

The social determinants of healthy ageing in the Canadian Arctic

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ABSTRACT

A better knowledge of the social determinants of health (SDH) promoting healthy ageing in Inuit communities is needed to adapt health and social policies and programs. This study aims to identify SDH associated with healthy ageing. Using the 2006 Aboriginal Peoples Survey (n = 850 Inuit aged ≥50 years), we created a holistic indicator including multiple dimensions of health and identified three groups of participants: those in 1) good 2) intermediate and 3) poor health. Sex and age-adjusted multinomial regression models were applied to assess the associations between this indicator and SDH measured at the individual, household and community scales. In comparison to APS respondents in the “Poor health” profile, those in the “Good health” profile were more likely to have a higher individual income, to participate in social activities, and to have stronger family ties in the community; those in the “Intermediate health” profile were less likely to be in a relationship, more likely to live in better housing conditions, and in better-off communities. Results indicate that SDH associated with the “Good health” profile related more to social relationships and participation, those associated with the “Intermediate health” profile related more to economic and material conditions.

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Introduction

While health inequalities between Inuit and the non-Indigenous Canadian population persist in time [1,2], the gap is smaller in older age groups. In a study describing health inequalities between age groups in the general and Inuit populations in Canada, the prevalence of one's rating their health as very good or excellent was 15% to 17% lower for Inuit aged 25 and 44 years compared to non-Inuit in the same age group; this gap was reduced to 10% for those aged 45 years and older [3]. Reduction in health disparities in later years could be explained through health-promoting factors beneficial to elders health, e.g. selected social determinants of health (SDH) [4,5]. SDH are the social conditions affecting individuals' health such as socio-economic conditions, health services, employment and education opportunities, housing conditions, social exclusion [6]. Information relating the SDH to health for Inuit elders is needed to inform policies that support and promote healthy ageing across Inuit Nunangat, the Inuit homeland in Canada [7]. Toward this end, the aim of this article is to identify the SDH promoting healthy ageing across Inuit Nunangat.

Healthy ageing in non-indigenous and Inuit populations

Healthy ageing is a concept used to conceptualise positive dimensions of health in later years. In non-Indigenous populations, the concept generally encompasses physical, social and emotional dimensions [8,9]. In Inuit populations, healthy ageing is more specifically defined by good physical health, emotional well-being, spirituality, strong kin connections and social networks, and being engaged in the community [10–13]. Health is interconnected with links to the family, to others in the community and with the land [10,13–15]. As people age, the definition of health changes: for healthy ageing, Inuit describe the growing importance of physical health and relationships with younger people [12,16]. Inuit elders mostly define physical health by accepting to live with activity limitations and chronic diseases. Being around children and adopting healthy behaviours such as keeping physically active [13], eating country food, and avoiding alcohol and drug consumption are important components of healthy ageing [10–12].

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Social determinants of healthy ageing in non-Inuit population

The literature on healthy ageing in non-Indigenous population defines the social determinants of healthy ageing across different scales: individual, household and community or neighbourhood [17–19]. At the individual scale, a person's demographic and socio-economic status (SES) has been shown to be a strong predictor of health [19–21]. Characteristics such as engaging in health-promoting behaviours (not smoking, being physically active), being socially active, and having a strong social support are important health-protective factors [19,22,23]. At the household level, protective factors include living in a house in good condition and with safety features, such as bathroom ramps [24,25]. Psychosocial dimensions of the house, such as satisfaction, positive social interactions and control are also associated with better health for the elderly [26]. Not living alone and having family members living nearby also help people age healthy as it by providing social support and security in case of emergency [25]. The built environment of communities, accessibility of services and socio-economic conditions also have an influence on elderly health [17]. Living in more affluent communities, with good access to health services and food stores, and low crime rates have also been identified as supporting healthy ageing [4,5,27,28].

Social determinants of Inuit health

In the Arctic, Inuit moved from a semi-nomadic way of life to settled communities with western-type health services, education systems, employment opportunities and housing conditions [29,30]. The settlement in communities, the extension of government power and decision-making to the north and the introduction of a market-based economy have changed the conditions in which peoples live, i.e. the SDH.

