ORIGINAL ARTICLE

Inuit housing and homelessness: results from the International Polar Year Inuit Health Survey 2007–2008

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ABSTRACT

Objectives. Evaluate housing characteristics across Inuit regions in Canada that participated in the 2007–2008 International Polar Year (IPY) Inuit Health Survey.

Study design. A cross-sectional Inuit Health Survey.

Methods. Housing characteristics were ascertained as part of the IPY Inuit Health Survey through interviews conducted in 33 coastal and 3 inland communities, representing all communities in the Inuvialuit Settlement Region (ISR) of NWT, Nunavut and Nunatsiavut of northern Labrador. Variable descriptive statistics were weighted and presented by region and by whether children were present or not in each household.

Results. A total of 2,796 Inuit households were approached, of which 68% participated (n=1,901 households). In ISR and Nunavut, approximately 20% of homes provided shelter to the homeless compared to 12% in Nunatsiavut (p≤0.05). The prevalence of public housing and household crowding also varied by region, with Nunavut having a statistically significantly higher prevalence of crowding (30%) than Nunatsiavut (12%) and ISR (12%). Household crowding was more prevalent among homes with children. Overall, 40% of homes were in need of major repairs and problems with mould were reported in 20% of households.

Conclusions. Adequate shelter is a basic human need and an essential foundation for thriving population health. The results indicate that improvements in housing indicators are needed. Of utmost concern is the high prevalence of overcrowding in Inuit homes with children, which poses potential consequences for children’s health and well-being. Further, the high percentage of homes providing shelter to the homeless suggests that hidden homelessness needs to be addressed by further research and program implementation.

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Keywords: Aboriginal Health, housing, homelessness, Inuit, health surveys, homeless persons, crowding
INTRODUCTION

Permanent housing in Inuit communities across the Canadian Arctic is a relatively recent development. It began in the mid-1950s and was triggered by the introduction of compulsory schooling, the collapse of the fur trade and the outbreak of infectious diseases, among other events (1). A number of factors contributed to an accelerated wear and tear of the houses, including the extreme conditions of the Arctic; substandard construction materials for the harsh climate; culturally inappropriate housing designs that did not incorporate traditional Inuit activities and lifestyles (such as processing country food); the need for residents to be indoors during long winters; and overcrowding (2–4). Projections indicate that the Inuit population will increase at the fastest pace of all Aboriginal groups in Canada (5), putting additional pressure on the existing housing crisis (6–9).

Overcrowding exists in all Inuit regions across the Canadian Arctic and is well documented (1). Living in crowded conditions takes a toll on health in many ways. A case study on the perceptions and experiences of Inuit living in crowded conditions reports the most significant problems as not having time alone, noisy conditions, trouble sleeping and a high prevalence of anger in homes that were nearly always overcrowded (1) – each of these with possible consequences for psychological wellbeing (10). Crowded conditions contribute to the high rates of lower respiratory tract infections in Inuit children due to inadequate ventilation in homes (11). In Nunavik, 35–45% of Inuit children with asthma or wheezing lived in overcrowded homes. (12). A surveillance study within a similar geo-cultural population of Inuit in Greenland found that nighttime crowding was a significant risk factor for upper and lower respiratory infections in 0–2 year olds (13). In a retrospective study based on hospitalization records for lower respiratory tract infections, reported over a 5-year period within a mixed northern Aboriginal population, Inuit infants accounted for two-thirds of admissions and pediatric transfers despite representing only one-fifth of the study population (14). The incidence of tuberculosis within comparable remote First Nations communities was shown to be associated with higher-than-average housing density and a susceptible population (15).

Homelessness is also a problem in Aboriginal communities and can range from absolute homelessness – resulting in individuals living in shelters or on the streets – to hidden homelessness, where individuals stay temporarily with family or friends and may move from one household to the next (16). Hidden homelessness is particularly difficult to measure and rarely included in surveys (17–18) but is of concern in northern Aboriginal communities.

