
Neutral	50	8%
Disagree	46	7%
Strongly disagree	135	22%

Exploring first the relationship between perceptions towards local infrastructure and amenities and life satisfaction during the lockdown, Figure 1 shows the percentage of respondents by life satisfaction level and perceptions of neighbourhood characteristics. For ease of interpretation, life satisfaction was recoded into three categories in this figure. These descriptive results suggest that there is a relationship between life satisfaction and satisfaction with enough park space and sidewalk width. For these two aspects, the proportion of individuals with a higher life satisfaction (5 and higher) is higher among individuals who agreed/strongly agreed with the statements as compared to those who disagreed/strongly disagreed: 50.8% vs 34.1% for park space and 54.4% vs 42.5% for sidewalk width. We observe the inverse relation for the proportions of individuals with a low life satisfaction (3 and lower). As for the presence of a grocery store or a local shop, the differences are less pronounced.

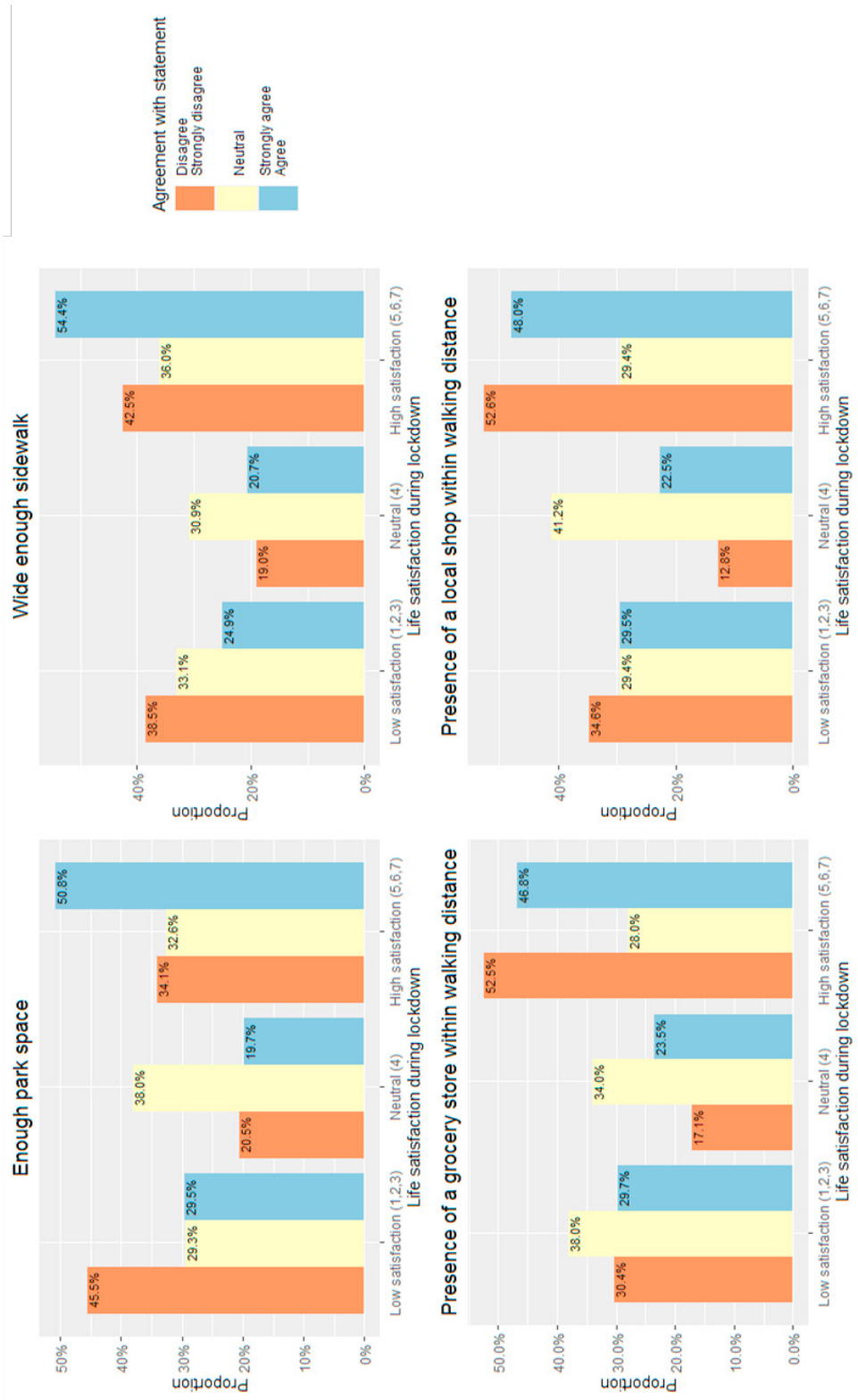