Nowadays, Inuit models of SDH include the impacts of colonialism and racism, connection to the land and environmental stewardship, as well as housing and community conditions [31,32]. Participating in land-based activities is central to Inuit health [31] as it promotes cultural continuity and social support, which improve mental and emotional health. Cultural continuity is a well-known determinant of Indigenous and Inuit health, mostly associated with good mental health [33]. Traditional practices rooted in the natural environment also promote health indirectly by increasing social capital, a strong sense of belonging to the land and participation in meaningful social activities. At the household level, overcrowding is

a major issue: 52% of the population in Inuit Nunangat live in overcrowded houses [1]. Living in an overcrowded dwelling is associated with poorer mental well-being among Greenlanders and with higher levels of chronic stress among Nunavimmiut (Inuit living in Nunavik) [34,35]. At the community level, availability of health services is defined as an important SDH of Inuit health [31]. In Greenland, there was an inverse U-shape association between community socio-economic conditions and blood pressure, where those who lived in the most and least affluent communities had lower blood pressure [36].

Social determinants of healthy ageing for Inuit

Inuit models of SDH define SDH across all ages; they do not identify SDH specifically relevant for older adults [31,37]. However, the transformations of SDH in the last decades have changed family dynamics and autonomy [38,39], influencing the living conditions of elderly Inuit. Demographic shifts following settlement and attendant structural, social and economic change have resulted in a growing number of nuclear families and of grandparents raising their grandchildren [40,41], while traditional practices such as intergenerational customary adoption have remained remarkably consistent over time. While spending time with grandchildren is positive for healthy ageing, raising grandchildren can also create financial and psychological stress [41]. As the SDH related to healthy ageing seem to differ from younger populations, it is necessary to explore the specificities of Inuit models of SDH for healthy ageing.

Objective of the study

Using an exploratory design and data from a large national cross-sectional survey, the objective of this study is to identify the SDH measured at the individual, household and community scales associated with healthy ageing in Inuit Nunangat.

Methods

Description of the survey and measures

We used data from Statistics Canada's 2006 Aboriginal People Survey (APS 2006) [42]. The APS is a post-census survey conducted every five years by Statistics Canada. The survey sample is selected from participants aged six years and older living in private dwellings who self-reported an aboriginal identity and/or ancestry at the 2006 census, i.e. First Nations, Inuit and/or Métis. The sampling frame of the APS excludes people living in First Nations communities

(reserves) [43]. The total sample represents 48,921 Indigenous Peoples.

For the purpose of this study, we limited the data to Inuit Nunangat, the Inuit homeland in northern Canada encompassing four regions: Inuvialuit, Nunavut, Nunavik and Nunatsiavut. In Inuit Nunangat, APS data were collected through face-to-face interviews (interviews were administered by phone in other regions). The 2006 APS includes a core questionnaire for children, a core questionnaire for adults aged 15 years and older and two supplements, including an “Arctic” supplement for Inuit Nunangat. The 2006 Arctic supplement included a broader coverage of the SDH including measures of personal well-being, social participation and community safety. Such measures were not included in the later APS cycles of 2012 and 2017. Over 6000 Inuit across Inuit Nunangat responded to the survey, for a response rate of 87.1%. For the current analyses, the study sample was restricted to the 850 Inuit respondents aged 50 years and older and living in Inuit Nunangat. The age of 50 was defined as a transitioning age between middle age and older Inuit adults [12,16].

Holistic measure of health

In previous work, we created a holistic indicator of healthy ageing for Inuit elders. More details on the creation of the indicator are available elsewhere [12], but are summarised here. In 2016, two workshops were held in Nunavik to map the conceptualisations of health and well-being for Nunavimmiut’s (Inuit living in Nunavik) and to identify supportive local conditions for health and well-being. For older Inuit, thematic analysis indicated that health was defined by eight concepts: general health balance, mental health, spirituality, not experiencing many activity limitations, being loved and having positive relationships, speaking Inuktitut, and being free of addiction.

