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Making room for everyone

Assessing housing needs and suitability in Waterloo Region, Ontario via time, space, and equity lenses

Faire de l'espace pour tout le monde : une évaluation des besoins et de la taille convenable du logement dans la région de Waterloo, en Ontario, selon des perspectives temporelle, spatiale et d'équité

Alex Petric, Dawn C. Parker, Sean Geobey and Kirsten Wright

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Article abstract

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Making room for everyone: Assessing housing needs and suitability in the Region of Waterloo, Ontario via time, space, and equity lenses

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Abstract

Over the past decade, the Region of Waterloo experienced significant population growth and housing construction, but housing costs have continued to rise. To tackle the broader housing crisis affecting Ontario and Canada, calls for increased housing construction have grown, but advocates often emphasize quantities of homes needed without considering housing type, household composition, or equity considerations. We analyze public data for Census Tracts and across the Region of Waterloo to compare housing construction and population growth and to assess housing indicators across socio-demographic indicators to highlight groups deserving greater attention in housing needs assessments. We observe 1) a need for both greater housing supply and greater housing diversity, 2) socio-demographic inequality in housing suitability outcomes, and 3) a need to include equity-based analysis in housing and land needs assessments. We therefore propose municipal policy options to support improved housing supply, diversity, and analysis, including a greater focus on developing "missing middle" housing.

Résumé

Dans la dernière décennie, la région de Waterloo a subi une croissance démographique ainsi que la construction de plusieurs logements, mais les prix des logements continue à augmenter. Pour résoudre la crise du logement Ontarienne et Canadienne, plusieurs proposent de construire de nouveaux logements, mais ceux-ci se concentrent sur les quantités de logements sans porter attention aux types de logements ou la composition du ménage. Nous analysons les données publiques pour examiner la construction et la croissance de population dans la région de Waterloo, ainsi que pour comparer les indicateurs de logement et les indicateurs socio-démographiques. Nous observons : 1) la nécessité d'une augmentation de logements et de la diversité de ceux-ci, 2) des résultats inéquitables de logement selon les facteurs socio-démographiques, et 3) un besoin d'inclure l'équité dans les évaluations des besoins de logement et de terrain. Nous offrons des options de politiques pour améliorer la quantité, diversité, et l'analyse des logements, comme une plus grande concentration sur le développement de logements intermédiaires.

Keywords:

housing, community planning, equity, Waterloo Region, missing middle housing

Mots-clés:

logement, aménagement communautaire, région de Waterloo, logements intermédiaires

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Introduction

Southwestern Ontario's Region of Waterloo (ROW) has experienced significant population growth in recent years, bolstered by a strong, tech-focused economy, robust post-secondary institutions, economic integration with the Greater Toronto Area, and increasing rates of immigration to Canada. Most of the Region's residents (88%) live in its three cities of Waterloo, Kitchener, and Cambridge (Statistics Canada, 2022b). Over 2016–2022, Statistics Canada estimates that the ROW's population grew at a strong average annual rate of 2.4%, from 553,437 to 644,828 (Statistics Canada, 2023c). Alongside this growth, the ROW has urbanized and intensified through pro-development policy and the construction of the ION light-rail transit (LRT) route, making it North America's smallest urban area to pursue such a project. Between 2011 and 2022, over $3.3 billion in new residential construction (primarily apartments) occurred in the Region's Central Transit Corridor (CTC), which covers roughly 800m around ION LRT stations (MacKinnon et al., 2023).

The ROW's growth has occurred against the backdrop of a growing housing crisis across Ontario and Canada, with surging housing demand, cratering vacancy rates, soaring homeownership costs, and a lack of affordable rental units (Canadian Mortgage & Housing Corporation [CMHC], 2023c; Hogue, 2023). In the ROW, population growth has outpaced housing construction since 2016, leading to rising house prices and falling affordability (Ayer, 2023; Van Der Merwe & Doucet, 2021). Concerns have grown around gentrification and affordability (Ellis-Young & Doucet, 2021), and land values have risen in the CTC (Huang et al., 2024), despite a significant expansion of the Region's housing stock (Parker et al., 2023). Rising housing costs strongly affect vulnerable, low-income, and student populations (Revington, 2023; Revington & August, 2020; Turman et al., 2021), and residents face frequent relocations, social network disintegration, discrimination, and evictions to facilitate renovations (Diwan et al, 2021; Mensah & Tucker-Simmons, 2021).

Mainstream perspectives see the crisis as a matter of alignment between housing supply and demand (CMHC, 2023c). Recent housing and land needs assessments have forecasted numbers of new dwellings needed to meet demand based on expected populations and average household/dwelling sizes (e.g., CMHC, 2023a; Moffatt, 2021; Moffatt et al., 2022; Ontario Ministry of Municipal Affairs, 2018). These approaches assume that a sufficient expansion in supply will necessarily lower housing costs in the market.

Such approaches may overlook alignment between dwelling types and household needs, especially for households that deviate from the average (Parker et al., 2023). Additionally, few housing needs assessments and response plans consider how housing pressures affect diverse household types and communities (Palm & Whitzman, 2019; Temple & Steele, 2004). More recent efforts have assessed housing needs across income categories and among priority populations like single-parent families or recent immigrants to highlight inequitable housing outcomes (Housing Assessment Resource Tools, 2022).

We suggest that housing and land needs assessments could be expanded to consider whether dwelling sizes are suitable for household sizes and whether such suitability varies for vulnerable groups. We demonstrate how planners can conduct such analysis using public data and how this additional analysis can contribute to policy solutions. We highlight how policies that facilitate additional supply of "missing middle" housing in all areas of the ROW might address deficits in housing supply and related inequities in housing suitability that our analysis identifies.

Figure 1. Types of "missing middle" housing existing between single-family houses and larger apartment buildings (Parolek, 2020)

Though housing costs and construction figures receive much attention, housing suitability—whether households can find dwellings large enough for their needs based on household size— has been relatively understudied (Moos et al., 2018), but its analysis may illuminate new dimensions of the housing crisis. As varied households require a diversity of housing, simple targets to construct a set number of new units may not meet all present needs. Finding suitable space for all household sizes is a particular challenge for settlement and integration of new immigrants (Brown, 2017; Oudshoorn et al., 2019; Teixeira & Drolet, 2017). Attention to housing suitability figures can provide valuable insights, especially given the ROW's increasingly diverse population (Ayer, 2023) and the federal government's elevated immigration targets.

"Missing middle" housing (MMH),[1] which includes a range of middle-density low-rise dwelling types (shown in Figure 1) like townhouses, triplexes/ quadruplexes, and low-rise apartments that contain sufficient space for families (Syvixay & Anderson, 2019; Wegmann, 2020a), has been proposed as a means to support housing suitability. MMH may help address unmet needs for families by providing larger units in dense, mixed-use, urban settings (Wegmann, 2020b). Though sometimes perceived as being more expensive, medium-density designs are often less expensive to produce per square foot (Altus Group, 2024). They can also preserve single-family property values while improving apartment and townhouse affordability by facilitating matches between occupants and dwellings (Nygaard et al., 2022). As added benefits, MMH allows higher residential densities than single-family homes, which reduce environmental footprints (Moos, 2017) and encourage walking-oriented lifestyles and designs (Bozikovic, 2019b), and their often-wood-based construction can require less embedded carbon than concrete-reliant high-density designs (Bozikovic, 2019a; Rankin et al., 2024). Canadian urban land-use policy often limits MMH designs or renders them financially unviable (Meslin, 2019; Oppedisano, 2019; Parker et al., 2023; Shieh, 2019), resulting in "tall-and-sprawl" cities with high-rises in core areas and suburbs further out (Filipowicz &

[1]The maximum number of storeys considered MMH may vary, partly due to differing variables commonly tracked by different research bodies and organizations (Clayton & Paton, 2022)

LaFleur, 2023; Grant & Scott, 2012). The ROW's built form has followed these "tall and sprawl" patterns, with several high-rises added in recent decades to accommodate a growing population. However, this new development is not alleviating housing affordability and perceived supply gaps. We suggest that by providing more suitable housing with more bedrooms for a wider range of household needs, MMH can be part of the solution to Canada's housing crisis.

Given the above context for the ROW and its housing needs, we seek to assess where the Region's current housing supply falls short in meeting residents' needs, and whether a lack of middle-density housing appears to be a contributing factor. We further explore statistics around housing impacts based on household types, bedroom sizes, and selected socio-demographic variables to identify inequitable housing outcomes. We assess the following research questions:

1) How well does the recent or in-the-pipeline housing supply align with population growth trends within and across the ROW?

2) Is there evidence of a need for larger units to meet the needs of different household types in the ROW?

3) In the ROW, how does unsuitable housing align with socio-demographic indicators?

4) How can analysts incorporate housing suitability and equity indicators into land and housing needs assessments using public data to better inform land and housing plans?

To provide a transparent, replicable approach, we limit our analysis to publicly available data from Statistics Canada and the ROW (detailed in Section 2). Key analytical findings include: (1) Concerning signs of housing supply shortages based on unit counts, dwelling type diversity, and spatial allocation across the ROW, (2) Spatial concentration of housing needs within the Region, and (3) Differential housing suitability outcomes for diverse household types and communities.

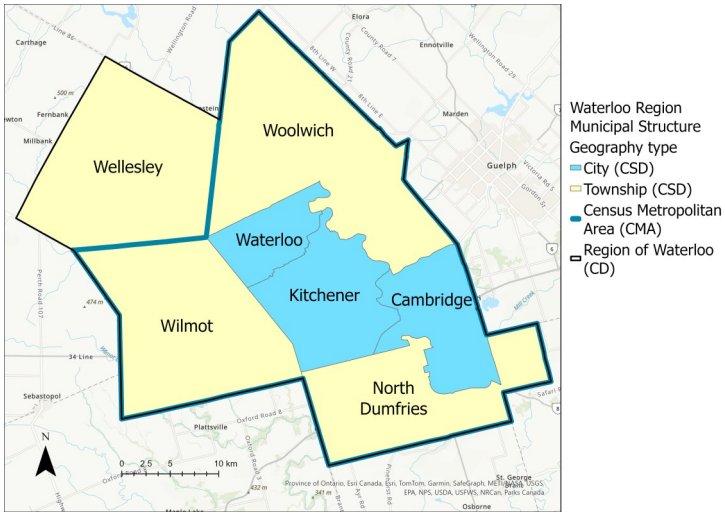

Figure 2. Municipal structure of the ROW.

We proceed with an outline of our data sources and methods. We then share analytical results and close with discussion and concluding thoughts based on our findings.

Data and Methods

Data scales, sources, and variables

Geographically, the ROW includes the cities of Cambridge, Kitchener, and Waterloo; and the four rural townships of North Dumfries, Wellesley, Wilmot, and Woolwich. Our analysis uses data at four geographic scales: 1) Census Division (CD: the entire ROW), 2) the Kitchener-Cambridge-Waterloo Census Metropolitan Area (CMA: all of the ROW excluding Wellesley Township—a divergence that omits approximately 12,000 people [roughly 2% of the CMA's population]), 3) Census Subdivisions (CSDs: the three cities and four townships), and 4) Census Tracts within the CMA

[2]In the KCW CMA, CT populations roughly range from 1,000 to 10,000; one outlier lists a population of 5 due to data suppression for anonymity

(CTs: areas comparable to neighbourhoods). Figure 2 shows the Region composed of cities and townships, along with the CMA's boundary. The CD's and CMA's bounds are relatively similar, but data are sometimes available only at the CMA scale. Where possible, we opt to cover the full ROW (CD), though we resort to CMA metrics when needed.

Because CT boundaries change between censuses, we at times consolidate 2021 CT data to fit 2016 CT boundaries to allow data comparisons. Further, while Wellesley Township is outside the CMA (and not a CT), we include Wellesley Township data alongside CTs to show results for the full Region.

Table C1 (in Appendix C) summarizes our data sources, their geographic/population scales, and their relevant variables. To provide a replicable approach, we use three public data sources:

1. Statistics Canada's 2016 and 2021 Censuses of Population profiles.
2. Additional Statistics Canada datasets, including tabulations for housing-related variables within selected subgroups, which allow comparisons between relevant variables.
3. A cleaned, verified version of publicly available building permit data for the Region over 1995–2022, provided by ROW staff.

Census profiles (Statistics Canada, 2022b; 2017) include population and dwelling counts for the four scales above (CD, CMA, CSD, and CT). They also include 1) counts of households in suitable/unsuitable housing (detailed further below), and 2) counts of population—i.e., individuals, rather than households—by visible minority status (binary variable), immigration status (decade arriving in Canada), and low-income status (using the After-tax Low-income Measure [LIM-AT]: low-income individuals have after-tax income below half the national median after-tax income).