Fig. 1. Percentage of individuals by agreement level with questions about neighborhood amenities, presented for each level of satisfaction.

As for the house characteristics, Figure 2 explores the relationship between the number of people per bedroom and access to a private yard on life satisfaction during lockdown. The number of people per bedroom was calculated by dividing the number of people in the household by the reported number of bedrooms. The results show that the proportion of respondents with a lower life satisfaction is higher among those without access to a private yard. In contrast, there is no clear trend between satisfaction during COVID-19 and the number of people per bedroom. At first glance, these results suggest that house size compared to the household size is not conducive to higher life satisfaction, but that access to a private yard could be. These relationships are analyzed further in the next section.

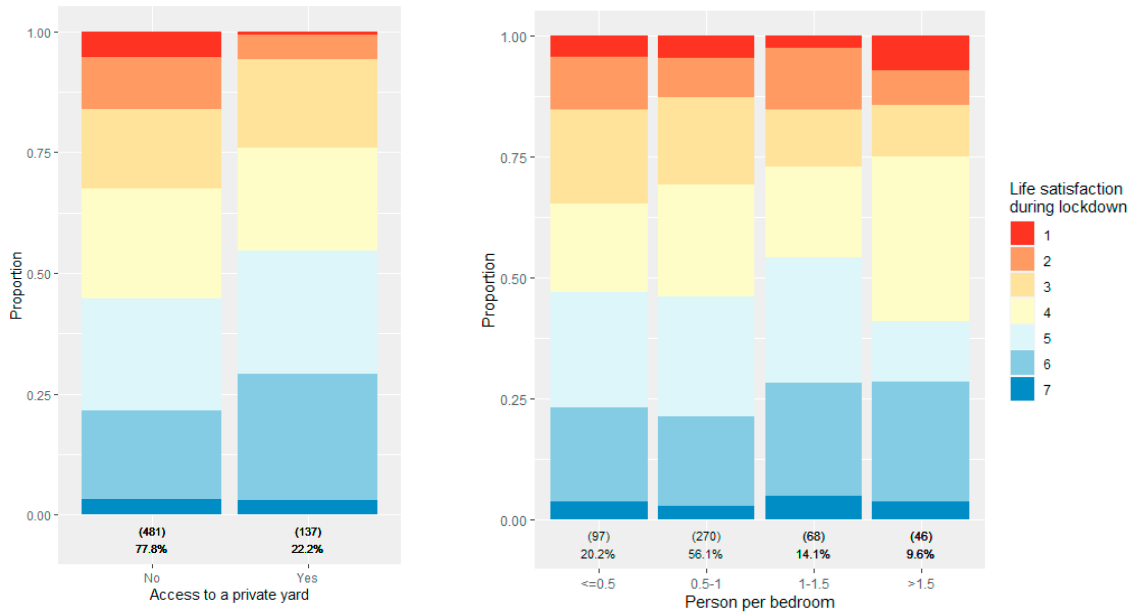


Fig. 2. Relationship between people per bedroom and access to a private yard to life satisfaction during lockdown.