To operationalise this multidimensional model of health, we applied latent class analysis (LCA) to data from the APS 2006 to create a typology of health profiles for Inuit elders. Six variables from the APS allowed operationalising the definition of health from the workshop: self-rated health; psychological distress measured by the Mental Health Inventory 5-item scale; activity limitations; frequency of alcohol consumption; social support, combining four measures of availability of love and affection, and having positive relationships; speaking an indigenous language, i.e. Inuktitut¹ spoken throughout Inuit Nunangat. No measure of spirituality was available in the 2006 APS. Using best-fit statistics for the latent class models, survey respondents were categorised into one of three health profiles.

In the “*Good health*” profile, Inuit elders reported positive outcomes for most indicators: most reported their health and their mental health as very good, never experiencing activity limitations, high social support, never drinking alcohol and speaking Inuktitut very well. In the “*Intermediate health*” profile, Inuit elders reported mixed answers to the six health measures. Most reported their health as good (but not very good), experiencing activity limitations sometimes or never, and poor mental health. Compared to the first category, a higher proportion of respondents grouped in the *Intermediate health* profile reported having low social support and not speaking Inuktitut, and most reported drinking alcohol at least once a month. The “*Poor health*” profile grouped older Inuit mostly reporting their general health and mental health as poor, and often experiencing activity limitations. However, most respondents grouped in this profile reported speaking Inuktitut very well, never drinking alcohol and high social support, although in a proportion lower than for those with a “*Good health*” profile. The three-category health profile is used as the dependent variable in statistical analyses, with the “*Poor health*” profile modelled as the reference category in respect to the healthy ageing perspective of the article.

Social determinants of health

SDH at individual, household and community scales were selected based on the scientific literature [4,5,19,25,31,37] and on the availability of measures in the 2006 APS. At the individual level, age and sex were used as covariates in all models. Marital status was dichotomised to contrast those in a relationship (married or in common law) vs. those who are not (single, separated, divorced and widowed). Two categories of individual income were created, contrasting those with a personal income below \$20,000 vs. ≥ \$20,000. Respondents reported the frequency of their participation to different activities in the community: volunteering at a community event; working at a community event; attending local committees or board meeting; attending a public meeting; and participating or attending local sports events. Answers to these questions were combined to create a categorical measure of social participation: having participated in none, one or two, or three or more types of social activities in the last year. A dichotomous measure of land-based activities was created grouping people who hunted, fished, trapped or picked berries in the last 12 months vs. those who did not. To measure consumption of country food, participants were asked: “Of the total amount of meat and fish eaten in your household during the year ending December 31st, 2005, how much of this total

¹Inuktitut is a generic term used in Nunavut for the regional variations and appellations of the Inuit language.

was country food?" Responses to this question were dichotomised into none or less than half, vs. about half or more than half.

At the household level, we used an indicator of housing adequacy, i.e. whether respondents' dwelling needed major vs. minor or no repairs. Household overcrowding was also considered, contrasting participants in dwellings with more than one person per room vs. those who lived in dwellings with one person or less per room.

Community-level measures available in the 2006 APS related to respondents' perception of the social environment of their community. Participants reported whether they felt safe when walking in the neighbourhood at night. Answers to this question were dichotomised to contrast those reporting feeling very and reasonably safe vs. those feeling somewhat or very unsafe, or reporting never walking alone. Strength of family ties in the community was dichotomised into those reporting having very weak, weak or moderate family ties, vs. those reporting strong or very strong ties in the community.

To assess the socio-economic context of communities, we used the *Community Well-Being* (CWB) Index from Aboriginal Affairs and Northern Development Canada [44]. The 2006 CWB index is calculated using socio-economic information derived from the 2006 Canadian Census with the aim of comparing, over time, the socio-economic well-being across First Nations and Inuit communities with well-being in non-Indigenous communities. The CWB index is calculated based on different indicators related to income, education, housing conditions and labour force activity, where communities are defined by the boundaries of census subdivisions. For this study, the index was categorised into tertiles of lower, intermediate and higher socio-economic well-being. Data were merged to the 2006 APS using the community identifier (census subdivision code).