We also use Statistics Canada household-based tabulations (Statistics Canada, 2022d; 2022e) linking housing suitability to household type (detailed below), number of bedrooms (0 [studio apartment], 1, 2, 3, and 4+ bedrooms), Core Housing Need (detailed below), shelter-cost-to-income ratio (percent of income a household spends on shelter: Under 15%, 15–29%, 30–49%, 50%+), and tenure status (a household owning or renting its dwelling) at the CD and CSD levels. CMA-level, individual-based tabulations (Statistics Canada, 2022f) link housing suitability to immigration status (non-immigrants, non-permanent residents, and immigrants by immigration decade), age (Under 14, 15–24, 25–54, 55–64, Over 65), and visible minority status (binary). We use population estimates for intercensal years for CDs, CSDs, and the CMA (Statistics Canada, 2023b; 2023c; 2023d) and annual residential property counts for the KCW CMA and the ROW's member municipalities (Statistics Canada, 2023e).

Our work explores statistics for housing suitability and Core Housing Need. The CMHC's housing suitability definition requires that there are no more than 2 persons per bedroom in a home, with additional criteria, such as that parents should not

[3]According to the CMHC (2022), Housing Suitability requires:

- No more than 2 persons per bedroom.
- Married spouses/Common-law partners share a bedroom.
- Single parents do not share bedrooms with children.
- Persons 18 or older have their own bedroom, unless in a relationship.
- Persons under 18 only share a bedroom with members of the same sex, except:
  - ◊ If in a marriage/common-law relationship.
  - ◊ If two opposite-sex members are both under 5, without enough bedrooms otherwise.

share rooms with children (CMHC, 2022). While definitions of "suitable" housing vary across cultures (Haan, 2011), the measure provides a high-level assessment of how well housing markets meet living space demands.

Core Housing Need requires two conditions: First, a household's housing must be inadequate (needing major repairs), unsuitable (as above), or unaffordable (costing at least 30% of pre-tax household income). Second, local housing resolving these conditions would exceed 30% of the household's pre-tax income (CMHC, 2023b). Core Housing Need identifies pressing unmet housing needs and indicates negative social impacts for affected residents. For clarity, Core Housing Need figures exclude persons experiencing homelessness (Pomeroy, 2021).

Household type data follow Figure 3's hierarchy. We use the white terminal branch boxes to calculate percentages of households. "Non-census family households" are groups of unrelated persons who live together, such as students or young people seeking to reduce housing costs. "Other census family households" include members beyond parents and their children, e.g., grandparents or a parent's sibling. The remaining categories are intuitive.

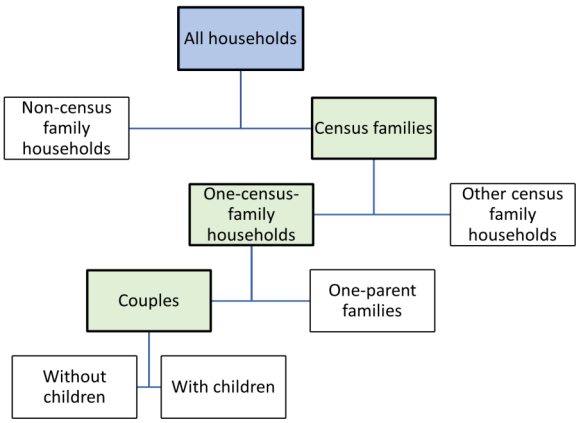

Figure 3. Statistics Canada hierarchy for household types

The ROW building permit data cover permit issue dates, expected occupancy dates, locations, numbers of units, structure types, and storey counts. The Structure Type field includes "Single-detached", "Semi-detached", "Townhouse", and "Apartment" values. To align results with census dwelling categories, we divide "Apartment" permits into "Apartments under 5 storeys" and "Apartments with 5+ storeys", yielding 5 categories in total. Given the range of storeys, some of our visualizations divide apartment building permits into categories for zero, 1–4, 5–8, 9–12, and 13+ storeys. These categories generally reflect counts for low-, medium-, and higher-rise apartments, while separating special cases (primarily basement apartments) in the zero-storey category.

We use a public dataset for the ION LRT route path (ROW, 2023b) to assign a dummy variable ("InCTC") to CTs to indicate CTs with any part within 800m (in radial distance) of the ION route (InCTC=1) and CTs entirely outside this distance (InCTC=0).

Methods

Given our research questions, we divide our analysis into two sections:

1. Public dialogue across Canada asserts that a housing supply deficit is a root cause of our housing affordability deficit. However, municipal-scale evidence has largely been missing from this dialogue. Therefore, our first analysis examines data on dwelling construction and population growth to compare these rates within and across the ROW and to assess trends in housing supply based on dwelling type. We use these comparisons to assess how well housing supply matches localized and overall changes in population (RQ1).

2. Dwelling counts are insufficient to understand whether new supply provides the right housing forms for varied household types. We therefore analyze data on housing suitability and Core Housing Need to explore trends across household types and bedroom counts (RQ2) and co-occurrence with other equity-related indicators (RQ3). Through the approach, we aim to demonstrate how to incorporate housing suitability and equity indicators into land and housing needs assessments (RQ4).

For replicability and interpretability, Table C2 (Appendix C) lists our figures/tables, the question each output aims to address, the data analyzed, the scale of analysis, and the method applied. For our analysis, we used Tableau to organize data and generate scatterplots, ArcGIS Pro for geographic analysis/outputs, and GeoDa's regression function to calculate CT-level conditional simple correlations between variables.

Methods to analyze recent housing supply

To compare changes in housing supply with population growth, we first apply a method from the Canadian Housing Statistics Program (Statistics Canada, 2023a). Using changes in estimated populations and counts of residential properties, we calculate the population added per residence added for the KCW CMA as a whole and for the ROW's member municipalities over 2018–2021 (based on years with available data). We then compare the resulting statistics to each geography's average household size in 2021. We assume that municipalities where the population added per new residence exceeds the average household size exhibit higher housing pressures.

We also apply a modified, finer-grained approach at the CT level. For each CT, we multiply dwelling units added over 2016–2021 (based on building permit data) by the CT's average household size in 2016 to estimate the added capacity in dwellings. We subtract the population change between the 2016 and 2021 censuses from this estimated new capacity to estimate the shortfall or surplus of housing capacity added between 2016 and 2021. For example, for a CT with an average household size of 3, a population change of 36, and 10 added dwellings, we estimate a housing shortfall of 2 units. (3 * 10 = 30 in added capacity; 36 – 30 = 6 persons beyond added capacity; 6 / 3 = 2 units beyond added capacity.)

To assess recent and in-the-pipeline housing supply, we chart annual counts of new units approved for construction according to the building permit data. We calculate and plot the net number of new units across the Region for our five major dwelling type categories and our five apartment storey categories by issue date (for 2016–2022) and occupancy date (for 2016–2024). We observe the resulting trends across time by dwelling type and storey category.

Additionally, we assess spatial distributions of new units by calculating the units added from 2021 on, for each CT. Using ArcGIS Pro's Spatial Join operation, we tabulate new units from January 1, 2021 onward (by occupancy date) within each CT by expected occupancy date. We use this data to assess whether new supply concentrates in CTs with higher housing suitability rates in 2021 to meet those needs in the following years. To do so, we calculate the CT-level conditional simple correlation between 2021 housing suitability rates and new units expected to be occupied by CT. We include our dummy variable for connection to the CTC as a control. We show a scatterplot for this correlation, with points coloured according to their connection to the CTC.

Methods analyzing housing outcomes by socio-demographic indicators

To assess the correlation between housing suitability, household characteristics, and socio-demographic variables, we apply varied approaches based on the scale and quality of data available. Where feasible, we calculate rates of unsuitable housing within all categories in a variable (e.g., the percentage of one-parent families in unsuitable housing) to observe which sub-groups are more likely to experience unsuitable housing. We present results for household type, household size, shelter-cost-to-income ratio, tenure status, immigration status, and visible minority status. For household type, we also calculate the percentage of all unsuitably housed households belonging to each category (e.g., among households with unsuitable housing, what percentage are one-parent families) for the three cities and the Region overall. Appendix A tabulates counts of the total and unsuitably housed households by household type and number of bedrooms to clarify skewed figures due to small numbers in certain categories. Further, as data on shelter-cost-to-income ratios and tenure status include data on Core Housing Need, we also calculate rates of households (within tenure status and shelter-cost-to-income ratio categories) experiencing both housing suitability and Core Housing Need to assess the interplay between these variables.

To observe spatial trends across the ROW in housing suitability, we map CT-level rates for the percent of households in unsuitable housing, the percent of residents who belonging to a visible minority, the percent of residents who immigrated to Canada over 2011–2021, and the percent of residents in low income based on the LIM-AT. We discuss visual comparisons between unsuitable housing rates and socio-demographic variables in the resulting maps.

We also use 2021 Census data to assess the CT-level conditional simple correlations using regression analysis between rates of unsuitable housing and (1) Share of population belonging to a visible minority, (2) Share of population that immigrated to Canada over 2011–2021, and (3) Share of population with low-income (LIM-AT). In each regression, we include a dummy variable for connection to the CTC. Through this analysis, we seek to answer the question: once we control for connection to the CTC, do CTs with higher rates of these socio-demographic variables tend to have higher rates of unsuitable housing? Appendix B contains our regression results.

Method limitations

Our methods have some acknowledged limitations, partly because we use public data. While building permit data include several variables, they do not report the number of bedrooms in a unit, which limits our ability to analyze new housing supply based on bedroom counts. Additionally, our use of Statistics Canada data tabulations can limit our analysis, as public tabulations are only available for selected variables; e.g., separate data tables link housing suitability to household type and to immigration status, but data linking household type to immigration status are not public. Therefore, we can calculate only conditional correlations, instead of developing full regression models that reflect co-occurrence of our equity measures. Further, our use of unsuitable housing indicators highlights cases where a household does not have enough space, but this method has less insight regarding cases where households have more space than needed. Finally, while we seek to retain nuance in our work by avoiding using averages for calculations, we at times must still rely on using average household sizes when comparing changes in population and dwellings. Future research can use custom tabulations or more

Table 1. Comparisons of changes in population and residential units for KWC CMA and ROW member municipalities, 2018–2021 (Calculated from Statistics Canada, 2023b; 2023d; 2023e)

	Change 2018-2021		**% Change 2018-2021**			
Geography	Population	Residential Units	Population	Residential Units	New persons/ new units	Average household size (2021 Census)
Kitchener	15,536	3,305	6.09%	4.57%	4.70	2.6
Cambridge	5,910	645	4.31%	1.63%	9.16	2.7
Waterloo	8,245	2,610	7.12%	7.55%	3.16	2.5
Woolwich	1,119	340	4.21%	4.47%	3.29	2.8
Wilmot	136	215	0.63%	3.20%	0.63	2.7
North Dumfries	607	135	5.51%	4.07%	4.50	2.9
Wellesley	427	60	3.59%	1.94%	7.12	3.4
KCW CMA	31,963	7,250	5.6%	4.42%	4.41	2.6