Homelessness can result from a complex interaction of individual factors (adverse childhood experiences, low and substandard educational attainment, lack of job skills, abuse and violence, mental illness and substance use) and societal factors (poverty, high housing costs, labour market conditions, low social assistance, racism and discrimination) (18). Risk factors associated with becoming homeless include living in substandard or unsafe housing; and spending a very large proportion of monthly income on housing (17). In addition to providing temporary shelter to homeless visitors, households can include multigenerational families, where a parent’s grown children, together with their partner and own children, continue to reside with the parents because of the long waiting time.
for housing (1). The number of homes in need of major repairs in the Arctic regions is high and rising, except in Nunatsiavut (19). Furthermore, parents and teachers in a study of 9–12 year olds report that housing quality is related to behavioural problems in children (20). As an environmental determinant of health, homes not in need of repairs are significantly related to measures of thriving health among Indigenous people (21).

Given the importance of adequate housing and hidden homelessness to population health, the characteristics of housing and the prevalence of households providing shelter to homeless visitors were important health indicators included in the International Polar Year Inuit Health Survey.

METHODS

The International Polar Year Inuit Health Survey (IPY-IHS) was a multifaceted, cross-sectional health survey conducted in the late summer and fall of 2007 and 2008 in 33 coastal and 3 inland communities in 3 regions of Inuit Nunangat (or Inuit Homeland). The 2006 Canadian Census enumerated a total of 50,485 Inuit, of which over 78% lived in 1 of the 4 regions within Inuit Nunangat and made up the majority of the population in these regions. The Inuvialuit Settlement Region (ISR) within the Northwest Territories of the Western Arctic accounted for 3,115 Inuit, or 55% of the total population in ISR; the territory of Nunavut accounted for the largest Inuit population in Canada with 24,635, or 84% of the total population of Nunavut; and the northern region of Labrador, Nunatsiavut, accounted for 2,160 Inuit, or 89% of the total population in Nunatsiavut (22).

All coastal communities were visited by the Canadian Coast Guard Ship (CCGS) Amundsen, which was equipped with research and laboratory facilities. The inland communities were visited by air by separate research crews. Communities provided us with numbered housing lists from which a random sample of households was selected using a random numbers table or computer-generated random digits.

All Inuit adults within the selected households who were 18 years of age and older were eligible to participate. Three attempts were made to contact the selected households. Households were visited by locally trained research assistants and survey team members, who explained the study protocol, obtained written consent from individuals and booked clinic appointments on the ship.

Participatory process

The IPY-IHS was developed using a participatory health research approach (23). Memoranda of Agreements were developed and signed with steering committees in each of the 3 regions, consisting of representatives of Inuit communities and regional health officials outlining responsibilities and processes to be followed. Similarly, separate community-university agreements were signed by all 36 local community councils, inviting the IPY-IHS teams into their communities.

Informed consent

In recognition of the Inuit’s strong oral traditions, a “visual” consent form was created as a DVD in the appropriate Inuit languages. The DVD followed the written informed consent form word for word and depicted all clinical and laboratory procedures. After watching the DVD, participants who consented to participating in the study signed the bilingual written consent form.
Ethical approval

Ethical approval for the research was obtained from McGill University’s Faculty of Medicine Institutional Review Board. Research licences were obtained from the Nunavummi Qaujisaqtulirijikkut for Nunavut (Nunavut Research Institute) and the Aurora Research Institute in ISR – both of which are regulatory agencies for scientific research in Canada’s territories. Nunatsiavut region waived the licence requirement given the extensive consultations with the Nunatsiavut Government’s Department of Health and Social Development.

Questionnaires

All questionnaires were administered by trained research staff, including bilingual (Inuit dialect and English) research assistants. One adult from each household completed an interviewer-administered household questionnaire concerning language spoken at home, living conditions, access to country food, employment, income and other questions about the home environment. All eligible adults within a household also completed an individual questionnaire on current and past health, health-related behaviours such as smoking and socio-demographic information, and diet was assessed using both multiple-pass 24-hour food recalls and a past-year food frequency questionnaire.

The data for the current report were compiled from the household questionnaire, which was verbally administered by research staff. Answers included information on each respondent’s type of housing (public or private) and number of bedrooms, as well as whether the home was in need of major repairs (a new roof, defective plumbing or electrical wiring and structural repairs to walls, floors or ceilings) or had a problem with mould. Participants were also asked whether homeless visitors had stayed in the home in the past year, and if yes, how many individuals had stayed and the duration of their visit.

The responses were entirely subjective, according to the judgement of the respondent, and no attempt was made to objectively assess housing characteristics. The questions used to assess conditions reported in the current manuscript are presented in Appendix 1.