3.2. Regression analysis

The results of the ordered logit regression model are presented in Table 3. A coefficient above 0 suggests a positive association with a higher life satisfaction. First, we find that change in income is strongly associated with life satisfaction during lockdown. Individuals who experienced a decrease or a complete loss of income are more likely to report a lower life satisfaction than those who had a stable income (no change or a decrease of less than 10%). As for housing characteristics, the number of bedrooms (used as a proxy for house size in this study) is not significant. The findings suggest that, holding the household size constant, the number of bedrooms is not associated with a higher life satisfaction. However, having access to a private yard is significant. This confirms the contribution of a private yard to life satisfaction during the pandemic. Having access to a shared space (e.g., common staircase, laundry room) is also significantly associated with a higher life satisfaction during the confinement period. This might be explained by the extra social contacts those shared space can provide. Looking more closely at the type of shared space is warranted in future studies to shed light on the specific contribution of shared spaces on life satisfaction during lockdown. Finally, household size is not significantly associated with life satisfaction. This may be due to having both positive and negative effects on life satisfaction that cancel each other out. Note that the presence of children (with and without the inclusion of household size in the model) was tested and found to be non-significant, which again could be due to the coexistence of positive and negative influences.

With respect to the neighborhood characteristics, people who reported that sidewalks are wide enough are more likely to report a higher life satisfaction during lockdown. Similarly, those that agreed/strongly agreed that there was enough park space are also more likely to report higher levels of life satisfaction. This suggests that sidewalk width and park space may have contributed to higher life satisfaction during lockdown. In line with the exploratory data analysis, access to a local shop and to a grocery store were found not to be significant and were, therefore, not included in the final model.

Table 3. Results of the ordered logit model modelling life satisfaction during lockdown.

	Coefficients	Std. error	p-value
Income change (Ref : Stable)			
Decrease	-0.943	0.201	<0.001 ***
Complete loss	-1.151	0.303	<0.001 ***
No income	-0.360	0.300	0.230
Number of bedrooms			
	0.047	0.082	0.564
Access to a private yard			
	0.573	0.178	0.001 **
Shared space with another household			
	0.427	0.198	0.031 *
Household size			
	0.102	0.064	0.111
Wide-enough sidewalks (Ref : Strongly disagree/disagree)			
Strongly agree/agree	0.547	0.174	0.002 **
Neutral	0.035	0.204	0.864
Enough park space (Ref : Strongly disagree/disagree)			
Strongly agree/agree	0.586	0.294	0.046 *
Neutral	0.248	0.330	0.454
AIC			
	2151.6		
BIC			
	2226.8		
Log-likelihood			
	-1058.8		

* p < 0.05., ** p < 0.01., *** p < 0.001.

To dig deeper into the interactions between the house and neighborhood characteristics, Figure 3 illustrates the combined relationship between access to park space and a private yard. As seen in the exploratory data analysis, there is an observed relationship between life satisfaction and private yard access: a greater proportion of respondents reported low levels of life satisfaction among those without private outdoor space. With respect to park space, we see a significant trend specifically for people who do not have access to a private yard: the proportion of respondents with high levels of satisfaction is higher among respondents who are in agreement (48.1% vs 34.2%). The trend is less clear for those with access to a private yard, suggesting that access to park space could be more important for those without private outdoor space.