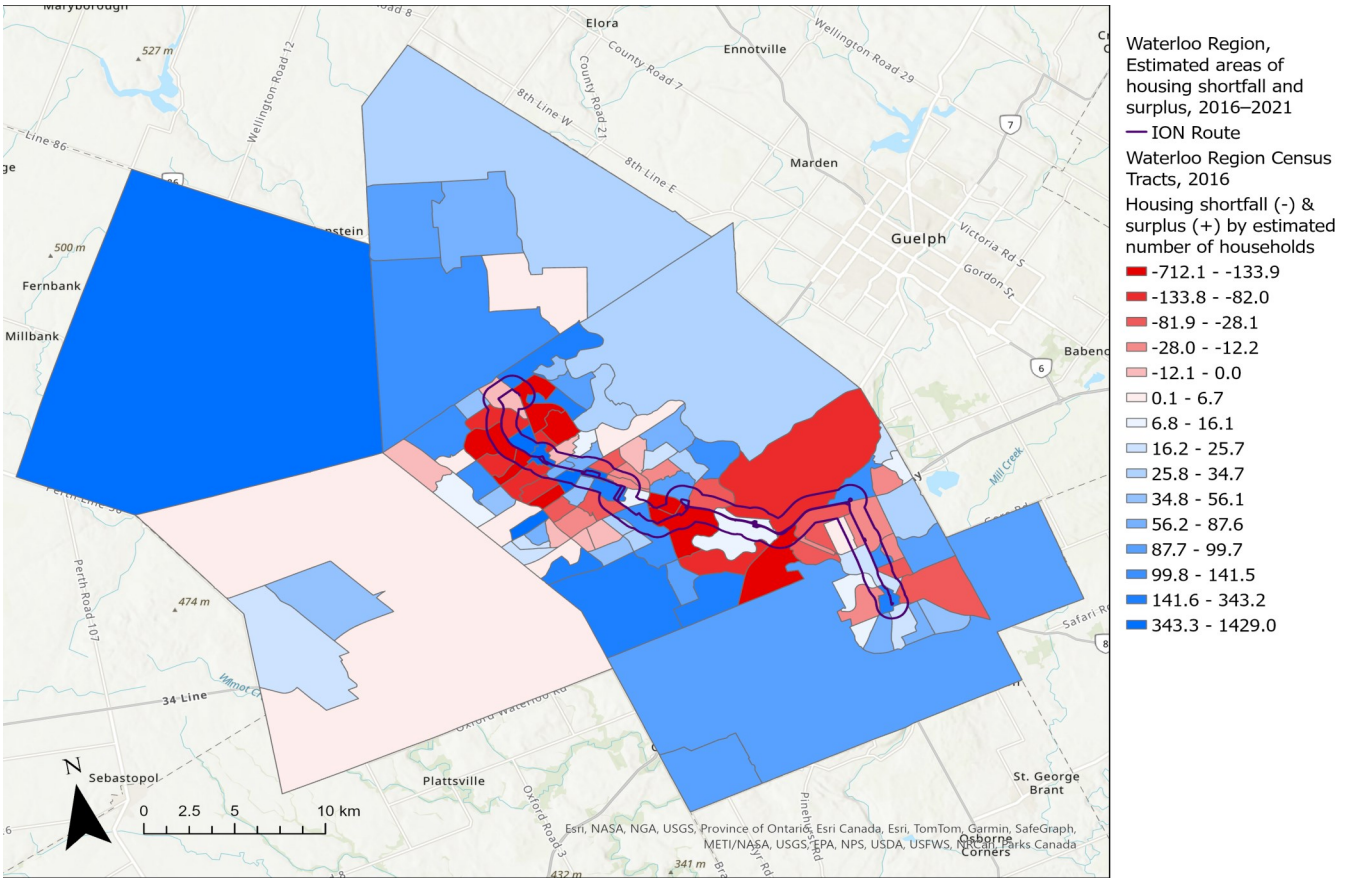

Figure 4: Estimated housing construction shortfalls (negative) and surpluses (positive) in numbers of households by 2016 CT in the ROW, 2016–2021 (Calculated from ROW, 2023a; 2023b; Statistics Canada, 2022b; 2017)]

specialized data sources to mitigate these analytical limitations.

In Section 3, we consider our first research question by exploring data on recent housing supply. Then, in Section 4, we discuss the latter three research questions which assess spatial trends in housing supply/demand and the relationships between housing suitability and household/socio-demographic indicators.

Assessing recently housings supply

Estimating relative changes in dwellings and population

As the ROW's population is projected to continue increasing in the coming years, new housing construction appears vital for accommodating growth. Thus, we explore how recent builds compare to the Region's recent population growth, according to Statistics Canada data (Statistics Canada, 2023b, 2023d;2023e).

Table 1 compares the number of new residents per new dwelling unit to the average household size for the ROW's member municipalities and the KWC CMA. The final two columns demonstrate clear signs of housing pressure in the three cities, with the new residents per new unit exceeding average household sizes. Cambridge appears especially affected, with 5,910 residents added and only 645 new residential units recorded. Overall, the CMA added one dwelling for every 4.41 new residents, while the CMA's average household size is 2.6 persons. While Statistics Canada's analysis (2023a) found Vancouver and Toronto's population and dwellings growing in line with each other, our results suggest that Toronto's growth may have stayed balanced in part through residents relocating to nearby areas like the ROW (van der Merwe & Doucet,2021).

We next apply our CT-level approach comparing 2016–2021 population growth with housing construction according to the permit data (detailed in Section 2). We show the resulting negative (estimated housing shortfall) and positive (estimated housing surplus) values in Figure 4, with the Region's CTC also shown. Figure 4 suggests a link between the CTC and areas of estimated housing shortfall, often on the edge of the corridor. This pattern appears along the LRT's existing line and along its planned expansion to Cambridge. While some CTs along the LRT path show estimated surpluses, the clustering of negative values along the line compared to suburban and rural areas shows a continuing need for added housing capacity in rapidly densifying areas. If the Region is building more housing on its fringes than in the downtown areas relative to population growth, households may resort to relocating to suburbs and rural areas to meet housing needs, which may spur greater car-dependency and thwart environmental goals.

New supply by dwelling type and location

Given the demonstrated ongoing housing needs present in the Region, we analyze recent and in-the-pipeline supply based on building permit data.

Figure 5 shows units approved since 2016 by structure type, based on issue date and expected occupancy date. Approvals of single-detached homes, semi-detached homes, and townhouses appear relatively consistent, though single-detached home permits have declined since 2016, while townhouse permits increased in 2021. Permits for apartments with 5+ storeys grew substantially in 2019, likely driven by the pending end of local policy removing development charges from construction in downtown Kitchener, and perhaps in response to LRT development. These trends align with the Region's metrics for change in the CTC and across the Region, which reported building permit value growing from $929 million to $1.535 billion over 2018–2019, with the percentage in the CTC growing from 23% to 44% (MacKinnon et al., 2023). Permit

approvals for apartments with 5+ storeys have fallen since 2019, though the 2019 spike in apartment approvals appears later when viewed by expected occupancy date. Expected new supply in 2024 shows a decline, though permits issued in 2023 (not shown in our data) may balance this out to an extent. Aside from the spike in taller apartments, new units expected to be occupied appear relatively consistent over time.

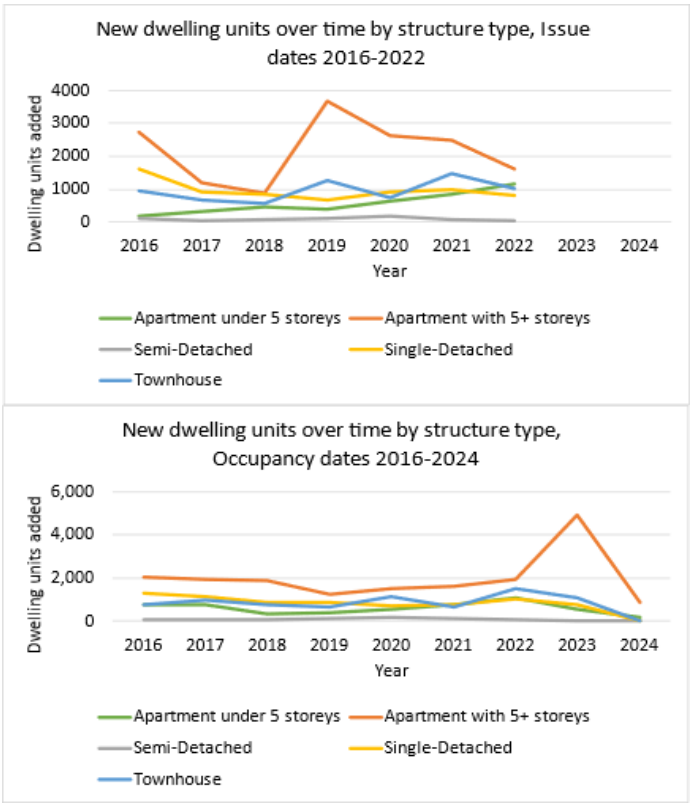

Figure 5. New dwelling units approved by structure type in the ROW over 2016–2022 by issue date and expected occupancy date (Calculated from ROW, 2023a)

For additional detail, we chart new approvals for apartment permits only, divided into our five categories. We again plot the data by issue dates and expected occupancy dates in Figure 6. The spike seen earlier in apartments with 5+ storeys units by issue date in 2019 clearly corresponds to apartments with 13+ storeys (Figure 6). However, approvals for units in 13+ storey buildings have fallen since 2019, while basement units (zero-storey) and units in 5–8-storey buildings show steady recent growth. Regarding expected new supply, we similarly see a 2023 spike in apartments with 13+ storeys, along with a smaller increase in 2020. Expected new supply of 5-to-8-storey apartments also appears relatively strong in 2023 and 2024.

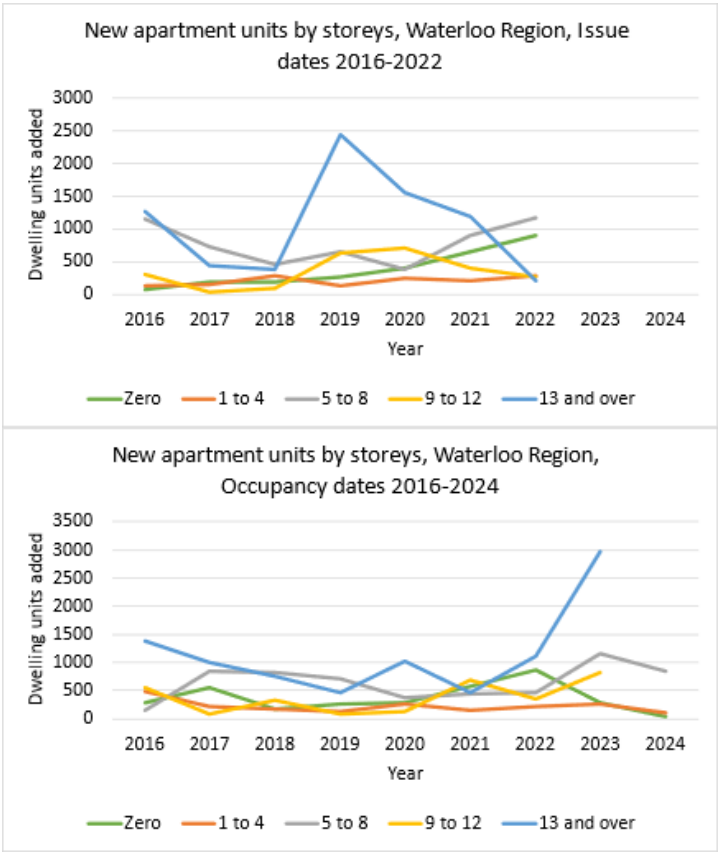

Figure 6. New apartment dwelling units by storey category in the ROW over 2016–2022 by issue date and expected occupancy date (Calculated from ROW, 2023a)

The concentration in high-rise development approvals and their subsequent decline raises concerns for housing supply in the coming years, as the overall number of units approved per year is declining, while the Region continues to experience population growth and housing pressure. As most high-rise units have few bedrooms, this trend raises concern for larger families, who may struggle to find

enough room (suitable housing) in standard high-rise designs. Unfortunately, the building permit data's lack of detail on bedrooms per unit prevents us from assessing alignment between the housing supply and types of households more fully.

We explore the spatial distribution of new approved units in the years following the most recent census (2021–2024). Figure 7 shows the number of new units projected to be added in each CT based on occupancy date since January 1, 2021. The areas with the most units built are primarily in the downtown areas of the suburban fringe of Waterloo (especially around the city's universities) and Kitchener. In Cambridge, recent housing builds also appear to concentrate in the space between the city's three major cores (Hespeler, Preston, and Galt

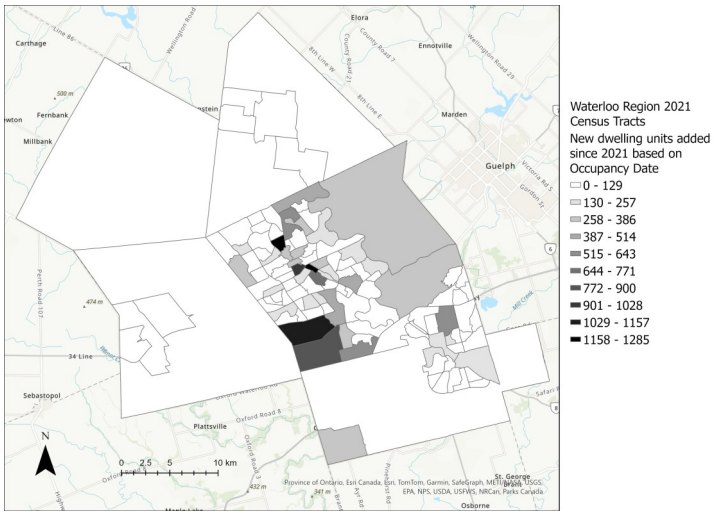

Figure 7. ROW Census Tracts by dwelling units added since Jan. 1, 2021 based on occupancy date (Calculated from ROW, 2023a)

Household and equity consideration for housing outcomes

Household type and number of bedrooms

There are clear housing needs within the ROW, but residents may experience these needs differently based on their locations, living situations, economic conditions, and social factors. Here, we explore public data on housing needs, first by household characteristics and then by socio-demographic attributes.