Overcrowding

Statistics Canada’s definition of household crowding was used for this study. In this definition, a home was considered crowded if more than 1 person occupied a room, and rooms included bedrooms, kitchen and living room (24). The data on the number of days that homeless visitors stayed in a home were heavily skewed, and so the geometric mean was used. Outliers accounted for the skewed distribution. Days exceeding 1 year for the duration of a homeless visitor’s stay were recoded to 365 days. The ages of all household members was missing for 8% of homes in ISR, 6% of homes in the Nunatsiavut region and 6% of homes in Nunavut.

Statistical analyses

The prevalence of household characteristics by region was weighted using Stata/SE 11.1 (StataCorp LP, College Station, TX) and 95% confidence intervals (95% CI), where communities were strata and sampling weights reflected the proportion of participating households in each community.
RESULTS

A total of 2,796 Inuit households were approached, of which 1,901 households participated (68%). The percentage of randomly selected households that participated in the survey was 65% in ISR, 58% in Nunatsiavut and 71% in Nunavut (Table I). The total number of Inuit participants was 2,595, of whom 310 (108 male and 202 female) were from Nunatsiavut; 362 (118 male and 224 female) were from ISR; and 1,923 (772 male and 1,151 female) were from Nunavut. There were a total of 288 participating households in the ISR, of which 62% had children (under 18 years of age); there were a total of 239 households in Nunatsiavut, of which 53% had children; and there were a total of 1,374 households in Nunavut, of which 78% had children.

Housing

The majority of homes surveyed were public housing (65%), with the remaining being either private (29%), Territorial/Provincial¹ (4%), other (1.7%) or federal housing (<1%), based upon weighted results. Nunavut reported the highest frequency of public housing at 73.7% (95% CI 71.5–75.9), followed by the ISR at 46.4% (95% CI 41.2–52.5) and finally the Nunatsiavut region at 17.2% (95% CI 13.3–21.1). On average there were 3 bedrooms per home, and household crowding was noted for 25% of homes. The average number of bedrooms varied: the Nunatsiavut region had 3.1 bedrooms (95% CI 3.0–3.2), which was statistically significantly higher than both Nunavut, with an average of 2.8 bedrooms (95% CI 2.8–2.9), and the ISR, with an average of 2.7 bedrooms (95% CI 2.6–2.8) (p≤0.05). The total number of rooms per home included the bedrooms plus 2 rooms (kitchen and living room). Nunavut had a greater prevalence of household crowding (29.7%) compared to ISR (11.6%) and the Nunatsiavut region (11.6%) (p≤0.01). The percentage of homes in need of major repairs was high across all regions (40.4%), but ISR had a significantly lower prevalence (33.8%) of homes in need of major repairs. In contrast, problems with mould affected 20% of all households, with Nunatsiavut reporting the highest prevalence (30.4%) for all regions.

Help to the homeless

Across the Arctic, nearly 1 in 5 Inuit households (19.1%) (17.3% for unadjusted data) provided shelter to homeless individuals. The prevalence rate was similar between ISR and Nunavut but was lower in Nunatsiavut, where only 11.6% of households provided shelter to the homeless. On average, there were 2.3 homeless visitors per home in the year prior to the survey among the homes that reported providing shelter. The

Table I. Inuit household characteristics by region: International Polar Year Inuit Health Survey, 2007–2008.

|                          | ISR     | Nunatsiavut | Nunavut |
|--------------------------|---------|-------------|---------|
| Total number of Inuit households | 1,097   | 623         | 7,182   |
| Total number of eligible households approached | 443     | 417         | 1,936   |
| Number (%) of participating households | 288 (65%) | 239 (57%)  | 1,374 (71%) |
| Weighted results | Mean (95% CI) | Mean (95% CI) | Mean (95% CI) |
| Number of bedrooms per household | 2.7 (2.6–2.8) | 3.1 (3.0–3.2) | 2.8 (2.8–2.9) |
| Number of persons per household | 3.4 (3.2–3.6) | 3.7 (3.5–3.9) | 4.4 (4.3–4.6) |

¹Total number of Inuit households was estimated from Statistics Canada Census 2006 data, based on the number of total households and the % Inuit of the total population by region.