Statistical analyses

We conducted weighted descriptive analyses of the overall sample and the distribution of the SDH across the categories of the holistic health indicator. Using multivariate multinomial regressions, we examined the associations between the SDH measured at individual, household and community scales and the categorical holistic health indicator. All models were adjusted for age and sex and were estimated using bootstrap weights that Statistics Canada provided to account for the complex sampling frame of the survey (the person-weight used in the APS includes both individual and community respective weights). Analyses were conducted using Stata software version 15 [45].

Data analyses were conducted at Statistics Canada Research Data Centre at Laval University, Quebec City. Analyses of data and dissemination of results from the APS follow specific confidentiality rules. All descriptive results were calculated with weighted frequencies rounded to 50. It is not possible to display categories with too few participants; this prevented us from reporting the prevalence of missing data for some variables. Coefficients of variation were calculated to measure the chances of deviation from the target population due to sampling errors between the distribution of sample and the target population. Whereas all estimates could be disseminated according to Statistics Canada's confidentiality guidelines, those with coefficients of variation between 16.50 and 33.33, identified in the tables with the letter *E* in superscript, must be carefully interpreted, as these estimates may not reflect the target population well.

Results

Descriptive statistics of the whole sample

Descriptive statistics for the whole sample are presented in the left part of Table 1. The estimates are calculated with weighted frequencies representing a population of 4,450 Inuit aged ≥ 50 years in Inuit Nunangat. In the sample, there was about one-third of older Inuit who were grouped in each of the *Poor*, *Intermediate* and *Good health* profile (this distribution was randomly achieved through latent class analyses). The sample comprised slightly more men than women; respondents were aged 61 years on average. Most participants reported having strong family ties and feeling safe when walking at night. About three quarters of participants lived in a house that was not overcrowded, and about two-thirds in a house requiring only minor or no repairs. Most participants were in a relationship and had participated in land-based activities in the previous year, and to three or more types of social activities in the last 12 months. Most participants reported eating more country food meat than store-bought meat. There was a roughly equal distribution of participants having an individual income $< \$20,000$ or $\geq \$20,000$.

Descriptive statistics of the SDH across the Poor, Intermediate, and Good health profiles

The prevalence of the SDH for each of the three health profiles is presented in the right part of Table 1. Participants in the "Poor health" profile were the oldest,

Table 1. Descriptive statistics of the sample of Inuit aged 50 years and older and of the SDH across the three health profiles, from the 2006 Aboriginal People Survey, weighted sample n = 4450.

Measures	Total sample n(%)	Health profiles of Inuit elders		
		Poor health %	Intermediate health %	Good health %
Health profiles of Inuit elders				
<i>Poor health</i>	1500 (33.3)			
<i>Intermediate health</i>	1350 (30.0)			
<i>Good health</i>	1650 (36.7)			
Sex				
<i>Men</i>	2300 (51.7)	44.8	50	57.6
<i>Women</i>	2150 (48.3)	55.2	50	42.4
Age (mean(SD))	61 (0.35)	65	58	60
SDH at the community level				
Strenth of family ties in the community				
<i>Weak/moderate</i>	1050 (23.6)	28.6	28.0 ^E	15.6
<i>Strong</i>	3250 (73.0)	71.4	72	84.4
<i>Missing</i>	150 (3.4)			
Feeling of safety when walking in the community				
<i>Unsafe</i>	1050 (23.6)	33.3	20.0 ^E	19.4 ^E
<i>Safe</i>	3100 (69.7)	66.7	80	80.6
<i>Missing</i>	300 (6.7)			
Community socioeconomic tertile				
<i>Low</i>	1550 (34.8)	41.4	22.2	39.4
<i>Middle</i>	1450 (32.6)	31	40.7	27.3
<i>High</i>	1450 (32.6)	27.6	37	33.3
SDH at the household level				
Lived in an overcrowded household				
<i>Yes</i>	1050 (23.6)	26.7	15.4 ^E	27.3
<i>No</i>	3400 (76.4)	73.3	84.6	72.7
Repairs needed in the house				
<i>Major repairs</i>	1300 (29.2)	30.0	26.9	33.3
<i>No/Minor repairs</i>	3150 (70.8)	70.0	73.1	66.7
SDH at the individual level				
Individual income				
<i><\$20,000</i>	2300 (51.7)	69	48.1	40.6
<i>≥\$20,000</i>	2100 (47.2)	31	51.9	59.4
<i>Missing</i>	50 (1.1)			
Marital status				
<i>Alone</i>	1900 (42.7)	45.2	48	36.4
<i>In a relationship</i>	2550 (57.3)	54.8	52	63.6
% Of country food eaten/total meat				
<i><50%</i>	850 (18.9)	21.4 ^E	25.0 ^E	16.1 ^E
<i>≥50%</i>	3300 (73.3)	78.6	75	83.9
<i>Missing</i>	350 (7.8)			
Participated in on-the-land activities				
<i>No</i>	650 (14.6)	24.1	7.7 ^E	12.1 ^E
<i>Yes</i>	3800 (85.4)	75.9	92.3	87.9
Participated in social activities				
<i>0</i>	1000 (22.5)	33.3	23.1	15.6
<i>1 or 2</i>	1200 (27.0)	29.6	30.8	25
<i>3 or more</i>	2050 (46.1)	37	46.2	59.4
<i>Missing</i>	200 (4.5)			