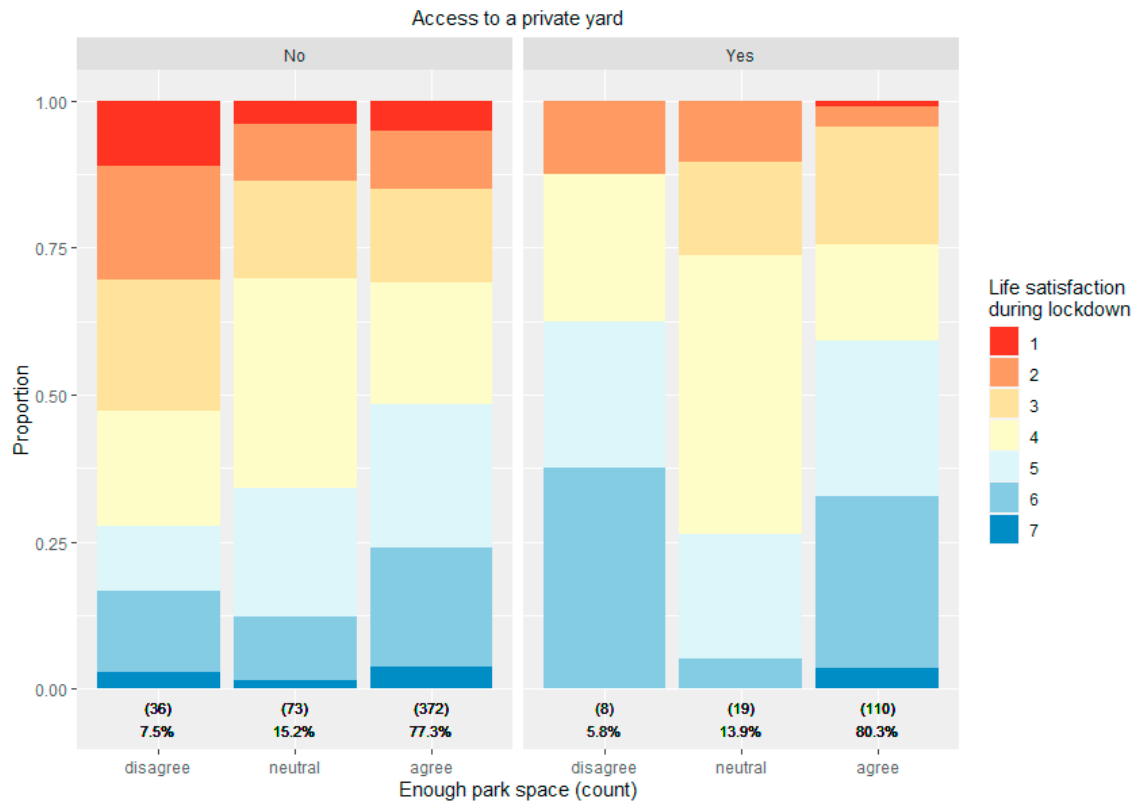


Fig.3. Relationship between enough park space, access to a private yard, and life satisfaction during the confinement.

4. Conclusion

Through an online survey conducted across Canada during the second wave of COVID-19, this study investigated the relationship between perceived neighborhood characteristics, housing characteristics and reported life satisfaction. This study has a few limitations including the inability to control for self-selection biases such as the type of neighborhood and type of home people prefer to live in. However, such influences should be captured to a certain extent by the pre-Covid measure of life-satisfaction. The findings highlight the potential contribution of a private yard, sidewalk width, shared space and park space in supporting life satisfaction during lockdown. These findings are in line with previous research that has shown that outdoor activities and contact with nature contributed to supporting well-being during the pandemic (Beall et al., 2022). More specifically, public park area and private outdoor spaces were found to be directly associated with psychological health during the pandemic (Pouso et al., 2021), while the provision of transport infrastructure near home is key in supporting recreational walking (Kang et al., 2017; Sugiyama et al., 2010). Combined with previous research on life satisfaction and travel behavior, the findings suggest that supporting high-quality transport infrastructure and access to nearby outdoor spaces, specifically for those without access to a private yard, can play a positive role in people's life satisfaction. Conversely, the results shed light on the non-significant contribution of house size, when other factors such as the household size and perceptions of neighborhood characteristics are controlled for.

This study focused on individuals' perceptions of their neighborhood infrastructure and amenities. Future studies could further examine the relationship between the actual provision of infrastructure and individuals' perception and reported life satisfaction. Notwithstanding the discrepancies that may exist between perceptions and provision, the

results highlight the importance of specific land use and transport factors that can support individuals' satisfaction during confinement periods. As for housing characteristics, more efforts are required to further investigate the influence of different types of shared and outdoor spaces. Qualitative studies building on the findings of this study are also warranted to explore the underlying mechanisms influencing the relationship between land use and transport, housing characteristics and life satisfaction. The policy implication of this study is that it emphasizes the importance of including public spaces in high density neighborhood and the benefits of including private spaces in medium density 'missing middle housing' neighborhood. Finally, future studies are called for to examine the observed relationships in other cultural contexts.

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