¹Gov’t of Nunavut or Nunatsiavut or Inuvialuit housing.
### Table II. Weighted prevalence (%) or mean and 95% confidence interval (CI) of housing characteristics by region: International Polar Year Inuit Health Survey, 2007–2008.

| Housing characteristics | ISR % (95% CI) | Nunatsiavut % (95% CI) | Nunavut % (95% CI) | All regions % (95% CI) |
|-------------------------|----------------|------------------------|-------------------|-----------------------|
| % Public                | 46.4 (41.2–51.5)$^{a,b,c}$ | 17.2 (13.3–21.1)$^{a,b,c}$ | 73.7 (71.5–75.9) | 67.2 (62.8–66.6) |
| Home with children      | 43.3 (36.3–50.3)$^{a,b,c}$ | 25.4 (18.7–32.1)$^{a,b,c}$ | 73.7 (71.2–76.3) | 66.7 (64.4–69.0) |
| Home without children   | 52.8 (43.0–65.6)$^{a,b,c}$ | 9.4 (4.0–14.9)$^{a,b,c}$ | 73.7 (68.3–78.9) | 60.5 (56.4–64.6)$^{#}$ |
| % Need of major repair  | 33.8 (28.1–39.6)$^{a,b,c}$ | 41.6 (35.2–48.0) | 41.8 (39.1–44.6) | 40.4 (38.3–42.5) |
| Home with children      | 41.9 (34.6–49.1) | 38.9 (31.7–46.1) | 43.7 (40.8–46.6) | 43.2 (40.6–45.7) |
| Home without children   | 24.8 (16.8–32.9)$^{a,b,c}$ | 45.8 (38.1–53.5) | 34.8 (29.5–40.0)$^{#}$ | 33.9 (30.0–37.9)$^{#}$ |
| % With mould problem    | 9.8 (6.4–13.1)$^{a,b,c}$ | 30.4 (24.5–36.3)$^{a,b,c}$ | 21.3 (19.0–23.6) | 20.0 (18.4–21.7) |
| Home with children      | 13.6 (9.1–18.0)$^{a,b,c}$ | 31.1 (24.4–37.9)$^{a,b,c}$ | 22.7 (20.2–25.1) | 21.9 (19.8–24.0) |
| Home without children   | 4.1 (0.3–7.9)$^{a,b,c}$ | 31.6 (24.3–38.9)$^{a,b,c}$ | 16.5 (12.3–20.8)$^{#}$ | 15.7 (12.7–18.7)$^{#}$ |
| % Household crowding$^{1}$ | 11.6 (8.3–15.0)$^{a,b,c}$ | 11.6 (8.3–15.0)$^{a,b,c}$ | 29.7 (27.5–31.9) | 25.1 (23.3–26.8) |
| Home with children      | 19.5 (13.7–25.2)$^{a,c}$ | 20.5 (13.8–27.2)$^{a,c}$ | 37.9 (35.2–40.7) | 34.2 (31.8–36.6) |
| Home without children   | 1.1 (0.0–3.2)$^{a,b,c}$ | 45.8 (38.1–53.5) | 34.8 (29.5–40.0)$^{#}$ | 33.9 (30.0–37.9)$^{#}$ |
| % With mould problem    | 9.8 (6.4–13.1)$^{a,b,c}$ | 30.4 (24.5–36.3)$^{a,b,c}$ | 21.3 (19.0–23.6) | 20.0 (18.4–21.7) |
| Home with children      | 13.6 (9.1–18.0)$^{a,b,c}$ | 31.1 (24.4–37.9)$^{a,b,c}$ | 22.7 (20.2–25.1) | 21.9 (19.8–24.0) |
| Home without children   | 4.1 (0.3–7.9)$^{a,b,c}$ | 31.6 (24.3–38.9)$^{a,b,c}$ | 16.5 (12.3–20.8)$^{#}$ | 15.7 (12.7–18.7)$^{#}$ |
| % Household crowding$^{1}$ | 11.6 (8.3–15.0)$^{a,b,c}$ | 11.6 (8.3–15.0)$^{a,b,c}$ | 29.7 (27.5–31.9) | 25.1 (23.3–26.8) |
| Home with children      | 19.5 (13.7–25.2)$^{a,c}$ | 20.5 (13.8–27.2)$^{a,c}$ | 37.9 (35.2–40.7) | 34.2 (31.8–36.6) |
| Home without children   | 1.1 (0.0–3.2)$^{a,b,c}$ | 45.8 (38.1–53.5) | 34.8 (29.5–40.0)$^{#}$ | 33.9 (30.0–37.9)$^{#}$ |

$p ≤ 0.05$ for differences between regions as designated by a for ISR, b for Nunatsiavut and c for Nunavut.