In Figure 8, we chart rates of unsuitable housing based on household type; that is, for each household type, we report the percentage of households in that category that experience unsuitable housing. We only show data for the ROW, as the trends are similar across the Region's three cities. Table A1 (Appendix A) contains further details on counts of households and unsuitably housed households in each category in the ROW. We find that 24.6% of Other census family households (families with additional members) report being unsuitably housed, which translates to 4,010 such families lacking suitable housing. As these families may include parents, children, and other family members, they likely experience space needs beyond those afforded by conventional housing designs. In contrast, Couples with children have a higher count of affected households (4,730 households), despite having a lower rate of unsuitable housing (7.2%). One-parent families have the second-highest rate of unsuitable housing (10.4%), which may reflect difficulties finding suitable housing with a single income. Couples without children are the group least likely to experience unsuitable housing (0.2%), which we

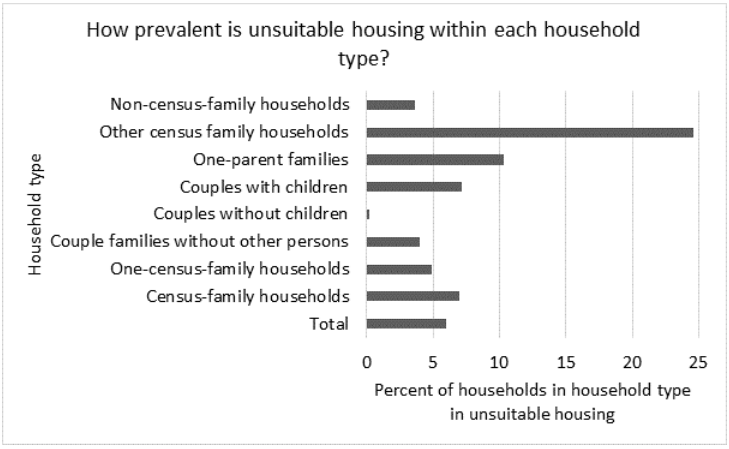

Figure 8. Rates of unsuitable housing within each household type category for all of the ROW, 2021 (Statistics Canada, 2022d)

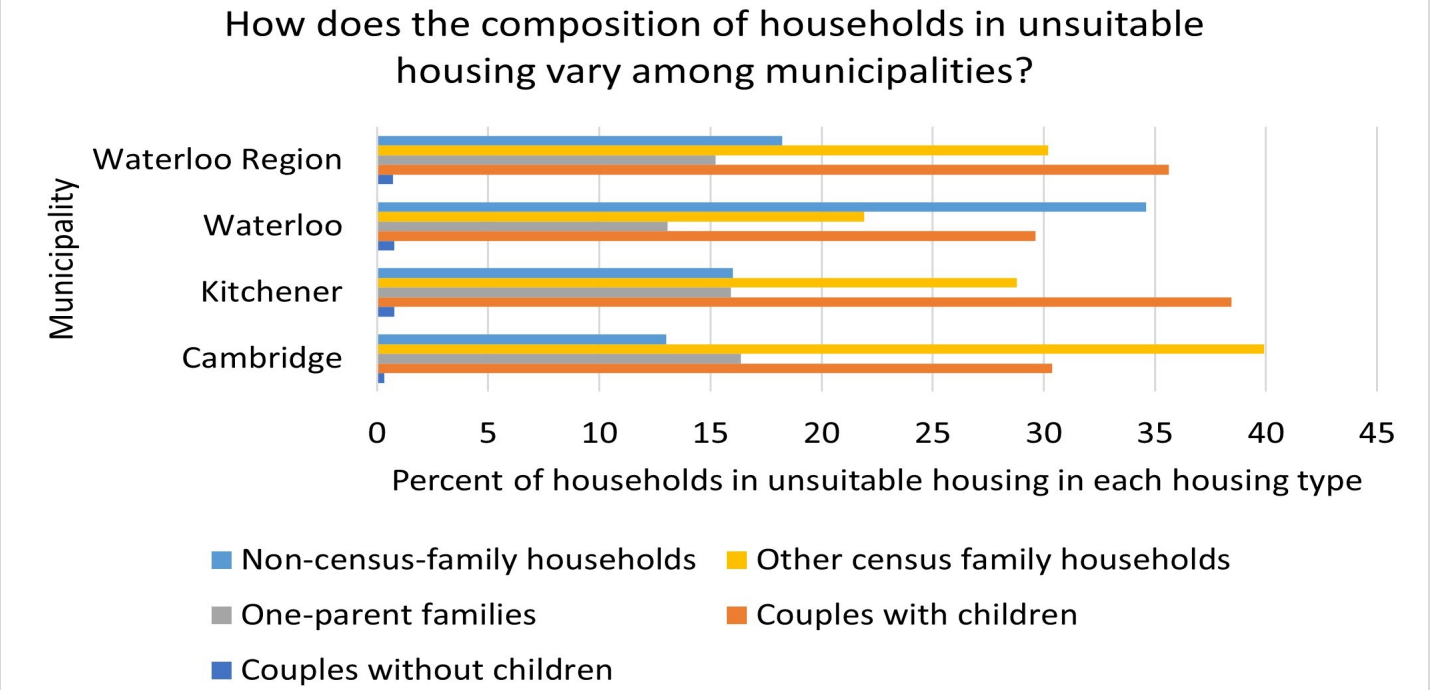

Figure 9: Share of all households in unsuitable housing in each terminal household type branch, ROW and urban municipalities, 2021 (Statistics Canada, 2022d)

expect based on the definition of unsuitable housing, given that couples without children only have two household members who are anticipated to share a bedroom.

In Figure 9, we divide the subset of households in unsuitable housing into different household types, using the terminal branches of the hierarchy in Figure 3 (e.g., of all unsuitably housed households, what proportion are Couples with children?). We find unique trends among the Region's three cities: affected households in the City of Waterloo are more likely to be Non-census-family households (35% of affected households; likely reflecting concentrations of post-secondary students and young adults), while those in Cambridge tend to be Other census families (40% of affected households). Data for Kitchener follow similar trends to the Region, with Couples with children comprising the greatest share of affected households, followed by Other census families.

We also explore whether housing suitability varies by a household's number of bedrooms. Figure 10 charts the unsuitable housing rate for different bedroom categories (e.g., what percentage of households with 2 bedrooms have unsuitable housing?) across the ROW. Table A2 (Appendix A) relates these rates to counts of all households and of unsuitably housed households in each bedroom category. Overall, we find that households with more bedrooms have lower rates of unsuitable housing, as

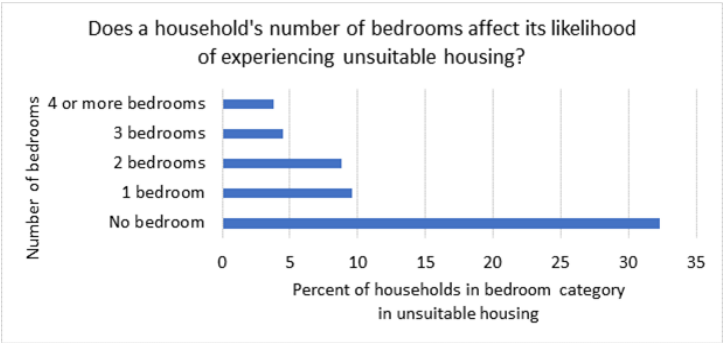

Figure 10: Rates of unsuitable housing within each bedroom category, ROW, 2021 (Statistics Canada, 2022d)

expected from the CMHC's definition of suitable housing. The "No bedroom" category refers to studio apartments. Because of their size, the CMHC considers studio apartments unsuitable if they have more than one occupant (CMHC, 2022b), and these households have the highest unsuitable housing rate (32.3%), though they are relatively few in number. We see elevated rates among 1- and 2-bedroom households, with close to 10% of each of these categories affected.

In raw numbers, 2-bedroom households comprised the largest portion of unsuitably housed households (4,285), with 3-bedroom households close behind (4,070). Although Canada's average household size has steadily declined from 2.9 persons in 1981 to 2.4 persons in 2021 (Statistics Canada,2022c), which may imply that large dwellings are less necessary, these high counts of unsuitably housed households—even among those with 3 bedrooms—suggest ongoing unmet needs for households across the spectrum.

We now ask whether the new housing supply, as seen in the building permit data (Section 4.1), might help address gaps in suitable housing.

We compare our map of recent builds (Figure 7) with the spatial distribution of households with unsuitable housing to assess whether new builds are concentrated where households lack sufficient housing space. Across the Region, 5.97% of households had unsuitable housing in 2021 (meaning that they had fewer bedrooms than prescribed for the number of residents). Figure 11 disaggregates this statistic to show CT-level rates of unsuitable housing (each CT's number of unsuitably housed households divided by its total number of households) in the ROW in 2021.

We observe higher unsuitable housing rates in student-focused areas around the University of Waterloo and Wilfrid Laurier University, as well as in CTs in downtown Kitchener, around Kitchener's Fairview Mall, and in east Galt (in Cambridge). The highest rate occurs in a CT in Downtown Kitchener, where 19.9% of households experience unsuitable housing. The Region's suburban and rural areas show lower rates of unsuitable housing, which may reflect relative affluence and larger houses in those areas, as well as relatively lower housing costs for properties further from urban cores. However, the northernmost parts of the Region (Wellesley and Wilmot Townships) also show modestly high rates of unsuitable housing, which demonstrates that unsuitable housing is not a solely urban phenomenon.

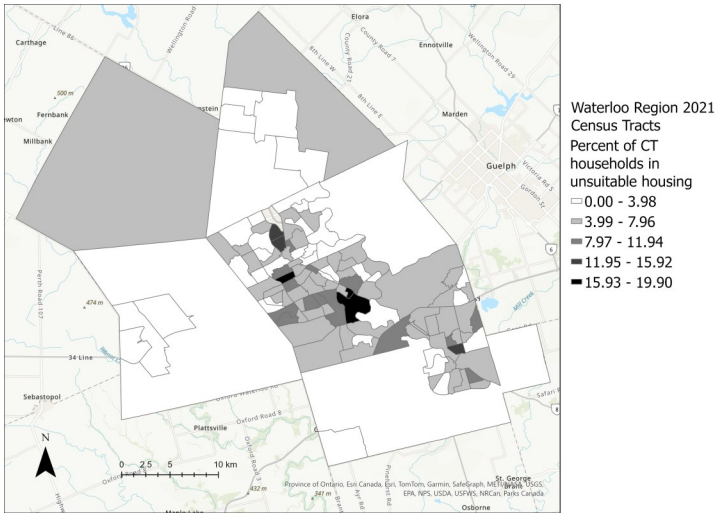

Figure 11: Census Tract-level rates of households in unsuitable housing, ROW, 2021 Census of Population (Statistics Canada, 2022b)

When comparing the distribution of unsuitable housing rates (Figure 11) to the distribution of units added since 2021 (Figure 7), there is little evidence that new construction is occurring in areas where unsuitable housing is high. Areas around Kitchener's Fairway Mall have high rates of unsuitable housing but little new construction, while suburban areas have comparatively low rates of unsuitable housing

but have seen substantial housing unit growth. While the construction of new dwellings does not guarantee a particular unit size, this mismatch may indicate further exacerbation of existing housing issues. While households might move within the Region to find suitable housing, doing so is not ideal as it can disrupt residents' social networks (Lyu & Forsyth, 2022) and—when residents relocate to suburbs—may work against environmental goals and resident preferences (Huang et al., 2023).

We further assess the CT-level correlation between percent of households with unsuitable housing in a CT in 2021 and the number of new units since 2021 based on occupancy dates. We control for connection to the CTC. Figure 12 shows a scatterplot

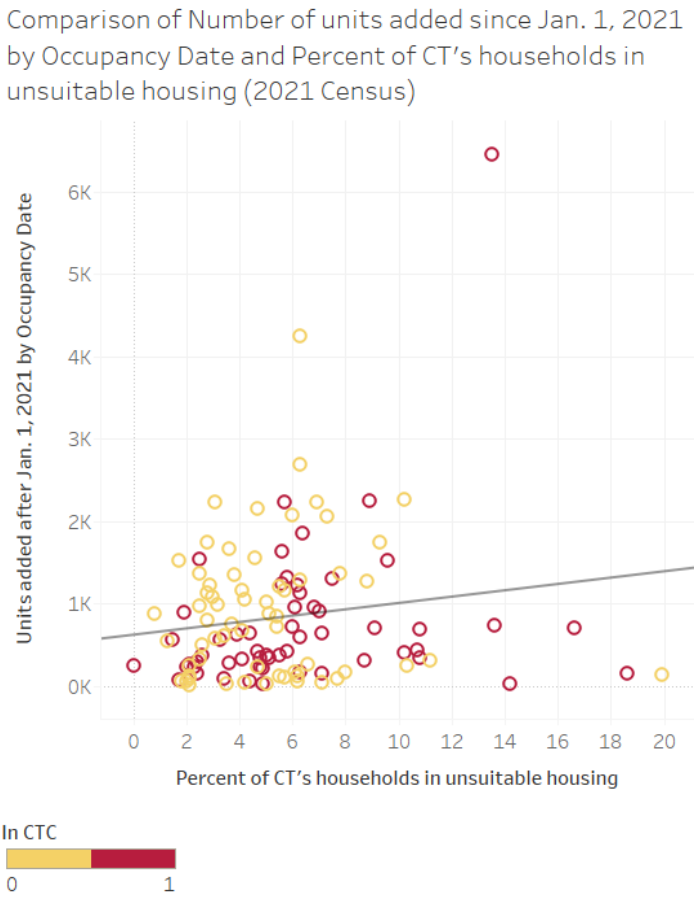

Figure 12: Scatterplot comparing Units approved since Jan. 1, 2021 based on Occupancy Date and Percent of CT households in unsuitable housing

comparing unsuitable housing rates and new units occupied, while Table B1 (Appendix B) reports the regression results. The results do not indicate a statistically significant relationship between unsuitable housing and new units (ß = 8.2; p > 0.10), although being in the CTC is positively associated (ß = 80.8; p < 0.10) with the number of units added. These findings reinforce that new supply might not be going to areas of deeper housing need, and residents may find it difficult to meet their housing needs while remaining in their neighbourhoods.