E: The estimate must be used carefully as it is associated with a high level of error.

and those in the “*Intermediate health*” profile the youngest. In the “*Good health*” profile, there were more men than women. More than three quarters of respondents reported having strong family ties and feeling safe in the community, had a consumption of country food superior or equal to 50% of the total meat, and had participated in land-based activities. About two-third lived in a house that was not overcrowded and needed no or minor repairs, had an individual income superior or equal to \$20,000, were in a relationship and had participated in three or more social activities. One-third lived in a community with a high socio-economic level.

In the “*Intermediate health*” profile, there was an equal representation of men and women. Most of the respondents felt safe when walking in the community at night, lived in a household that was not overcrowded, had participated in land-based activities; reported having strong family ties in the community, living in a house needing no or minor repairs, and had a consumption of country food superior or equal to 50% of the total meat. About half of the respondents had an income superior or equal to \$20,000, were in a relationship and had participated in three or more social activities in the past 12 months. More than one

third lived in a community with a high socio-economic level.

In the "Poor health" profile, there were less men than women. More than two-third reported having strong family ties and feeling safe when walking at night in the community, lived in a household that was not overcrowded and needed no or minor repairs, had a consumption of country food superior or equal to 50% of the total meat, and had participated in land-based activities. About half of the respondents were in a relationship and about one-third had participated in three or more social activities. Less than one-third had an individual income superior or equal to \$20,000, and lived in a community with a high socio-economic level.

Associations between the holistic health indicator and theSDH

Associations between the holistic health and each SDH were tested in separate multinomial regressions adjusting for age and sex, using "Poor health" as the reference group

(Table 2). Associations between the health profiles an age and sex were similar across models (results not tabulated). Participants in the "Intermediate" and "Good health" profiles were more likely to be younger, with relative risk ratios (RRR) between 0.90 and 0.94 (p-value <0.001 for all models). Participants in the "Good health" profile were less likely to be women than in the "Poor health" profile (RRR between 0.50 and 0.60, p-value between <0.001 and 0.034). For all models, there was no difference for sex between the intermediate and the "Poor health" profile.

After adjusting on age and sex, several associations between the holistic health indicator and SDH were not statistically significant at $p < 0.05$: feeling safe when walking in the neighbourhood at night, country food consumption and repairs needed in the house. All other SDH measures were associated with at least one health profile.

Respondents in the "Intermediate health" profile were more likely than those in the "Poor health" profile to live in a community with a higher socio-economic level, in a house that was not overcrowded, and to have participated in land-based activities. Participants with a "Good

Table 2. Multinomial regressions testing the association between the holistic indicator and each SDH measure, APS 2006 (weighted sample = 4450)*.