$^{#}$ p<0.05 for differences between homes with and without children within each region or for all regions combined.

$^{1}$ Statistics Canada’s definition of household crowding was used, where a home with more than 1 person per room was considered a crowded dwelling and where rooms included bedrooms, kitchen and living room.

$^{2}$ Geometric mean.

### Table III. Percent (%) and 95% confidence intervals (CI) of total Inuit populations and of Inuit children (<18 yrs) affected by housing issues by region: International Polar Year Inuit Health Survey, 2007–2008.

| Housing characteristics | ISR % (95% CI) | Nunatsiavut % (95% CI) | Nunavut % (95% CI) | All regions % (95% CI) |
|-------------------------|----------------|------------------------|-------------------|-----------------------|
| % Public                | 42.0 (35.3–48.7) | 16.8 (11.1–22.6) | 72.2 (69.2–75.2) | 63.2 (60.6–65.9) |
| Total population affected | 49.9 (41.3–58.4) | 23.6 (15.1–32.0) | 77.6 (74.9–80.4) | 72.5 (70.0–75.1) |
| % Need of major repair  | 37.5 (30.5–44.6) | 44.0 (36.5–51.5) | 44.0 (40.6–47.4) | 43.0 (40.1–45.9) |
| Total population affected | 52.7 (43.8–61.7) | 37.8 (27.6–48.0) | 48.5 (44.9–52.1) | 48.4 (45.2–51.6) |
| % With mould problem    | 10.4 (6.5–14.3) | 32.3 (25.2–39.4) | 21.6 (18.7–24.4) | 20.8 (18.4–23.1) |
| Total population affected | 20.7 (13.0–28.5) | 33.6 (23.4–43.8) | 25.1 (21.9–28.3) | 25.1 (22.2–28.0) |
| % Household crowding$^{a}$ | 17.3 (11.5–23.1) | 16.8 (10.3–23.3) | 41.0 (37.6–44.4) | 35.3 (32.5–38.2) |
| Total population affected | 33.5 (24.8–42.3) | 28.5 (18.1–38.9) | 58.3 (55.1–61.6) | 54.4 (51.5–57.4) |
| % Homes that provided shelter to homeless | 22.1 (16.1–28.1) | 14.0 (8.4–19.7) | 20.0 (17.1–22.9) | 19.8 (17.4–22.2) |
| Total population affected | 25.2 (17.3–33.2) | 6.6 (1.9–11.3) | 17.2 (14.5–19.8) | 17.4 (15.0–19.9) |

Note: the population is for Aboriginal people only.

$^{a}$ Adults and children combined.

$^{b}$ Statistics Canada’s definition of household crowding was used, where a home with more than 1 person per room was considered a crowded dwelling and where rooms included bedrooms, kitchen and living room.
geometric mean number of days of shelter provided to homeless guests was 42.9 days; this did not vary significantly by region (Table II).

**Homes with and without children**

Housing characteristics were also evaluated by whether or not children were present in the household. Homes with and without children had similar prevalences of providing shelter to the homeless. The prevalence of public housing was similar between households with and without children, with the exception of Nunatsiavut, where homes with children had a greater likelihood of being public housing than homes without children (Table II). In ISR and Nunavut, homes with children were significantly more likely to be in need of major repairs or to have mould problems. However, homes with children had a statistically significant and substantially higher prevalence of household crowding than homes without children for all 3 regions. Nearly 1 in 5 homes with children in ISR (19.5%) and the Nunatsiavut region (20.5%) and nearly 2 in 5 homes with children in Nunavut (37.9%) were crowded, compared to crowding prevalences of 1.1%, 0% and 2.3% for homes without children in ISR, the Nunatsiavut region and Nunavut, respectively.

**Extrapolations regarding burden of housing characteristics for children**

When extrapolating the current data to estimate the percentage of children affected by housing conditions, we estimated that 54.4% of children lived in a crowded household, 25.1% lived in a house with mould, 48.4% lived in a home in need of major repairs, and 72.5% resided in public housing in all regions combined (Table III). However, we took note of regional differences; generally, children in Nunavut had a higher prevalence of adverse housing conditions relative to ISR and Nunatsiavut. Similarly, the burden of housing conditions for the total population showed similar trends (Table III).