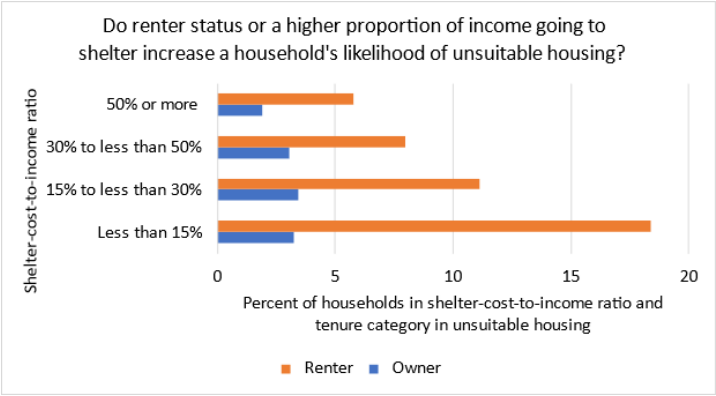

Figure 13: Rates of unsuitable housing within each combined shelter-cost-to-income ratio & housing tenure category, ROW, 2021 (Statistics Canada, 2022e)

Housing costs and incomes

Housing costs may play a key role in housing suitability. We consider costs based on ratios between a household's shelter costs and income. The available data distinguish between households that own or rent their dwellings. We display unsuitable housing rates for each shelter-cost-to-income ratio and tenure category in Figure 13. Across all shelter-cost-to-income ratios, renters demonstrate higher rates of unsuitable housing than owners, which may reflect that households able to purchase homes have higher incomes in general, which can allow them to find a dwelling that is satisfactory in the long term. Curiously, among renters, households with higher shelter-cost-to-income ratios have lower rates of

unsuitable housing. This pattern suggests that renter households may make a trade-off between their income and suitable housing by either increasing their spending on shelter or settling for more cramped living conditions. While not shown in these data, households may also make these trade-offs due to factors including access to public transit, proximity to work, desire to remain in a rent-controlled unit, or a preference to remain in a neighbourhood due to social connections or familiarity.

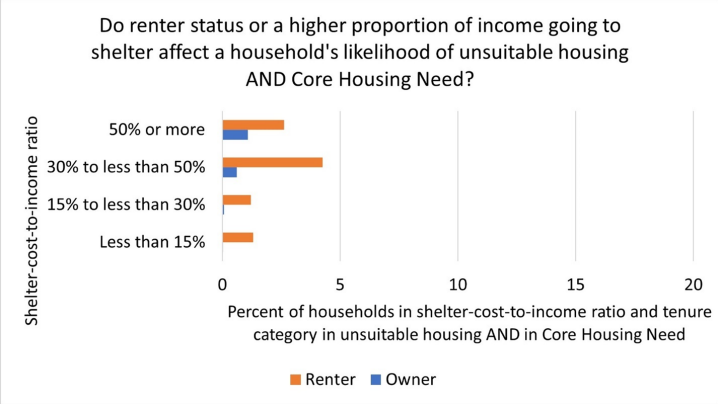

Figure 14: Rates of households in unsuitable housing AND in Core Housing Need by shelter-cost-to-income ratio & housing tenure, ROW, 2021 (Statistics Canada, 2022e)

To explore this hypothesis further, we assess rates of households experiencing unsuitable housing and Core Housing Need together (Figure 14). By considering these conditions together, we focus on those households in cramped living conditions who cannot affordably remedy their situation in the current market. We plot data on the same axis as Figure 13 to allow easier comparisons of figures. The percent of households experiencing both shows a steep decline, particularly among households with shelter-cost-to-income ratios under 30%. The difference underscores that some households could find suitable housing but instead choose to remain in their current living conditions, possibly to retain lower housing costs, to remain in rent-controlled housing, or for socio-economic reasons not captured by the data.

Socio-demographic factors

Available data from Statistics Canada also lets us explore how the current housing supply serves different groups of the Region's residents. We assess differences based on visible minority status, immigrant status, and low-income status, in that order.

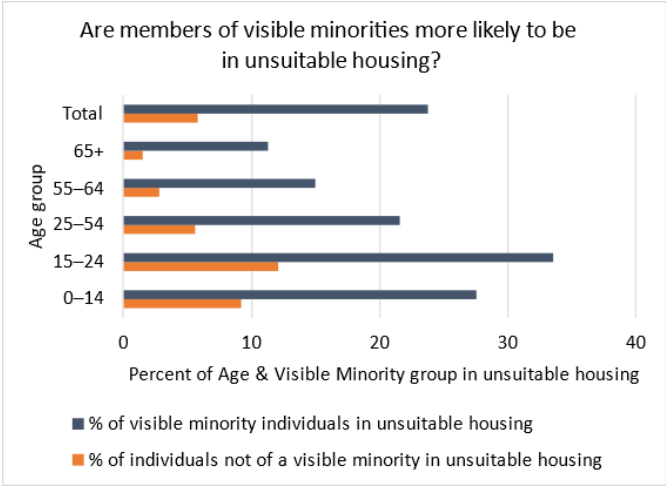

Figure 15: Rates of housing suitability and Visible Minority status within each Age category, KWC CMA, 2021 (Statistics Canada, 2022f)

Figure 15 shows housing suitability rates for KWC CMA residents based on Visible Minority status within 5 age groups. Table A3 (Appendix A) lists detailed counts and percentages. Overall, residents belonging to visible minorities report substantially higher rates of unsuitable housing (23.8%) than residents not belonging to a visible minority (5.8%). Visible minority populations also experience substantially higher rates of unsuitable housing in every age category: for all age groups, at least 10% of the visible minority population is unsuitably housed, while for residents not belonging to a visible minority, only the 15–24 age group has an unsuitable housing rate over 10% (12.1%). Perhaps most

concerningly, 61.6% (37,785/61,380, Table A3, Appendix A) of the Region's unsuitably housed population belongs to a visible minority, despite visible minority residents only comprising 30.0% (158,810/568,065) of the Region's population.

To assess these trends spatially, we display the percentage of each CT's population who belong to a Visible Minority in Figure 16. The Region's urban municipalities are more diverse than its rural townships, although trends within the cities are harder to identify. Some suburban areas (like northwest Waterloo and southwest Kitchener) also have high proportions of Visible Minority population. However, compared to Figure 11 (showing unsuitable housing rates by CT), high proportions of Visible Minority population appear to correlate with the rates of households with unsuitable housing in central areas in Kitchener and Waterloo.

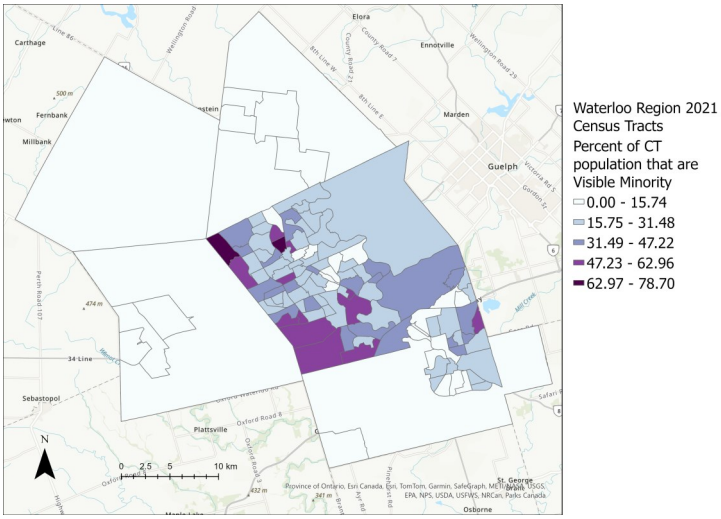

Figure 16: Percentage of CT population who belong to a Visible Minority, ROW, 2021 Census of Population (Statistics Canada, 2022b)

To test this hypothesis, we assess calculated correlations between CT-level population percentages of Visible Minority residents and unsuitable housing rates, with a control term for connection to the CTC. Figure 17 shows a scatterplot for comparison, while Table B2 (Appendix B) shows regression results. There are statistically significant positive associations between a CT's Visible Minority population share and its rate of unsuitable housing (ß = 0.14; p < 0.01; Table B2), and between unsuitable housing rates and proximity to the CTC (ß = 1.2; p < 0.05; Table B2). Thus, CTs with higher Visible Minority populations and CTs closer to the CTC both report higher rates of unsuitable housing. We also see that the association between Visible Minority population and unsuitable housing exists among CTs in the CTC (in red) and among those outside of it (in yellow).

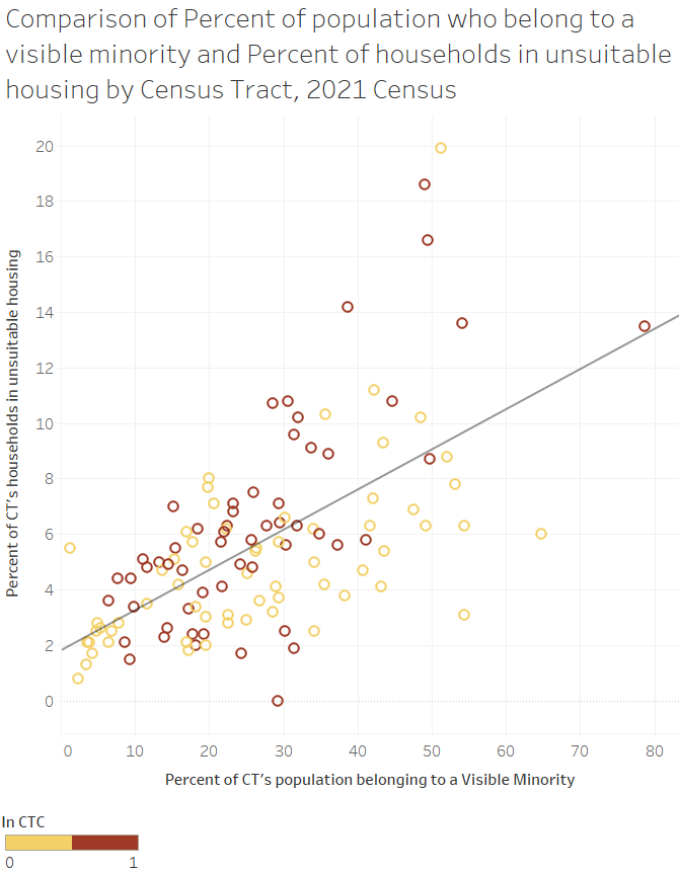

Figure 17: Scatterplot comparing Visible Minority Percent of CT population and Percent of CT households in unsuitable housing

Immigrant status also appears to affect housing suitability status, as shown in Figure 18, which displays the percentages of each immigration category (immigration status or period of immigration) that report unsuitable housing. We find that residents who immigrated more recently are more likely to have unsuitable housing, and 30% of immigrants who came to the ROW over 2011–2021 are unsuitably housed. Non-permanent residents have especially high rates, with over 35% of this population lacking suitable housing. Immigrants are also more affected than residents born in Canada, although immigrants who immigrated before 1980 and from 1980–1990 report lower unsuitable housing rates than Canadian-born residents. Together, immigrants and non-permanent residents comprise the majority of the Region's unsuitably housed population (31,760/61380 = 51.7%, Table A4, Appendix A).