	Intermediate health		Good health	
	RRR (95%CI)	p value	RRR (95%CI)	p value
SDH at the community level				
Feeling of safety when walking				
<i>Unsafe</i>	ref		ref	
<i>Safe</i>	1.37 (0.84;2.23)	0.205	1.41 (0.93;2.14)	0.108
Strength of family ties in the community				
<i>Weak</i>	ref		ref	
<i>Strong</i>	1.32 (0.76;2.30)	0.321	2.79 (1.77;4.39)	<0.001
Community socioeconomic lower tertile				
<i>Lower tertile</i>	ref		ref	
<i>Middle tertile</i>	2.75 (1.63;4.66)	<0.001	1.08 (0.70;1.66)	0.742
<i>Higher tertile</i>	2.65 (1.61;4.35)	<0.001	1.34 (0.87;2.07)	0.190
SDH at the household level				
Household crowding				
<i>Crowded</i>	ref		ref	
<i>Not crowded</i>	2.29 (1.44;3.63)	<0.001	1.07 (0.73;1.58)	0.713
Repairs needed in the house				
<i>Major</i>	ref		ref	
<i>No/minor</i>	1.47 (0.94;2.30)	0.090	1.06 (0.69;1.64)	0.777
SDH at the individual level				
Individual income				
<i><\$20,000</i>	ref		ref	
<i>≥\$20,000</i>	1.49 (0.97;2.29)	0.069	2.14 (1.44;3.18)	<0.001
Marital status				
<i>Alone</i>	ref		ref	
<i>In a relationship</i>	0.49 (0.32;0.74)	0.001	0.98 (0.69;1.40)	0.933
% of country food eaten/total meat				
<i><50%</i>	ref		ref	
<i>≥50%</i>	1.01 (0.61;1.67)	0.985	1.45 (0.87;2.40)	0.155
Participation in land-based activities				
<i>No</i>	ref		ref	
<i>Yes</i>	2.28 (1.30;4.00)	0.004	1.79 (1.05;3.06)	0.033
Participation in social activities				
<i>None</i>	ref		ref	
<i>1 or 2</i>	1.21 (0.72;2.04)	0.474	1.41 (0.85;2.35)	0.180
<i>3 or more</i>	1.27 (0.74;2.16)	0.381	2.37 (1.47;3.81)	<0.001

*Separate regressions for each SDH measure, adjusted for age and sex (estimates reported in the text).

health” profile were more likely than those in the “*Poor health*” profile to report strong family ties in the community, to have an income \geq \$20,000, and to have participated in land-based and social activities.

Discussion

In this study, we tested the associations between a holistic indicator of health and SDH across individual, household and community scales for Inuit aged 50 years and older. We used a multidimensional indicator corresponding to Inuit’s definition of healthy ageing to represent the complexity of ageing profiles [10–12]. Our results indicated that associations between SDH and healthy ageing differed by health profiles.

SDH associated with the “*Intermediate health*” profile mostly related to factors external to the individuals, i.e. to SDH related to economic and material circumstances: living in good quality housing and in a community with a higher socio-economic level. Overcrowding was only associated with the “*Intermediate health*” profile. In Inuit populations, housing overcrowding has been associated with poorer respiratory health, poorer well-being and chronic stress for all-age population [34,35,46]. While not statistically significant at the 0.05 threshold, participants in this group were also more likely to live in adequate housing, i.e. in houses only needing minor repairs or none (p -value 0.090). Living in a house in good conditions and with adaptations to protect elders mobility is also associated with physical health in general elderly population [24,25]. We hypothesise that housing conditions are mostly important for physical and mental dimensions of Inuit health, whereas other SDH are associated with a good holistic health.

Living in a community with a more favorable socio-economic conditions was associated with the “*Intermediate health*” profile only, i.e. who mostly had a good physical health. It may suggest that, for this population, community socio-economic conditions are mostly associated with physical dimensions of healthy ageing. In Greenland, community socio-economic level was also associated with blood pressure, one aspect of physical health: participants who lived in the most and least affluent communities presented with lower systolic and diastolic blood pressure [36]. Relationships between health and community socio-economic level were different in our results as we used a categorical health variable. In general population, living in a community with poorer socio-economic conditions is associated with greater loss of physical function and disability, poorer self-reported health, and increased incidence of degenerative disease and cardiovascular mortality [4,5]. Associations between community socio-economic

level and mental health outcomes are, however, less consistent [5].

Our results support these findings and suggest that external factors such as objective housing conditions and community socio-economic levels could be more strongly associated with physical health, rather than with social and mental dimensions of health. Studies conducted with younger adult populations suggest that neighbourhood disorder and social capital could be mediating or confounding factors in the relationships between community socio-economic status and mental health [47], which we could not test in this study.

In comparison to the “*Intermediate health*” profile, SDH indicators associated with the “*Good health*” profile related more to social connectedness: strength of family ties and participation to social activities in the community. In non-Indigenous population, being in a relationship is a well-known protective factor against mortality, psychological distress, activity limitations, poorer health-related behaviours such as physical inactivity, cigarette and alcohol consumption [21,48]. Yet in our results, marital status was only associated with participants categorised in the “*Intermediate health*” profile. A deeper understanding of the mechanisms linking the SDH to health, defined holistically, is needed to understand how SDH related to external factors or social connections can promote healthy ageing in Inuit communities. However, our results suggest that SDH related to social connections and relationships might be more important for psychosocial aspects of health, whereas material living conditions might relate more to physical dimensions of health.

Participation in land-based activity was the only SDH associated with both “*Intermediate*” and “*Good health*” profiles. Participation in land-based activities is an important determinant of Inuit health as it promotes cultural continuity, physical activity and provides country food [31,49]. Elderly Inuit describe the importance of sharing skills and knowledge related to land-based activities and survival on the land [10,11]. Our results also suggest that it is an important protective factor for healthy ageing. In the 2006 APS, participation in land-based activities was measured by hunting, fishing, trapping and picking berries; social connections and intergenerational exchanges related to land-based activities were not measured. It would be interesting to extend the question about the nature of land-based activity participation to understand its importance for healthy ageing in Inuit communities in future waves of the APS.

The experience of healthy ageing is multidimensional. Synthesising several health dimensions in a holistic indicator was useful to identify SDH associated with different health profiles. Holistic health indicators enable the measurement of the multiple dimensions of healthy ageing

simultaneously and better capture healthy ageing experience for older Inuit.

The use of secondary data in our study has limitations. The Arctic supplement of the 2006 APS was developed in collaboration with several Inuit organizations. However, several SDH measures of Inuit health were not validated or are missing in the survey. For example, the indicator of the proportion of country meat eaten is not a measure of access and consumption of country food, nor of food security, which is important SDH for Inuit [31,32]. Indicators measuring the availability of health services in communities were not available. Measures of neighbourhood environment are mostly developed in urban contexts, questioning their reliability in rural and Indigenous communities [50]. Thus, the measure of feeling safe when walking in the neighbourhood at night used in this study may be an inadequate proxy of safety in Inuit communities. The use of inadequate measures of SDH can lead to an underestimation of their importance for indigenous health and has been criticised [51,52]. For example, the inclusion of environmental stewardship and access, and homelessness measures in the APS could have extended the understanding of the importance of these SDH for healthy ageing in this study.

The use of data from the 2006 wave of the APS might limit some of the interpretations for Inuit aged 50 years and older today. We decided not to use more recent waves of the APS, since several of the variables of interest were missing from the later cycles such as participation in social activities and community safety. Time trends data of the CWB show little change in Inuit communities between 2006 and 2016 [44]. Over the same period, there was little variation in individual median income, and in the proportion of houses needing major repairs, of participation in land-based activities and of people reporting speaking Inuktitut as main language at home [1,53]. The slow changes in some of the living conditions examined in this paper suggest that 2006 data are still relevant today.

The elderly Inuit population is not homogenous. Inuit elders experience different health and social challenges which lead to contrasted health profiles. Universal health and social interventions aiming to promote healthy ageing are unlikely to answer the needs of this heterogeneous population. Our findings indicate that interventions on economic and material circumstances could be more relevant to address physical dimensions of healthy ageing, while social interventions can promote healthy ageing more globally. As

participants of 50 years and older in 2006 are now the retired segment of the Inuit population, adapting health and social policies to these healthy ageing profiles could improve their adequacy to specific population segments and promote a better healthy ageing.

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