**DISCUSSION**

In the present survey, about one-fifth of Inuit homes reported providing shelter to the homeless, with an average of 2.3 homeless guests for an average duration of 1.4 months. Little is known, however, about the circumstances contributing to homelessness or about the characteristics of those seeking shelter. Communities and regions vary in their capacity to establish, operate and maintain community-based and crisis shelters where homeless individuals or survivors of domestic violence may otherwise find assistance. According to Inuit Tuttarvingat, 11 shelters were identified within the 3 IPY survey regions – 7 in Nunavut and 2 each in the Nunatsiavut region and the IRC (25). According to a recent report on Nunavut Housing, Statistics Canada estimates that 8% of Nunavut dwellings had temporary residents who did not have a home elsewhere (26). The Statistics Canada survey differed from the Inuit Health Survey in that it covered both Inuit and non-Inuit dwellings. By comparison, the present study indirectly suggests that Inuit households have a higher prevalence of providing shelter to the homeless than non-Inuit households in Nunavut. In addition to the high prevalence of households providing temporary shelter to homeless visitors, household crowding is particularly prevalent in Nunavut, where nearly a third of homes were considered crowded. Regardless of geographic region, however, homes with children had a greater prevalence of household crowding than homes without children. In the Statistics Canada
assessment of Nunavut housing, a similar prevalence of crowded homes was identified at 35% (24). Household crowding is suggested to be a common issue throughout the circumpolar Arctic. A Greenlandic study reported that the median number of rooms in a household was 4, and that the median number of persons per room was 1.5, suggesting that household crowding is also a public health concern in Greenland (13). On the other hand, a comparison between data from the current study and the 2006 Canadian Census suggests that Inuit residing in the Canadian Arctic have a greater prevalence of household crowding (25.1%) compared to Aboriginal homes (11%) and non-Aboriginal Canadian homes (3%) (27). While the Canadian Mortgage and Housing Corporation (CMHC) does not present information categorized by Aboriginal status in their reports, approximately 85% of the Nunavut population is Inuit. CMHC reports that of all jurisdictions in Canada, Nunavut housing indicators score lowest; for example, only 52% of Nunavut housing was considered “acceptable” (a composite indicator including crowding, disrepair and affordability) – far lower than any provincial or territorial jurisdiction in Canada (28).

Mental health is affected by crowding, with studies showing that individuals living in chronically crowded conditions feel angry more often, as was reported by Tester (29) and others (10). Crowding evidently influences social relations, as well, with Fuller et al. finding that crowded housing contributed to psychological stress, unhappiness, irritability and suicidal thoughts (10). These outcomes lead to questions about environmental organization, personal safety and coping strategies to deal with overcrowding in the Arctic context. Also, the Arctic presents restraints to prolonged outdoor activities, with greater consequences for psychosocial and health effects associated with residence in crowded homes. Housing infrastructure development is a long-term goal supported by federal and local governments, but construction takes time; learning to cope with crowded conditions is a more immediate actionable goal that warrants further study from an Indigenous perspective within the public health, social work and health promotion fields. The level of violence against women, rates of suicide by Inuit youth and health disparities between Inuit and other populations are all high, representing disturbing and widespread underlying determinants (6,30–32) that affect overall personal and community health.

Particular concerns arise regarding the tendency of crowded homes to contribute to feelings of anger, which may reduce physical safety and mental well-being. As well, crowded homes may increase the potential for food insecurity and opportunities for infectious disease transmission – especially among children, who are susceptible hosts, and in situations of low levels of household ventilation (11–13).

In addition to household crowding, a large percentage of homes across the North are in need of major repairs. In analyses of the Aboriginal Population Survey, thriving health was related to not having a home in need of major repairs (21), indicating the importance of adequate housing and economic pressures on health. While we identified that 40.4% of homes were in need of major repairs, the same question identified 23% of Aboriginal homes and 7% of non-Aboriginal Canadian homes to be in need of major repairs based upon the 2006 Canadian Census data (27).

Housing strategies that suit both market-driven areas like the Nunatsiavut region and public housing areas in other regions, and that address risk factors of homelessness, will require specific approaches. Reducing the number of
homes in need of repairs is shown to positively influence conditions that lead to thriving Indigenous health and narrower health disparities between Aboriginal and non-Aboriginal Canadian populations (2,4,21).

The results of the Nunavut Inuit Child Health Survey of preschoolers identified a similar prevalence of household crowding and homes in need of major repairs (33–35). Further, household crowding was associated with anemia among the preschoolers due to causes other than iron deficiency; this could possibly reflect greater infection rates among children from crowded homes, given that in acute infection, inflammation reduces erythrocyte half-life and blocks iron export proteins (35). The findings highlight the many ways in which poor living conditions may have an impact on population health.

**Limitations**

A limitation of this study is that household composition was not ascertained for all households included in the survey. We noted that during the interview process, some respondents seemed reluctant to report upon the number and ages of household members; a few participants shared their concern that the information would be reported to housing authorities, who have regulations against over-occupancy. Thus, our estimates of household crowding and providing shelter to the homeless may underestimate the true prevalence of these characteristics in the study population.

Another limitation is that we didn’t have adequate statistical power to evaluate differences in all housing characteristics by whether the household had children or not, as the majority of households had children. Another limitation is the extent of missing data on the duration of stay for homeless visitors among those respondents who reported providing shelter to the homeless, where 17% of those providing shelter did not report the length of stay. Further, for characteristics involving a small percentage of homes, we had insufficient power to detect differences in the prevalence of characteristics between regions.

A further limitation is that questions about having a home in need of major repair and with mould may have resulted in confusion among respondents; they could have indicated a problem with both, only mould or only major repairs. We cannot rule out the possibility that respondents may have said yes to the question about having a house “in need of major repairs and with mould” when in effect they may have interpreted the response item as “either in need of major repairs or with mould.” The subjective question item on major repairs and mould used in the current study, however, came from standard questionnaires used by Statistics Canada (including the Aboriginal Peoples’ Survey), and thereby the results should be comparable to other studies from these regions. Finally, authors should interpret the results with caution as we did not directly assess housing conditions and did not define the term “homeless.”

**Concluding remarks**

Rapid social changes are problematic for Inuit society despite gains in self-governance through land claim settlements. Modern housing for Inuit represents a significant social change, and housing models and policies as well as inadequate housing can be seen to influence the relationships of people to their environment, which in turn can influence a population’s health and well-being (10–11,13–15,31–32,34–36).

Housing authorities in the various jurisdictions, and the federal government and their housing initiatives, are responsible for taking the
lead in improving housing. For example, in 2008 the Nunavut Housing Corporation was allocated $200 million CAD from the federal government to construct 725 housing units, while an additional $100 million was contributed towards the building of 285 additional housing units in Nunavut. This much-needed funding was a welcome contribution towards improving the housing shortage in the Arctic (37). Other investments in housing in Nunavut have come from Canada’s Economic Action Plan to build new homes or renovate existing homes, as well as from program dollars to assist elderly people and persons with disabilities. (38) However, cost-sharing initiatives can be problematic for Inuit regions where few funds are generated from within the territories. In addition, estimates for maintenance and repairs for the public housing stock were found to be less than thorough, and in 2008 management agreed to put improved monitoring systems into practice (39). In addition, Nunavut Housing Corporation’s community partners face implementation challenges and a high turnover of staff that impact the public housing system in the territory; and, according to an auditor’s review of the Nunavut Housing Trust, there have been misspending and mismanagement problems that threaten the Nunavut Housing Corporation’s ability to effectively improve the housing situation in Nunavut (40–41).

Given that solutions take time to be put into place, immediate short-term solutions are needed, such as providing shelter for homeless individuals and particularly for those suffering from domestic violence. CMHC outlined examples of the best practices regarding programs and services addressing homelessness in Canada, but while these can serve as models (42), financial support for the development, maintenance and operation of shelters in Inuit communities is sorely needed.

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Conflicts of interest
The authors have no conflicts of interest to declare.

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Appendix 1. Question items used to assess housing characteristics.

1. Is your home (choose one of the following): public housing; private housing; government housing; other; don’t know; no response.
2. How many bedrooms are in your house? _____ bedroom(s). (Note: all homes had a kitchen and living room).
3. Does your home have a problem with mould or is it in need of major repairs (for example, new roof, plumbing repairs, structural repairs)? Response options: mould; major repairs; both; neither; don’t know; no response.
4. In the past 12 months, have you had homeless persons staying with you in your home? Response options: yes; no; don’t know; no response.
5. If yes, how many? _____# of people.
6. If yes, in the past 12 months, how often do you think they stayed with you on average? Please circle whether days, weeks or months:____# days / weeks / months; don’t know; no response.