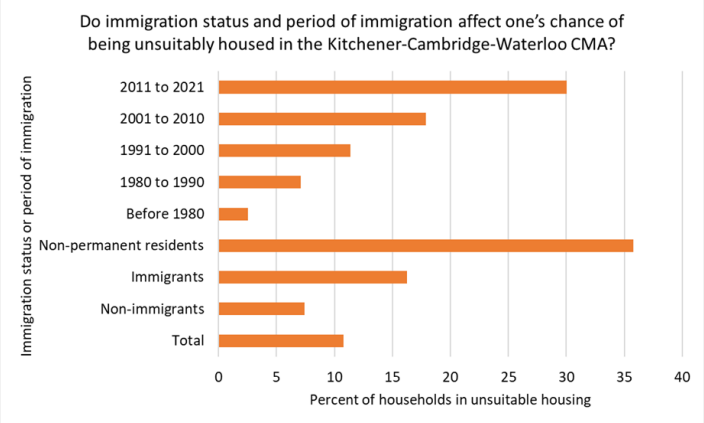

Figure 18: Rates of unsuitable housing by immigrant status category and period of immigration category, KWC CMA, 2021 (Statistics Canada, 2022f)

To assess the spatial distribution of recent immigrants in the Region, we display the proportion of each CT's total population that immigrated to Canada over 2011–2021 in Figure 19. There are areas of alignment between this map, Visible Minority population shares (Figure 16) and rates of unsuitable housing (Figure 11). Recent immigrants and Visible Minority population both cluster in specific central and suburban CTs, whereas the rural townships have lower percentages of recent immigrants and visible minority residents. When comparing recent immigrants and rates of unsuitable housing, we observe alignment between the two in Waterloo and Kitchener's downtown areas.

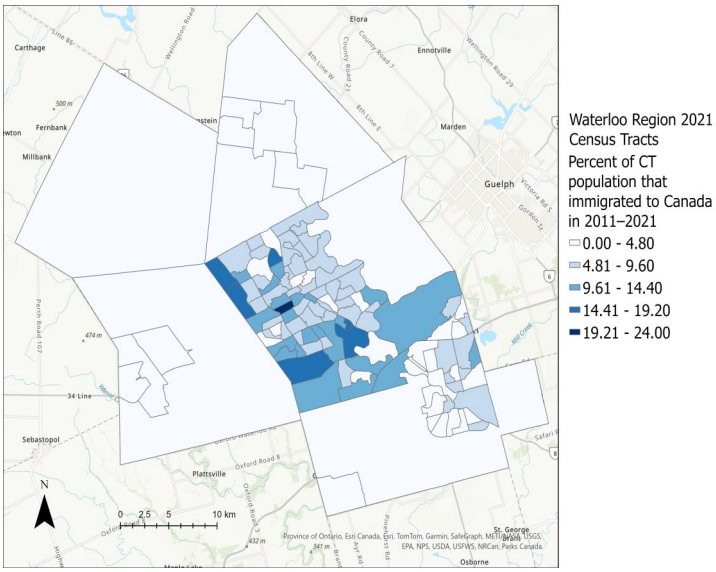

Figure 19: Percentage of CT population that are recent immigrants (immigrated in 2011–2021), ROW, 2021 Census of Population (Statistics Canada, 2022b)

As above, we assess the correlation between shares of CT population who are recent immigrants and rates of unsuitable housing, with a control term for connection to the CTC. The results are similar to the trends seen with visible minority status. There is a statistically significant positive correlation (ß= 0.53; p < 0.01; Table B3, Appendix B) between recent immigrant population and unsuitable housing rates in the scatterplot. Thus, areas with a larger proportion of recent immigrants also tend to report more households with unsuitable housing (Figure 20), and this trend is present among CTs connected to the CTC (in red) and among those outside of it (in yellow). CTC proximity and unsuitable housing rates

also have a positive association (ß= 0.73; p < 0.05), meaning that areas connected to the CTC are more likely to report high rates of unsuitable housing.

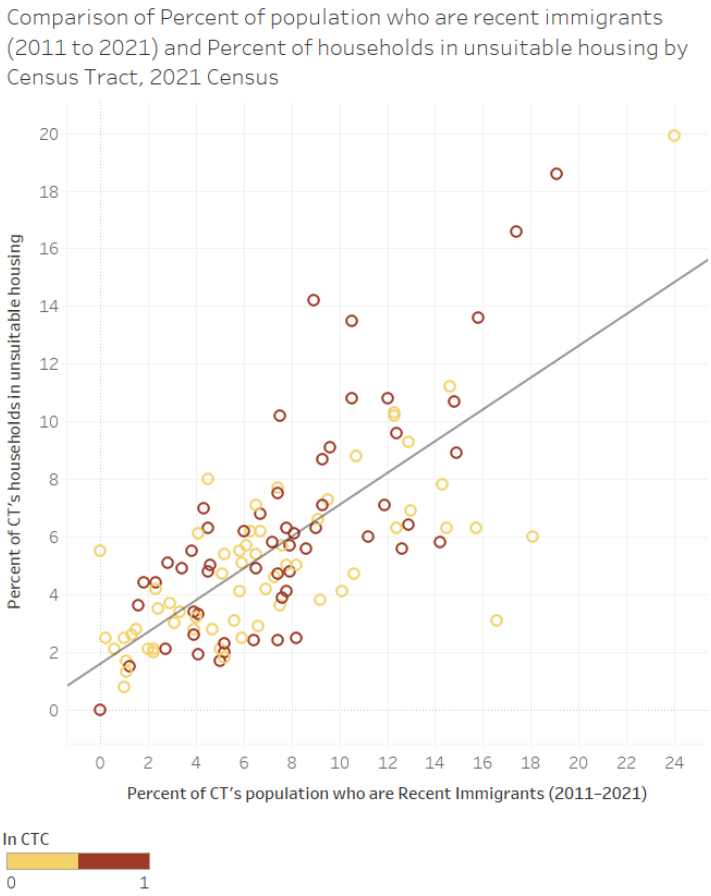

Figure 20: Scatterplot comparing Recent Immigrant Percent of CT population and Percent of CT households in unsuitable housing

We also explore the spatial distribution of low-income status by showing 2021 low-income rates by CT in Figure 21, based on the After-tax Low-income Measure (LIM-AT; described in Section 2). While the downtown areas tend to have higher rates of low income compared to suburban areas, some rural townships also show moderate rates of low income. Spatial trends for low income are not identical to those for other socio-demographic factors: suburban areas like southwest Kitchener have low rates of low-income status and high percentages of Visible Minority (Figure 16) and recent immigrant population (Figure 19). On the other hand, CTs in downtown areas and in rural townships with elevated low-income rates also tend to have high unsuitable housing rates (Figure 11).

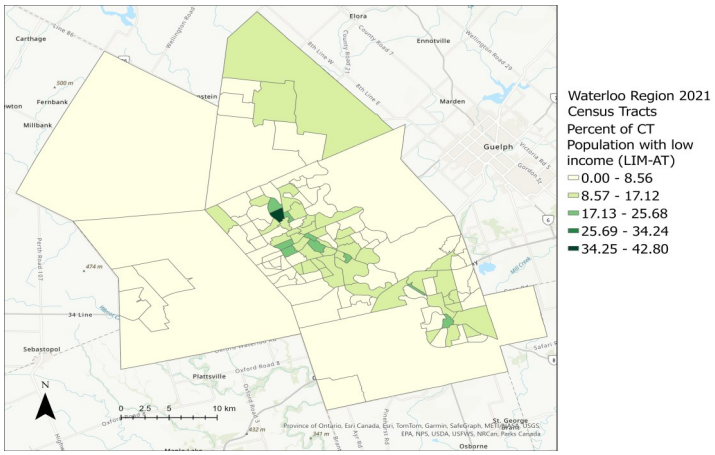

Figure 21: Census Tract-level prevalence of low income among residents tested for low-income status (Low-Income Measure-After Tax), ROW, 2021 Census of Population (Statistics Canada, 2022b)

Finally, we assess the correlation between CT-level prevalence of low income and unsuitable housing rates, with a control variable for connection to the CTC. The results (Figure 22) show a statistically significant positive association (ß = 0.40; p < 0.01; Table B4, Appendix B) between low-income prevalence and rates of unsuitable housing, meaning that CTs with more low-income residents tend to have higher unsuitable housing rates. Connection to the CTC does not appear to correlate with unsuitable housing rates once we account for the prevalence of low income (ß = -0.88; p > 0.10). This indicates that low-income prevalence is more tightly associated with unsuitable housing rates than whether a CT is connected to the CTC.

Discussion

Based on our research questions, our analysis uncovers five findings relevant for housing

discussions in the ROW. Rooting these findings in real-world data adds important evidence to verify assertions about housing market forces and dynamics. We outline these five findings here before focusing on policy options.

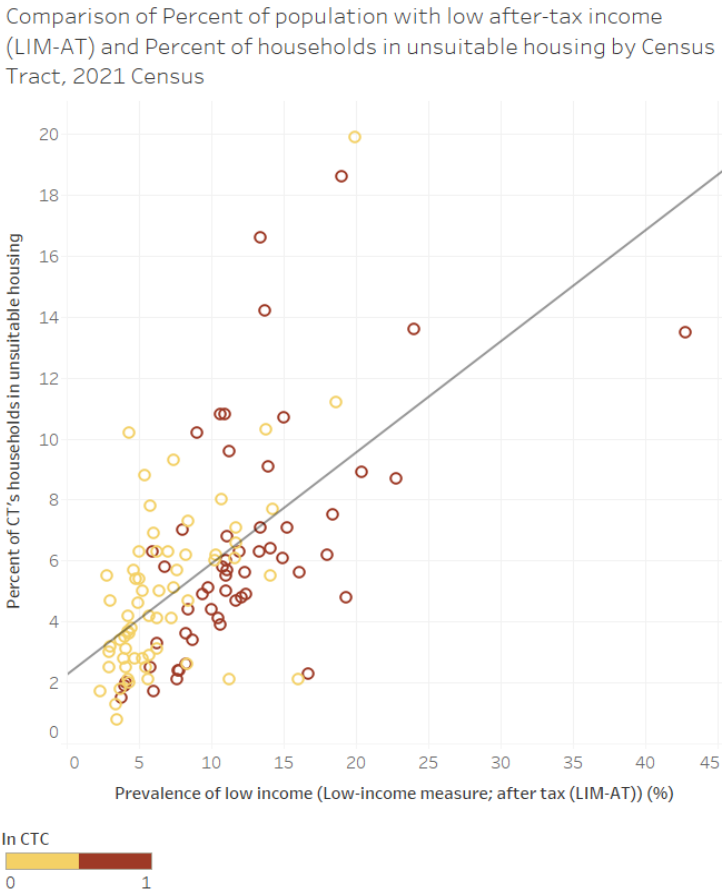

Figure 22: Scatterplot comparing CT prevalence of low-income (LIM-AT) and Percent of CT households in unsuitable housing

Housing supply not meeting population growth

First, despite generous upzoning and approval of new housing construction in the ROW, based on building permit data and average household sizes, new housing construction measured by number of units is falling short of the Region's growing population (Table 1 and Figure 5). The importance of this finding for housing capacity and suitability depends on the real-world relationship between average household size and average dwelling size. If newly added dwellings are larger than average household size, this supply deficit might not be of practical policy concern, as there still might be enough bedrooms added to suitable house the growing population. However, the majority of the ROW's new dwellings are now small units in tall towers, so this supply deficit indicates not only a shortage of homes, but a possible escalation in housing unsuitability.

The data on new apartment supply (Figure 6) that show a steep decline in high-rise construction reflect an era of rising interest rates, increased construction costs, and limited government engagement, which reduce developer incentives for construction, especially for taller builds. Declines in construction raise concerns for the ROW, as the Ontario government has tied infrastructure funding to housing starts (Jones, 2023), and construction may be even lower than indicated by building permits due to changes in interest rates and input costs (Outhit, 2024b). Recent data indicates that the ROW fell short of provincial housing start targets, which places the cities of Waterloo and Cambridge at risk of losing important infrastructure funding for future housing development, though Kitchener met its target (Outhit, 2024a).

We also found that that new dwelling construction is not occurring in locations with high with local population growth, notably along the Central Transit Corridor (Figure 4). Further, new housing supply is not occurring in areas with high rates of unsuitable housing (Figure 12).

Many households may be in unsuitable housing for non-economic reasons

Second, our findings have implications for community development, given the results on unsuitable housing and Core Housing Need (Figures 13 and 14). Among households spending less than

30% of their income on shelter costs, over 10% of these households experience unsuitable housing. However, few of these households are in Core Housing Need, meaning that they could in theory find affordable suitable housing in the market. This observation may indicate a trade-off, where households remain in unsuitable housing despite having funds to attain enough space. While saving income may be the primary motivator in some cases, households might also stay in place to meet transit needs, to remain in their neighbourhood (Kleinhans, 2009), to access amenities, to be near transit (Hu & Wang, 2019), or to stay in a rent-controlled apartment. These observations resonate with previous survey findings (Pi, 2017), which found concerns about affordability, transit access, and other amenities as affecting renter decisions in the ROW. An alternative explanation is that these household face discrimination in the housing markets. Though we cannot identify household motivations based on the quantitative data above, planners should be careful to not assume that pocketbook issues are the only consideration for residents seeking shelter. Further qualitative research to understand the lived experiences of these residents is needed to unpack the causality behind this seeming paradox.

Despite the preceding argument, we do not seek to dismiss or minimize more immediate housing challenges; the 2021 Census still found 9.0% of households in the ROW to be in Core Housing Need (Statistics Canada, 2022b), which also includes cases where households experience unaffordable or inadequate housing. Efforts to reduce this figure are still necessary and will continue to be so in the future.

Larger units needed in core areas

Third, when we combine the apparent shortfall of housing construction along the LRT route with high unsuitable housing rates among 2-bedroom households (Figure 10), high counts of unsuitably housed 2- and 3-bedroom households (Table A2, Appendix A), and similar figures for Other census family households and Couples with children (Figure 8 and Table A1, Appendix A), we see a case for expanding dwelling options for larger households and families. Medium-density construction, particularly in areas within or near the CTC, may be able to accommodate the current high population growth. Our case, rooted in public data, echoes Huang et al.'s survey work (2021) that shows unmet demand for families to locate close to denser, amenity-rich downtown areas. Previous work explains this gap in supply of family-sized housing as due to a locked-in "tall-and-sprawl" development pattern that simultaneously locks out missing middle housing for families and larger households within denser parts of the region (Parker et al., 2023). This locked-in development and zoning pattern and its associated land costs (Parker et al., 2023) can also prevent the benefits of MMH—including lower per-unit construction costs (Altus Group, 2024), lower risks due to smoother sequencing of projects, and larger units with more bedrooms—from being fully realized in downtown areas.

Providing housing for families and larger households within dense areas also has clear relevance (and serves as an indicator) for the Region's own goal of developing vibrant urban centres within the CTC (Parkin et al., 2019), which connects to more holistic social development within the Region's downtowns. Overall construction numbers are part of the story, but attention to dwelling types, dwelling sizes, and the provision of social and community infrastructure is also necessary to address ongoing housing needs, as evidenced by recent housing strategies in other jurisdictions (Tasmanian Government, 2023). More foundational changes could explore experimental forms of shared ownership, social finance, and collaboration with non-profit and community organizations to increase housing supply and address growing housing costs (Ahmed & Nemtin, 2023).

Housing outcomes demonstrate inequity

Fourth, correlations between socio-demographic factors and unsuitable housing (Figures 15 to 22) highlight inequitable housing policy outcomes for diverse populations, particularly for members of visible minorities, recent immigrants, and low-income individuals. While our analysis does not explicitly establish cause and effect, we argue that our analysis presents clear initial evidence that these groups can face additional hurdles in finding suitable housing. Planning based solely on average households at the municipal scale may meet the needs of majority groups while failing to supply housing to demographics in need, such as recent immigrants, persons with low income, or households beyond the nuclear family.

Land and housing needs assessments can be improved

Fifth, given our findings on equity deficits in housing provision, we advise incorporating equity considerations into land and housing needs assessments. Our work demonstrates how such an assessment can be accomplished using public data based on housing types, sizes, affordability levels, immigration groups, and visible minority status. Such efforts can identify priority housing needs in greater detail and add initiatives to address them over time into community plans, while also encouraging transparency in land and housing needs assessments.

For example, British Columbia's (BC) Government now requires municipalities to complete Housing Needs Reports every 5 years starting in 2028, with interim reports due by January 1, 2025 (e.g., City of Vancouver, 2022); BC provides supporting data to municipalities for this work (BC Ministry of Housing, 2024). Municipalities report on populations based on household sizes, ages, incomes, student status, and renter/owner status; on housing stock based on factors such as unit counts, dwelling types, bedroom distributions, construction dates; and on housing outcomes based on housing suitability, affordability, and adequacy. However, reports do not include a focus on visible minority status, immigration status, or low-income status. Ontario does not require any such reports, so assessments occur less regularly, with varied foci and measurements (e.g., City of Kitchener, 2020; City of Waterloo, 2020).

Policy discussion and recommendations

While our research adds on-the-ground evidence to corroborate claims about Canada's broader housing crisis, municipalities have taken several recent steps to address this issue in the ROW. For instance, the Region and the Cities of Waterloo and Kitchener have removed property taxes on affordable housing developments, with Kitchener's exemption restricted to non-profit developers (Davis, 2024a; Jackson, 2024). Additionally, the City of Waterloo and the ROW have opened municipal lands for affordable housing developments (City of Waterloo, 2024; ROW, 2024), and Habitat for Humanity Waterloo Region (2023) has partnered with local developers and community organizations with an aim of creating 10,000 new affordable homes. The City of Kitchener has also removed parking minima in major transit areas (Farwell, 2024), which can reduce construction costs for new housing.

Further, Kitchener has implemented very limited inclusionary zoning—to require affordability metrics—around major transit station areas (Davis, 2024b). However, the policy's expected impact is limited (D'Amato, 2024) and there are concerns that inclusionary zoning can concentrate affordable housing unnecessarily or encourage gentrification (August & Tolfo, 2018). Instead, enacting these changes regionally could address housing challenges more proactively and holistically, and can be managed to preserve neighbourhood cohesion and identity as areas densify (Youssef & Tsenkova, 2020).

Further positive policy interventions include federal and BC efforts to develop favourable prototypes for building designs (BC Ministry of Housing, 2023; Government of Canada, 2024) that provide medium levels of density or that allow easier conversions in the future, removing parking minima that increase construction costs, and rezoning land for moderate intensification to avoid extreme land value increases that may result from rezoning allowing for high-rise construction, especially within the CTC.

Given our analysis and discussion, we propose the following additional options to respond to the ROW's housing crisis, with a focus on expanded medium-density housing development and attention to housing outcome equity:

1. To support future analysis, municipalities can improve building permit data collection to include bedroom counts by default.
2. Local planning departments can explore regulations on bedroom counts and unit sizes to encourage a greater mix of dwelling types in new developments.
3. Planners can advocate for an expansion to current inclusionary zoning to apply evenly across the ROW.
4. Planning departments (notably in the Cities of Waterloo and Cambridge) can reduce/remove parking requirements to support new developments in core areas (Garcia et al., 2022) while continuing to apply local urban design guidelines that improve livability in these areas.
5. Planning departments can streamline application processes and prioritize medium-density development to reduce time costs (Garcia et al., 2022).
6. While zoning for densification is valuable, maintaining a moderate densification can be effective in limiting land value spikes and improving finances for medium-density projects (Parker et al., 2023).
7. Expanded collaborations between non-profit organizations, developers, and municipalities to gather land, finances, and labour can drive greater affordable housing development.
8. The Government of Ontario can require municipalities to include a focus on housing suitability and equity in their housing and land needs assessment, as demonstrated above.
9. Statistics Canada can support efforts to improve equity in housing planning by disseminating additional data linking other socio-demographic factors to housing indicators, including measurements for housing adequacy and affordability.

As a form of inspiration, we highlight four recent ROW innovations (Figure 23) that provide affordable MMH. First, Habitat for Humanity Waterloo Region (2022) and local developer Activa have private capital and non-profit support for a development of affordable stacked townhouses in Cambridge that include 3- and 4-bedroom units. Second, Grand River Modular (2024) is a female, Indigenous-owned construction firm using modular processes to develop accessory dwelling units in the ROW, with plans to also develop multiplex dwellings (Janes, 2024). Grand River Modular encourages a culture built on Indigenous knowledge, particularly the seven-generations principle that considers the next seven generations to come when making decisions (Janes, 2024). Third, Maxwell Building Consultants (2024) recently intensified a single-family lot in Kitchener's Mount Hope neighbourhood into an affordable 3-storey development, with ten 1-bedroom units, two 3-bedroom units, and one 5-

Figure 23: Affordable MMH project renderings: (a) Activa & Habitat for Humanity Waterloo Region's stacked townhouse project (CambridgeToday, 2022); (b) Grand River Modular's (2024) "Minisi" accessory dwelling unit; (c) Maxwell Building Consultants' (2022) single-lot Mount Hope Affordable Stacked Townhouse Development; (d) The ROW's Langs Drive redevelopment project (Coxson, 2023)

bedroom unit. Beyond adding denser, larger, affordable units on a conventional lot, the project includes a rainwater recovery system and solar panels. Fourth, the ROW and private-sector partners are redeveloping 36 townhouses on Langs Drive in Cambridge into a 7-storey building with 136 affordable units of 1–5 bedrooms and a youth community centre. The Region sought resident input for on-site community spaces and for relocating residents during construction to their satisfaction (Coxson, 2023). We encourage greater attention to similar housing innovations in the ROW and across Canada.

Conclusion and future work

While housing discussions often involve generalized assertions about market forces and impacts, our work shows on-the-ground evidence to test and corroborate these claims, and to productively contribute to Canada's housing discussion. We find that new housing in the ROW is not keeping pace with population growth, both within several Census Tracts, and when observed at the regional scale. Using trends in building permit approvals and in housing suitability based on bedrooms and dwelling types, we see a case for prioritizing medium-density development that has thus far been largely missing in the ROW. We also find that housing outcomes

(primarily measured by housing suitability) show inequitable outcomes based on several socio-demographic indicators, and we suggest that our work offers a method for incorporating these metrics into land and housing needs assessments. Policies to encourage medium-density development (as outlined above) and to better monitor housing outcomes over time can help in combatting housing crises in the ROW and across Canada.

Future work can expand on this research by considering how additional socio-demographic factors relate to housing suitability and other housing indicators. Such work may use public data if available or explore special census data compilations or non-public datasets. Our building permit analysis could dive further into existing/updated data, particularly if bedroom counts are incorporated into the data. In addition to our quantitative work, we encourage future research to explore qualitative and spatial factors driving housing decisions and how households balance forces including shelter costs, employment/transportation needs, and neighbourhood attachment. From a policy perspective, equity-related housing considerations can benefit from work to develop more inclusive planning processes, targeted housing programs to serve affected groups, and improved regulatory frameworks to reduce negative housing outcomes.

The ROW is not alone in experiencing urbanization, intensification, and growing housing challenges, both among cities in Canada, and among urban areas worldwide. While provincial trends of high population growth and spillover from larger urban centres are outside of the Region's control, its historical spirit of innovation can guide its ongoing transition and spur innovation to meet housing goals alongside societal and environmental demands. However, such outcomes are not inevitable and will require concentrated action among various actors and a willingness to eschew previous assumptions when planning for housing needs across the Region.

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Appendix A – Additional Data Tables

Table A1: Counts of total households and households with unsuitable housing by terminal household type branches, ROW, 2021 (Statistics Canada, 2022d)

Household type	Households in Waterloo Region	Households with unsuitable housing	Percent of housing with unsuitable housing
Non-census-family households	66,735	2,420	3.6%
Other census family households	16,320	4,010	24.6%
One-parent families	19,500	2,020	10.4%
Couples with children	65,725	4,730	7.2%
Couples without children	54,150	95	0.2%

Table A2: Counts of total households and households with unsuitable housing with each bedroom category, ROW, 2021 (Statistics Canada, 2022d)

Number of bedrooms	Households in Waterloo Region	Households with unsuitable housing	Percent of housing with unsuitable housing
Four or more	55,540	2,100	3.8%
Three	91,120	4,070	4.5%
Two	48,570	4,285	8.8%
One	26,190	2,500	9.5%
None (Studio apartments)	1,005	325	32.3%

Table A3: Counts of total population and population in unsuitable housing by visible minority category, ROW, 2021 (Statistics Canada, 2022f)

Age	Visible minority category	Population in the ROW	Population in unsuitable housing	Percent of VM category in unsuitable housing
0-14	Visible minority Not a visible minority	34,595 63,865	9,535 9,535	27.6% 9.2%
15-24	Visible minority Not a visible minority	28,140 47,655	9,430 5,760	33.5% 12.1%
25-54	Visible minority Not a visible minority	73,520 164,655	15,835 9,255	21.5% 5.6%
55-64	Visible minority Not a visible minority	12,055 58,960	1,805 1,650	15.0% 2.8%
65+	Visible minority Not a visible minority	10,500 74,120	1,185 1,090	11.3% 1.5%
Total	Visible minority Not a visible minority	158,810 409,255	37,785 23,595	23.8% 5.8%

Table A4: Counts of total population and population in unsuitable housing by immigration category, the ROW, 2021 (Statistics Canada, 2022f)

Immigration category	Population in the ROW	Population in unsuitable housing	Percent of immigration category in immigration category in unsuitable housing
Immigrated before 1980	28,615	725	2.5%
Immigrated 1980-1990	16,865	1,200	7.1%
Immigrated 1991-2000	25,005	2,845	11.4%
Immigrated 2001-2011	31,495	5,630	17.9%
Immigrated 2011-2021	44,595	13,405	30.1%
Immigrated 2011-2015	16,810	4,075	24.2%
Immigrated 2016-2021	27,780	9,330	33.6%
All immigrants	146,575	23,800	16.2%
Non-permanent residents	22,250	7,960	35.8%
Non-immigrants	369,625	29,620	7.4%
Total population	506,690	61,380	10.8%

Appendix B – Conditional spatial regression tables

Table B1: Correlation coefficients for New dwelling units from building permits with occupancy dates from 2021 on with Rates of unsuitable housing and Connection to CTC (Calculated from Region of Waterloo, 2023a; Statistics Canada, 2022b). (* p-value < 0.10; ** p-value < 0.05; *** p-value < 0.01)

Independent variable	Dependent variables	Coefficient	Standard error
New dwelling units since Jan 1., 2021 by Occupancy Date	% of households with unsuitable housing	8.17874	6.39618
	In CTC	80.824*	44.2132
	Intercept	67.1744	42.1736
		No. of observations:	120
		R^2	0.047640
		Standard Error of regression	238.877
		AIC	1657.74

Table B2: Correlation coefficients for Rates of unsuitable housing with Visible minority share of population and Connection to CTC (Calculated from Statistics Canada, 2022b). (* p-value < 0.10; ** p-value < 0.05; *** p-value < 0.01)

Dependent variable	Independent variables	Coefficient	Standard error
% of households with unsuitable housing	% of Population Visible Minority	0.142804***	0.0162042
	In CTC	1.16475**	0.489408
	Intercept	0.88823	0.541247
		No. of observations:	120
		R^2	0.413714
		Standard Error of regression	2.67676
		AIC	579.813

Appendix B–Conditional spatial regression tables

Table B3: Correlation coefficients for Rates of unsuitable housing with Recent immigrant share of population and Connection to CTC (* p-value < 0.10; ** p-value < 0.05; *** p-value < 0.01)

Dependent variable	Independent variables	Coefficient	Standard error
% of households with unsuitable housing	% of Population Immigrated in 2011-2021	0.532469***	0.046744
	In CTC	0.730841*	0.435707
	Intercept	1.18758***	0.424813
		No. of observations:	120
		R^2	0.537485
		Standard Error of regression	2.37748
		AIC	551.357

Table B4: Correlation coefficients for Rates of unsuitable housing with Prevalence of low-income (LIM-AT) and Connection to CTC (Calculated from Statistics Canada, 2022b). (* p-value < 0.10; ** p-value < 0.05; *** p-value < 0.01)

Dependent variable	Independent variables	Coefficient	Standard error
% of households with unsuitable housing	% of Population with low income (LIM-AT)	0.401808***	0.0472442
	In CTC	-0.878666	0.547138
	Intercept	1.85742***	0.471562
		No. of observations:	120
		R^2	0.397203
		Standard Error of regression	2.71419
		AIC	583.146

Appendix C – Table C1: Summary of Data Sources

Data source	Geography	Population scale	Key Variables	Reference
Census Profile, 2021 & 2016	CD, CMA, CSD, CT	Individual Household	Population estimates Visible minority status Immigration category Low-income status Housing suitability	Statistics Canada, 2022b; 2017
Table 17-10-0135-01	CMA	Individual	Population estimates	Statistics Canada, 2023b
Table 17-10-0138-01	CD	Individual	Population estimates	Statistics Canada, 2023b
Table 17-10-0142-01	CSD	Individual	Population estimates	Statistics Canada, 2023d
Table 46-10-0027-01	CMA, CSD	Residential properties	Residential property counts	Statistics Canada, 2023e
Table 98-10-0238-01	CD, CSD	Household	Housing suitability Household type	Statistics Canada, 2022d
Table 98-10-0247-01	CD, CSD	Household	Housing suitability Core Housing Need Shelter-cost-to-income ratio	Statistics Canada, 2022e
Table 98-10-0327-01	CMA	Individual	Housing suitability Visible minority status Immigration category Age	Statistics Canada, 2022f
Region of Waterloo Building Permits	N/A	Property	Issue date Occupancy date Location Number of units Structure type Number of storeys	Region of Waterloo, 2023a
ION LRT route path	N/A	N/A	N/A	Region of Waterloo, 2023b

Appendix C–Table C2: Summary of analyses, input data

For Scale, the following codes apply: 1 – Census Metropolitan Area; 2 – Census Division (Region); 3 Census Subdivision (City/Township); 4 – Census Tract

Fig./ Tab. No.	Question being addressed	Data	Scale	Method
Table 1	Using StatsCan data, are residences growing in line with population?	Counts of residential units and population for 2018 & 2021 (StatsCan tabulation), and average household size (2021 Census)	1, 3	Calculate changes in residential units and population; then calculate ratio of the two and compare to average household size
Figure 4	Where in the Region does population growth appear to exceed the number of dwelling units added?	Population counts (2016 & 2021 Census), average household size (2016 Census), and units added over 2016–2021 (building permit data)	4	Tabulate building permit unit counts; calculate population change; compare population change to units added times average household size; display negative values
Figure 5	How have housing construction plans changed since 2016 based on structure type?	Units added over 2016–2022 by issue date and expected occupancy date (building permit data); tabulated by building type	2	Tabulate units added by building type (and storeys for apartments) and year according to issue date; chart by year
Figure 6	How have apartment construction plans changed since 2016 based on building height?	Apartment units added over 2016–2022 by issue date and expected occupancy date (building permit data); tabulated by storey category	2	Tabulate units added by storey category and year according to issue date; chart by year
Figure 7	Do units added since the last Census cluster spatially within the ROW?	Counts of units with occupancy dates on or after 1 Jan 2021 (building permit data)	4	Tabulate units added in each CT and chart results spatially
Figure 8	How prevalent is unsuitable housing for each household type in the ROW?	Counts of total and unsuitably housed households in each household type (StatsCan tabulation)	2	Calculate percentage of each household type with unsuitable housing and chart results (*e.g.*, for Couples with children, what percentage have unsuitable housing?)
Table A1	How do percentages per household type compare with the number of affected households in each household type?	Counts of total and unsuitably housed households in each household type (StatsCan tabulation)	2	Display totals, numbers of unsuitably housed households, and the affected percentage of each household type
Figure 9	How does the composition of households with unsuitable housing vary among municipalities?	Counts of total and unsuitably housed households in each household type for the Region and cities (StatsCan tabulation)	2, 3	Given ALL households with unsuitable housing, calculate share of those households in each household type (*e.g.*, of all households with unsuitable housing, what percentage are Couples with children?)

Table C2 continued

Fig./ Tab. No.	Question being addressed	Data	Scale	Method
Table A2	Does a household's number of bedrooms affect its likelihood of experiencing unsuitable housing?	Counts of total and unsuitably housed households in each bedroom category (StatsCan tabulation)	2	Calculate percentage of each bedroom category with unsuitable housing (*e.g.*, of all households with 2 bedrooms, what percentage have unsuitable housing?)
Figure 10	How do percentages per bedroom category compare with the number of affected households in each bedroom category?	Counts of total and unsuitably housed households in each bedroom category (StatsCan tabulation)	2	Display totals, numbers of unsuitably housed households, and the affected percentage of each bedroom category
Figure 11	Do high rates of unsuitable housing cluster spatially within the ROW?	Counts of households and of households with unsuitable housing (2021 Census)	4	Calculate rate of unsuitable housing for all CTs and chart results spatially
Figure 12	Do unsuitable housing rates or CTC proximity correlate with where post-2021 supply has been added?	Unsuitable housing rates (calculated from 2021 Census), dummy variable for CT touching 800m radius around LRT path, CT Counts of units with occupancy dates on/after 1 Jan 2021	4	Scatterplot between new units added and rates of housing unsuitability, with points coloured by CTC location
Table B1	Do unsuitable housing rates or CTC proximity correlate with where post-2021 supply has been added?	Unsuitable housing rates (calculated from 2021 Census), dummy variable for CT touching 800m radius around LRT path, CT Counts of units with occupancy dates on/after 1 Jan 2021 (building permit data)	4	Multiple linear regression to calculate conditional simple correlation; dependent variable: units built since 2021; independent variables: 2021 unsuitable housing rate, connection to CTC (binary)
Figure 13	Do renter status or a higher proportion of income going to shelter increase a household's likelihood of unsuitable housing?	Counts of total and unsuitably housed households for shelter-cost-to-income ratio categories and tenure status (StatsCan tabulation)	2	Calculate percentage of each shelter-cost-to-income ratio and tenure category with unsuitable housing and chart results
Figure 14	Do renter status or a higher proportion of income going to shelter increase a household's likelihood of being in unsuitable housing AND in Core Housing Need?	Counts of total households and households in both unsuitable housing and Core Housing Need for shelter-cost-to-income ratio categories and tenure status (StatsCan tabulation)	2	Calculate percentage of each shelter-cost-to-income ratio and tenure category in both unsuitable housing AND Core Housing Need and chart results
Figure 15	Are members of visible minorities more likely to experience unsuitable housing?	Counts of total individuals and individuals in unsuitable housing for visible minority and age categories (StatsCan tabulation)	1	Calculate percentages of each age group in visible minority and suitable housing categories and chart results

Fig./ Tab. No.	Question being addressed	Data	Scale	Method
Table A3	How does the number of residents in unsuitable housing vary by visible minority status?	Counts of total and unsuitably housed residents by visible minority status (StatsCan tabulation)	1	Display totals, numbers of unsuitably housed residents, and the affected percentage for residents who belong/do not belong to a visible minority
Figure 16	Do rates of visible minority population cluster spatially in the ROW?	Counts of total population and visible minority population (2021 Census)	4	Calculate percentages of CT population that are Visible Minority and chart results spatially
Figure 17	Do rates of visible minority population correlate with unsuitable housing rates?	Visible minority population percentages and percentages of households with unsuitable housing (derived from 2021 Census)	4	Scatterplot between percent Visible Minority population percentages and rates of housing unsuitability, with points coloured by CTC location
Table B2	Do rates of visible minority population correlate with unsuitable housing rates?	Visible minority population percentages and percentages of households with unsuitable housing (derived from 2021 Census)	4	Multiple linear regression to calculate conditional simple correlation; dependent variable: 2021 unsuitable housing rate; independent variables: 2021 % of population
Figure 18	Do immigration status & period affect a person's likelihood of having unsuitable housing?	Counts of total individuals and individuals in unsuitable housing for categories of immigration status and periods of immigration (StatsCan tabulation)	1	Calculate percentages of population in each category with suitable and unsuitable housing and chart results
Table A4	How does the number of residents in unsuitable housing vary by immigration status?	Counts of total and unsuitably housed residents by immigration status (StatsCan tabulation)	1	Display totals, numbers of unsuitably housed residents, and the affected percentage by immigration category
Figure 19	Do rates of immigrants who arrived over 2011–2021 cluster in the ROW?	Counts of total population and population that immigrated to Canada over 2011–2021 (2021 Census)	4	Calculate percentages of CT population that are recent immigrants (arrived in 2011–2021) for each CT and chart results spatially
Figure 20	Do recent immigrant population rates (arrived in 2011–2021) correlate with rates of unsuitable housing?	Recent immigrant population percentages and percentages of households with unsuitable housing (derived from 2021 Census)	4	Scatterplot between percent Recent Immigrant population percentages and rates of housing unsuitability, with points coloured by CTC location
Table B3	Do recent immigrant population rates (arrived in 2011–2021) correlate with rates of unsuitable housing?	Recent immigrant population percentages and percentages of households with unsuitable housing (derived from 2021 Census)	4	Multiple linear regression to calculate conditional simple correlation; dependent variable: 2021 unsuitable housing rate; independent variables: 2021 % of population immigrated in 2011–2021, connection to CTC

Fig./	Question being addressed	Data	Scale	Method
Figure 21	Do rates of low-income population cluster spatially in the ROW?	Counts of total population and low-income population based on the After-Tax Low-Income Measure (2021 Census)	4	Calculate percentages of low-income population for each CT and chart results spatially
Figure 22	Do low-income population rates correlate with rates of unsuitable housing?	Rates of low-income population and households with unsuitable housing (derived from 2021 Census)	4	Scatterplot between percent low-income prevalence (LIM-AT) and rates of housing unsuitability, with points coloured by CTC location
Table B4	Do low-income population rates correlate with rates of unsuitable housing?	Rates of low-income population and households with unsuitable housing (derived from 2021 Census)	4	Multiple linear regression to calculate conditional simple correlation; dependent variable: 2021 unsuitable housing rate; independent variables: