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Research

Exploring Ethno-Cultural Variations in Self-Ratings and Determinants of Healthy Aging among Canadians: A Population-Based Study Using Canadian Longitudinal Study on Aging (CLSA) Data

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Abstract

Individuals from various ethno-cultural backgrounds have different health-related practices, beliefs, lifestyles, and levels of social engagement, which may promote or impede healthy aging. We examined ethno-cultural variations in self-ratings of healthy aging and its determinants among Canadians. We analyzed the cross-sectional baseline data from the Canadian Longitudinal Study on Aging (CLSA) Tracking Cohort. Participants were classified into 13 ethno-cultural groups. Healthy aging was measured based on a closed-ended question. About 90% of Canadian adults 45-85 years of age reported that they are aging healthy, and these ratings did not differ significantly by ethno-cultural background. Age and income were significantly associated with ratings of healthy aging for all ethno-cultural groups. The determinants of healthy aging varied by respondents' ethno-cultural background.

Keywords: Canadian Longitudinal Study on Aging (CLSA); Determinants; Ethno-cultural background; Healthy aging

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Introduction

In 2016, about 6 million older adults (i.e., those aged 65 years and older) were living in Canada. It is projected that by year 2036, the number of older adults in Canada will be over 10 million [1]. With the aging of the Canadian population, supporting healthy aging has become one of Canada's strategic priorities [2]. Not only is the population of Canada aging, it is also ethno-culturally diverse. Currently, over 200 ethnic origins are represented in Canada, with 13 of these ethnic groups consisting of over 1 million people each. If the existing immigration rates and policies remain, the population of Canada is expected to become even more diverse in terms of its ethno-cultural background, with 28% of the population being foreign-born by 2031 [3].

The World Health Organization (WHO) defines healthy aging as "… the process of developing and maintaining the functional ability that enables well-being in older age" [4]. The terms healthy aging, successful aging [5], active aging [6], positive aging [7], and productive aging [8] are often used interchangeably to refer to what it means to age well. Commitment to action on healthy aging in every country, and improving measurement, monitoring and research on healthy aging are some of the global strategic objectives [9].

The limited available evidence based on data from the large-scale quantitative studies suggests that individuals' ethno-cultural background is an important factor affecting the health and aging experience. For example, Menec, Shooshtari, and Lambert [10] found significant ethnic variations in self-ratings of health based on data from two waves of the Aging in Manitoba (AIM) Study. Havens and Chappell [11] examined the triple-jeopardy concept of age, sex, and ethnicity in the elderly community-living population using data from the AIM Study. Triple jeopardy was evident in mental health-very elderly women (i.e., 85+ years) of the Polish/Russian/Ukrainian ethnic group reported significantly worse mental health outcomes than did the comparison groups (i.e., North American, British, French, other European). Lai [12] estimated that the prevalence of depressive symptoms reported by the older Chinese adults not born in Canada was twice that of the prevalence among older adults born in Canada. Khan et al., [13] found significant differences in hospital mortality among critically ill patients of Asian, Native Indian and European descent. Together, these findings suggest that examining ethnicity is important to understanding healthy aging.

Individuals' cultural background may influence healthy aging via different pathways, by influencing the type of health practitioners (e.g., traditional healers) and services (e.g., home care, nursing home) sought out, medications (e.g., traditional medicine) prescribed and used, and individuals' health-related (e.g., tobacco and alcohol use) and care-seeking (e.g., mental health treatment or immunization) behaviours. For example, the use of traditional medicine and procedures is a common practice among some ethno-cultural groups, but the combined use of traditional and non-traditional medications can cause adverse drug reactions [14]. A study conducted in Ontario found that seniors who immigrated from Asia, South and Central America, or

Africa were less likely than the Canadian-born seniors, or immigrant seniors from the USA, Australia, or Europe to use home care services [15]. The authors suggested that the immigrant seniors from Asia, South and Central America, and Africa might be less aware of the existence of such services or that the existing home care services are not sensitive enough to the cultural needs of these groups of seniors. Individuals' ethno-cultural background also influences their social relationships and activities. Pereira, Lazarowich, and Wister [16] interviewed 100 seniors of Portuguese and Italian descent living in two types of long-term care facilities in Toronto: ethnic homogeneous and ethnic heterogeneous. The results showed that a homogenous long-term care environment increased an ethnic elderly person's involvement in social activities, which is an important determinant of health. Seniors from ethnic minority groups that are placed in long-term care facilities that were created for the dominant culture may face additional challenges due to the loss of culture including ability to communicate in their own language and the loss of community [17].

Canadian studies of healthy or successful aging have been mainly qualitative in nature and have focused on definitions and underlying themes [18-20]. Little large-scale quantitative research has been conducted to explore prevalence and determinants of healthy or successful aging at the population-level. We located only one study that used national-level data for a sample of over 25,000 Canadians aged 65+ years who participated in the Canadian Community Health Survey: Healthy Aging (CCHS-HA) in 2008-2009 [21]. These researchers estimated the prevalence of successful aging as defined by Rowe and Kahn [22], and determined the roles of sociodemographic, psychological, and lifestyle factors as related to successful aging. Prevalence of successful aging was estimated at 50.1% among those aged 50+ years, which decreased to 46.2% for those aged 55+ years, 42.0% for those aged 60+ years, and 37.2% among those aged 65+ years. Significant sex differences were not found for the prevalence of successful aging. Higher income was not associated with successful aging, but being younger, married, regular drinkers, exercisers, perceived better health, satisfied with life, and taking calcium in the past month were all associated with successful aging. Presence of disease was associated with lower prevalence of successful aging. However, levels of functioning and engagement were not.

Large-scale quantitative studies from other jurisdictions also found a number of health-related behaviours, lifestyles [23] for a comprehensive review) to be associated with healthy aging or successful aging outcomes. No Canadian studies have examined ethno-cultural variations in determinants of healthy aging. Studies from other countries, which have examined ethno-cultural variations in determinants of healthy aging, or similar concepts, have revealed inconsistent results [17,24-29]. For example, Chaves and colleagues [25] examined predictors of normal and successful aging among urban-dwelling elderly Brazilians. They found that the number of living children was a risk factor, and number of confidants and family income were protective factors for successful aging. The authors concluded that in a developing country such as Brazil, socioeconomic status and social network structure may play a more important role than biological factors such as age or parental longevity to achieve successful aging. Studies conducted in developed countries have found that health-related and biological factors are the most significant predictors of successful aging [30]. Some studies reported no ethno-cultural differences in determinants of healthy or successful aging. For example, Oswald and colleagues [31] examined the relationship between housing and healthy aging in people aged 75-89 years living alone in their own homes in five European countries. The consistent finding was that people living in more accessible homes were more independent in their daily activities and had a better sense of well-being. In summary, studies from other jurisdictions that examined ethno-cultural differences in determinants of healthy aging have revealed inconsistent results. Many of them were based on small non-representative samples of cultural groups [29] or focused on a limited number of factors that might be related to individuals' perception of their own healthy aging experience [31]. To our knowledge, an in-depth examination of both personal and environmental factors in relation to how people from various ethno-cultural backgrounds define healthy aging in Canada had not been conducted previously.

The present study aimed to address this gap in knowledge by examining ethno-cultural variations in self-ratings and determinants of healthy aging using a generalizable random sample of participants of various ethno-cultural backgrounds from the Canadian Longitudinal Study on Aging (CLSA) [32]. The two specific objectives of the present study were to examine whether (1) ethno-cultural differences in ratings of healthy aging exist; and 2) determinants of healthy aging differ by ethno-cultural background. The present study broadens our understanding of ethno-cultural differences in individuals' definitions of healthy aging and associated factors. The knowledge generated can be used to enhance the cultural competencies within the health care system and among practitioners, and help decision makers and service providers to develop new, innovative, and effective health promoting programs for seniors that are culturally sensitive. By providing programs and interventions that are health promoting while culturally sensitive and appropriate, the demands and unnecessary costs of health care and social supports can be reduced.

An enhanced understanding of what healthy aging means to middle-aged and older Canadians from various ethno-cultural backgrounds and the reasons for these differences could help determine the cultural competencies needed to enhance the capacity and ability of health care system to provide more responsive health care and social support services to Canadians from various ethno-cultural backgrounds including Indigenous populations. This in turn could result in reduced health disparities experienced by those most at-risk. These strategies could also reduce health care costs by eliminating unnecessary demands, and offering programs and services that are health promoting while culturally sensitive and appropriate, and therefore better utilized, and effective [33]. The systematic neglect of culture in health and health care is reported as the "single biggest barrier to the advancement of the highest standard of health" worldwide [14].

Methods

Data source

The present study involved a cross-sectional analysis of a sub-sample of the baseline data of the CLSA Tacking Cohort.

Study sample

The CLSA Tracking Cohort consisted of more than 21,000 Canadian men and women, representing Canadians aged 45-85 years, randomly selected from age/sex strata across the 10 Canadian provinces. Excluded from the CLSA were individuals who could not communicate in English or French, those with cognitive impairment at baseline, residents of the three territories and some remote regions, full-time members of the Canadian Armed Forces; residents of institutions at baseline, and those living on federal First Nations reserves or other

First Nations settlements in the provinces [32]. The CLSA baseline data were collected via computer-assisted telephone interviews between 2011 and 2014. To address our research objectives, data for the full CLSA Tracking Cohort with valid responses to the key questions (self-rated healthy aging, and ethno-cultural background) were analyzed. The final sample sizes for addressing our research objectives was N = 20,260 and N = 18,100.

Study measures

Self-rated healthy aging: Responses to a single question measured on a 5-point scale (from excellent to poor) were used to measure CLSA respondents' self-assessed healthy aging experience. Due to small cell sizes (8% of the CLSA Tracking Cohort rated their healthy aging "fair" and 2% rated it as "poor"), the original self-rated healthy aging variable was re-coded as a binary variable. Those with a rating of excellent, very good, or good were classified 1 = "aged healthy" and those with a rating of fair, or poor were classified as 0 = "not aged healthy." Responses of "don't know/no answer" or refusals were excluded from the analysis due to small numbers. The re-coded binary variable of self-rated healthy aging served as the outcome measure in addressing the second objective of the present study.

Ethno-cultural background: The CLSA respondents' ethno-cultural background was defined based on their responses to the question, "To which ethnic or cultural groups did your ancestors belong?" The CLSA respondents were classified into one of the following 13 ethno-cultural groups: (1) multi-cultural (not including Canada); (2) French (French, Other French origins); (3) British (English, Scottish, Irish, Welsh, Other British Isles Origins); (4) South Asian (East Indian, Pakistani, Sri Lankan, South Asian); (5) West Asian (Iranian, Afghan, Hebrew, Lebanese, Syrian, Arab origins, Other West Asian); (6) East and Southeast Asian (Chinese, Filipino, Japanese, Korean, Vietnamese, East and south east Asian origins, Asian origins, Other east and south east Asian origins); (7) African Origins (Central and West Africa, East Africa, Southern African, Egyptian, Maghrebi); (8) Indigenous (North American Indian/Metis/Inuit); (9) Latin American and Caribbean (Guyanese, Haitian, Jamaican, Trinidadian, Other Caribbean, Caribbean, Central American, Central/South/Latin American); 10) Other North American Countries (Mexican); (11) Canada (only); (12) Canada (multicultural); and (13) Any other European. A more detailed description of this derived variable is provided in Shooshtari, Menec and Tate [34].

Other study variables: The CLSA collects information regarding socio-demographic characteristics (age, sex, education, income), functional status, health-related behaviours (smoking, and drinking behaviour) and social environment (marital status, and social participation). Guided by our conceptual framework, we examined if these variables had any significant independent effect on ratings of healthy aging among Canadians, and if the effects varied by respondents' ethno-cultural background.

Respondents were classified into three groups based on their age (45-64, 65-74, and 75-85 years). Respondents' sex was defined as 0 = "male" or 1 = "female", and five groups based on their marital status at the time of the interview: (1) single, never married or never lived with a partner; (2) married/living with a partner in a common-law relationship; (3) widowed; (4) divorced; and (5) separated. Respondents were classified into one of the following four categories based on their highest level of education: 1 = "less than secondary school graduation", 2 = "secondary school graduation and no post-secondary education", 3 = "some post-secondary education", and 4 = "post-secondary degree/diploma." Based on the reported estimates of total annual household income from all sources before taxes and deductions in the past 12 months, the CLSA Tracking Cohort members were classified into five groups: 1 = "annual household income less than $20,000", 2 = "$20,000 or more, but less than $50,000", 3 = "$50,000 or more, but less than $100,000, 4 = "$100,000 or more, but less than $150,000", 5 = "$150,000 or more", and 9 = "no household annual income information available". The latter group was included so as to maintain statistical power.

Functional status was assessed using the Older Americans' Resources and Services (OARS) Multidimensional Functional Assessment Questionnaire [35]. The scale consists of seven questions related to Activities of Daily Living and seven questions related to Instrumental Activities of Daily Living. Respondents are asked to indicate whether they can complete the task without help, with some help, or are completely unable to perform it. Based on the scores on this scale, the CLSA Tracking Cohort members were classified into one of five categories: (1) functional impairment; (2) mild impairment; (3) moderate impairment; (4) severe impairment; and (5) total impairment.

The CLSA participants were asked if they have been ever diagnosed by a doctor with at least one of 34 chronic health conditions. Those who reported having at least one of the listed conditions were classified as those with a chronic health conditions and coded as "1". Those who reported not having any of the listed conditions were classified as those with no chronic conditions and coded as "0".Based on their responses to a question about their smoking behaviour, participants were classified into one of the five categories: (1) daily smoker; (2) occasional smoker, but former daily smoker; (3) occasional smoker; (4) former daily smoker, but non-smoker now; and (5) never smoked. Each participant was classified into one of three categories based on the responses to questions about their drinking behaviour in the past 12 months: (1) regular drinker; (2) occasional drinker and (3) did not drink in the last 12 months. The CLSA tracking Cohort members were asked if they participated in in community-related activities. "Yes" responses were coded as "1", and "no" responses were coded as "0".

Data analysis

The two objectives of the present study were to examine whether (1) ethno-cultural differences in ratings of healthy aging exist; and (2) determinants of healthy aging differ by ethno-cultural background. To address the first objective, respondents' ratings of their own healthy aging on the single-item, close-ended measure were cross-tabulated with their "ethno-cultural background". A Chi-square (X^2) test was used to determine if the observed variations in individuals' ratings of their healthy aging experience by their ethno-cultural background is statistically significant. To address the second objective, we excluded CLSA respondents who were from smaller ethno-cultural groups and had missing values on healthy aging and all other study factors (except for income where there was more than 5% of the sample with missing data), and included data from respondents from the six largest ethno-cultural groups: (1) Multicultural (not including Canada); (2) French; (3) British; (4) Canada (only); (5) Canada (Multicultural); and (6) Any other European. The total sample size for the analyses presented in this section was n = 18,100, which represented about 90% of the CLSA Tracking Cohort.

We ran multivariable logistic regression. For each selected ethno-cultural group, we ran a base model with three variables including age, sex, and total household income. We included those with a missing value for income (as a separate category), but excluded those with missing data on age and sex. For each of the six ethno-cultural groups, we tested the independent effect of each factor (one by one): marital status, smoking behavior, drinking behavior, activities of daily living, social participation, highest level of education, chronic conditions, and long-term physical or mental conditions. The odds ratios and their 95% confidence intervals were used to identify the factors that were significantly associated with healthy aging among each selected ethno-cultural background. Sample weights provided with the CLSA Tracking Cohort data were used to obtain weighted frequencies at the population-level. Analytic weights provided with the CLSA Tracking Cohort data were used for statistical testing.

Data management and analyses were performed sing SAS version 9.4 (SAS Institute, Cary, NC, USA).

This research study received ethics approval from the Health research Ethics Board of the University of Manitoba and was approved by the CLSA Data Access Team.

Results

For our first set of analyses, the data from 20,260 respondents, representing 12,497,688 Canadians aged 45-85 years, and constitute 96% of the CLSA Tracking Cohort were retained (Table 1 for the distribution of the study sample by ethno-cultural background). The majority (90.05%) of these Canadians rated their own healthy aging as "good", "very good", or "excellent". Only 9.95% of the sample rated their own healthy aging experience as either "fair" or "poor". Results of the Chi-squared test indicated that ratings of healthy aging did not significantly differ by ethno-cultural background (X^2= 6.1913, df = 5, p = 0.2880) (Table 2).

	Sample Size	Population Estimate	
Ethno-Cultural Background	n	N	%
Multicultural (not including Canada)	4,107	25,43,255	20.35
French	2,331	18,02,002	14.42
British	7,581	40,23,640	32.20
Canada (only)	1,055	7,47,574	5.98
Canada (Multicultural)	1,980	13,70,588	10.96
Any European	3,206	20,10,629	10.09
Total	20,260	1,24,97,688	100.00

Table 1: Study population by ethno-cultural background.

For our second set of analyses, data from 18,100 Canadians were retained. Results of bivariate analyses are summarized in table 3 and were used to inform the selection of the potential independent variables for the multivariable analyses, which are summarized in table 4. Age, sex, and total annual household income together explained more than 60% of variation in self-ratings of health aging among the total sample and among each one of the six studied ethno-cultural group (data is not shown but are available per request). The effects of these three factors remained significant after controlling for the effects of all the other studied factors. The odds of reporting "aging healthy" increased by age, and this relationship was confirmed among the total sample and all the studied ethno-cultural groups, except for those who reported being multicultural not including Canada. Women were likely than men to report that they aged healthy; the observed difference was statistically significant among the total population, and all of the ethno-cultural groups, except for those who were French or Multicultural including Canada.

Ethno-cultural Background	Aged Healthy	
	Yes (%)(%)	No (%)
Multicultural (not including Canada)	89.23	10.77
French	90.44	9.56
British	90.56	9.44
Canada (only)	89.82	10.18
Canada (Multicultural)	89.63	10.37
Any European	90.01	9.99
Total	90.05	9.95

Table 2: Self-rated healthy aging by ethno-cultural background CLSA tracking cohort (N=20,260).

Note: Only the CLSA tracking cohort members who belonged to the six largest ethno-cultural groups were included in this analysis.

Measures	Total	Aged Healthy	Chi-squared test
	N (%)	n (%)	
Age* **			X2 = 17.2035, df = 3, p = 0.0006
45-54 years	5,128 (37.06)	4,583 (89.99)	
55-64 years	5,731 (31.81)	5,139 (90.00)	
65-74 years	3,955 (19.61)	3,634 (92.10)	
75-85 years	3,286 (11.51)	3,004 (91.57)	
Sex			X2 = 0.3236, df = 1, p = 0.5694
Female	9,119 (51.03)	8,272 (90.71)	
Male	8,981(48.97)	8,088 (90.46)	
Total annual household income			X2 = 332.2744, df = 5, p < 0.0001
< $20,000	1,016 (4.64)	794 (75.96)	
$20,000 - < $50,000	4,813 (22.67)	4,246 (87.83)	
$50,000 - < $100,000	6,303 (34.71)	5,794 (91.93)	
$100,000 - < $150,000	2,884 (18.17)	2,678 (92.64)	
≥ $150,000	2,019 (14.38)	1,904 (94.59)	
Missing	1,065 (5.43)	944 (88.64)	
Marital status			X2 = 80.0451, df = 4, p < 0.0001
Single, never married or never lived with	1,441(7.77)	1,240 (86.18)	
Married/Living with a partner in a common-law relationship	12,631(74.34)	11,542 (91.55)	
Widowed	1,834 (7.13)	1,664 (90.52)	
Divorced	1,697 (8.14)	1,495 (88.15)	
Separated	497 (2.63)	419 (84.22)	
Highest level of education			X2 = 109.2139, df = 3, p < 0.0001

Less than secondary school graduation	1,554 (6.97)	1,322 (84.85)	
Secondary school graduation, no post-secondary education	2,433 (12.96)	2,139 (87.35)	
Some post-secondary education	1,390 (7.37)	1,243 (88.86)	
Post-secondary degree/ diploma	12,723 (72.70)	11,656 (91.89)	
Smoking behaviour			X2 =242.4547, df = 5, p < 0.0001
Daily smoker	1,615 (8.95)	1,315 (81.59)	
Occasional smoker, but former daily smoker	270 (1.53)	239 (88.93)	
Occasional smoker	51 (0.32)	50 (98.30)	
Former daily smoker, but non-smoker now	7,599 (40.02)	6,791(89.45)	
Former occasional smoker	3,549 (20.43)	3,291(92.67)	
Never smoked	5,016 (28.75)	4,674 (93.51)	
Drinking Behaviour (12 months)			X2 = 224.2443, df = 2, p < 0.0001
Regular drinker	12,928 (73.29)	11,942 (92.53)	
Occasional drinker	2,882 (15.06)	2,490 (85.96)	
Did not drink in the last 12 months	2,290 (11.65)	1,928 (84.37)	
Functional health status			X2 = 925.3499, df = 4, p < 0.0001
No impairment	16,252 (91.14)	15,035 (92.58)	
Mild impairment	1,705 (8.15)	1,248 (71.58)	
Moderate impairment	97 (0.47)	54 (56.55)	
Severe impairment	30 (0.14)	17 (59.48)	
Total impairment	16 (0.09)	6 (30.42)	
Social participation (Participation in Community-Related Activities)			X2 = 58.1935, df = 1, p < 0.0001
Yes	18,007 (99.56)	16,297 (90.70)	
No	93 (0.44)	63 (65.88)	
Chronic condition			X2 = 123.7937, df = 1, p < 0.0001
At least one chronic condition	16,752 (91.58)	15,036 (89.86)	
No chronic conditions	1,348 (8.42)	1,324 (98.53)	

Table 3: Factors associated with the CLSA tracking cohort members' self-ratings of healthy aging.

A dose-response relationship was found between total annual household income and individuals' ratings of healthy aging, which was more pronounced among some of the ethno-cultural groups. For example, among the Multicultural but not including Canada group, those with an annual household income of $20,000 to less than $50,000, the odds of reporting aging healthy was 2.6 times higher than odds of reporting aging healthy among those whose annual household income was less than $20,000. The odds of reporting aging healthy was significantly increased by any increase in the level of household income and was 8.8 times greater among those with an annual household income of at least $150,000 compared to those whose annual household income was less than $20,000. This does-response relationship between income and ratings of healthy aging was less pronounced for the total study sample and some of the ethno-cultural groups, for example those who were British, or those from "other European" ethno-cultural background.

Marital status was significantly associated with ratings of healthy aging when we analyzed data for the total sample. Compared to those who never married, those who were married or living with a partner, and widowed or divorced had significantly higher odds of reporting aging healthy. This factor was not significantly associated with ratings of healthy aging for any of the ethno-cultural groups. Level of education was significantly associated with ratings of healthy aging among some (those who were from French, or British background), but not all of the studied ethno-cultural groups. Smoking, drinking, functional status, and a history of a chronic condition were all significantly associated with ratings of health aging among the total sample and each of the studied ethno-cultural groups. For some of the studied factors the magnitude of the effect varied by respondents' ethno-cultural background. For example, for those with a French background, the odds of reporting aging healthy aging among those with no chronic health condition was nearly 19 times higher than those with a history of chronic health condition. Among those who were British, the odds of reporting aging healthy among those with no chronic health condition was 7.6 times greater than those with a history of chronic health condition. Participation in community-rated activities was found to be significantly associated with ratings of healthy aging among the total sample, but not among any of the studied ethno-cultural groups.

Discussion

The present study is the first, to our knowledge, to examine ethno-cultural variations in the ratings and determinates of healthy aging for Canadians. An important strength of this study is that it is based on data for a national sample of Canadians, ages 45-85 years, who participated in the CLSA -- a large, national, long-term study of adult development and aging [32]. For the present study, we took advantage of the wide range of data that was available for the CLSA Tracking Cohort to explore the contribution of a number of personal and environmental characteristics (including ethno-cultural background) that are highlighted in the WHO's model of healthy aging [4] to examine healthy aging in Canadians.

Ethnic origin and culture are two aspects of population diversity. Ethnic origin refers to the ethnic origins of an individual's ancestors, and culture is regarded "as the set of distinctive spiritual, material, intellectual, and emotional features of society or a social group, and that it encompasses, in addition to art and literature, ways of living together, value systems, traditions and beliefs" [36]. From a theoretical point of view, ethnic origin and cultural background can differ in that people from the same ethnic group can belong to different cultures and cultural practices [36]. Important for this study is that culture can influence health-related behaviours and, thus, can affect people's health [14]. Given the difficulties in measuring "culture" in general, and on a national survey such as the CLSA, we used the "ethnic origin" of the CLSA respondents as a proxy for their ethno-cultural background. Our approach is comparable to that used by Statistics Canada for defining ethno-cultural background of Canadians based on the 2011 National Household Survey data. The key differences in our approach were that we differentiated between those who reported one and more

		Ethno-cultural background					
Measures	**Total sample N = 18,100**	**Multicultural (not including Canada) n = 3,718**	**Multicultural including Canada n = 1,803**	**French n = 2,111**	**Any other European n = 2,842**	**British n = 6,714**	**Canada ONLY n = 912**
Age (continuous)	1.030***	1.048***	1.015	1.031**	1.031***	1.038***	1.040**
Female	1.321***	1.579***	1.296	1.239	1.584**	1.284**	1.295
$20,000 to < $50,000	1.471***	2.632***	2.668***	1.418	1.720*	0.991	0.879
$50,000 to < $100,000	2.014***	2.876***	4.155**	2.273*	2.422***	1.682**	1.103
$100,000 to < $150,000	2.109***	3.440***	2.018*	2.472*	2.976***	1.798**	3.424
≥ $150,000	2.637***	8.864***	2.871**	3.006*	2.712**	2.088**	1.989
Missing	1.530***	2.353**	6.032**	1.813	2.888**	0.827	0.831
Married/Living with a common-law partner	1.088***	-	-	-		-	-
Widowed	1.247***	-	-	-		-	-
Divorced	1.097***	-	-	-		-	-
Separated	0.881***	-	-	-		-	-
Secondary school graduation, no post-secondary education	0.951***	-	-	0.514*		1.081	-
Some post-secondary education	1.144***	-	-	1.749		0.979	-
Post-secondary degree/diploma	1.285***	-	-	0.909		1.520*	-
Occasional smoker, but former daily smoker	1.446***	4.995**	0.979	2.441	2.717	0.883	-
Occasional smoker	5.684***	1.000	-	1.406	-	-	-
Former daily smoker, but non-smoker now	1.380***	1.523*	1.570	1.377	1.974***	1.224	-
Former occasional smoker	1.764***	2.332***	1.817*	1.193	2.087**	1.839***	-
Never smoked	2.132***	2.206***	3.129***	2.413**	2.883***	2.031***	-
Occasional drinker	0.645***	0.531***	0.606*	0.600*	0.514***	0.809	-
Did not drink in the last 12 months	0.654***	0.459***	0.611*	0.684	0.605**	0.758*	-
Mild impairment	0.224***	0.229***	0.304***	0.218***	0.172***	0.245***	0.110***
Moderate impairment	0.321***	0.166***	0.203*	-	0.074***	0.116***	0.036***
Severe impairment	0.330***	0.113*	0.059**	0.031	-	0.543	0.115
Total impairment	-	-	0.256	-	0.115	0.055***	-
Participate in community-related activities	1.576***	-	-	-		-	
No chronic conditions	3.978***	3.831***	-	19.175**	3.498***	7.623***	-

Table 4: Multivariable regression results (Adjusted Odds Ratios): Predictors of self-rated health aging for the total sample and the six largest ethno-cultural groups.

Notes: Base model for the total sample, and each one of the six ethno-cultural groups included age, sex, and total annual household income highlighted in grey colour.

Reference category: Male; total annual household income less than $20,000 per year; Single, Never married or never lived with a partner; Less than secondary school graduation; Daily smoker; Regular drinker, No impairment; Has at least one chronic condition.
***p < 0.001, **p < 0.01, *p < 0.05

than one ethnic origin (multicultural), and between those with and without a Canadian background. Examination of variations is ratings and determinants of healthy aging by ethno-cultural background fills in an important existing gap in knowledge. Cultural and social norms are factors determining individuals' roles and responsibilities within family and community, affecting their health-related behaviours, care seeking behaviour and life styles, and affecting attitudes towards aging. Cultural views on aging might affect individuals' experience of aging healthy. Several key findings emerged from our analysis. First, the majority of Canadians 45-85 years of age (~90%) self-rated that they are aging healthy; this result is consistent with the previous studies that found the majority of (younger and older) Canadians [37] have a positive perception of their health, and was higher than the reported prevalence in other research that used more objective measures of healthy aging [38]. Second, we found no significant disparity in ratings of healthy aging when the data were compared across various ethno-cultural groups. This finding is important as it indicates equity in healthy aging for all Canadians of all ethno-cultural backgrounds.

Third, similar to previous studies of self-rated health by age and gender [39], we found that prevalence of healthy aging increases with

age and women were more likely than men to report that they are aging healthy. Moreover, age, sex, and income together explained >60% of the variation in perceived healthy aging. Inclusion of other study factors enhanced the predictive ability of the model for the total sample and each of the studied ethno-cultural groups, but only by 10%. These findings confirm that healthy aging is a multi-dimensional concept as proposed by the WHO [4]. Many of the environmental factors related to individuals' home, community, and broader society that are known to affect individuals' healthy aging experiences [40,41] were missing in our study. For example, we did not examine the potential effect of housing and housing quality on individuals' own assessments of their healthy aging experience.

A fifth key finding of the present study was the confirmation that ethno-cultural background is an important determinant of healthy aging. Individual Canadians, aged 45-85 years, have diverse genetic inheritance and make different choices during their life course, which is affected by the physical and social environment that they live, and their cultural practices as related to food and nutrition, physical and leisure activities and social relationships [42]. The significant dose-response association between individuals' annual household income and ratings of healthy aging for each ethno-cultural group adds evidence for the social gradient in health. Level of education was another important determinant of healthy aging for some of the ethno-cultural groups (British) but not all. The reason for such association is unclear, so future studies of a qualitative nature are required to better understand the link between higher education and better perception of healthy aging.

Our results confirmed the findings of previous studies that health-related behaviours such as smoking and drinking are important determinants of healthy aging [43]. We found that these two behaviours are associated with ratings of healthy aging among Canadians as a whole and for people from specific ethno-cultural backgrounds. In their comprehensive review of eight longitudinal studies, Peel et al., [43] found that the majority of the studies reviewed reported that never having smoked or having previously quit was associated with healthy aging [44-47]. We did not examined the consumption rate, but studies that were inclusive of this factor found that a lower consumption rate was significantly associated with increased likelihood of aging healthy [47-49].

In the present study, abstainers (i.e., did not drink in the last 12 months) and occasional drinkers (i.e., drank less than once a week) had significantly decreased odds of reporting aging healthy; this pattern was observed for the total sample and all each ethno-cultural group. This finding is consist with the results reported in a longitudinal study conducted in the United States of America [45,46], but not other longitudinal studies [44]. Despite the strengths of our study, we must acknowledge several limitations. Our findings regarding health-related behaviours are based on cross-sectional data from the CLSA. With the subsequent waves of data becoming available, the influence of health-related behaviours on perceived healthy aging must be re-examined longitudinally. In addition, physical activity and body weight are other health-related factors that are found to be associated with ratings of healthy aging in previous studies of longitudinal nature [49,50]. We did not explore the association between these factors and healthy aging in this study. This must be a focus of research future studies.

Individuals who were not able to communicate in French or English languages, those with any degree of cognitive impairment, those living in long-term care facilities and those living in territories and remote areas were excluded from the CLSA Tracking Cohort. This likely reduced representation of people from various ethno-cultural backgrounds, and those most at risk for not aging healthy. Moreover, although we examined if existence of a chronic health condition is associated with ratings of healthy aging, we did not examine the effect of different types of chronic health conditions. For example, musculoskeletal health conditions are known as a global threat to healthy aging [51].

Another limitation of our study is that we did not consider caregiving and intergenerational connections; this is important to consider in future research as cultural variations in provision of long-term care to older family members do exist. For example in Bulgaria, children are expected to provide care to their aging parents [52]; this cultural value might affect healthy aging experience of younger and middle-aged adults who are the caregivers. Similarly, Abonyi, Hackett, and Dyck [53] discussed the importance of conducting research on healthy aging in a youthful indigenous community in rural Canada, and highlighted that rural-dwelling Indigenous seniors are more likely than seniors in urban areas to report fair or poor health. Indigenous seniors are central to their cultural revitalization; they are more likely than non-Indigenous seniors to be primary caregivers of their grandchildren. Thus, intergenerational connections might be an important determinant of healthy aging. The knowledge generated by our study enhances the current understanding of factors that are important to healthy aging of Canadians from various ethno-cultural backgrounds. Some ethno-cultural variations were found in the factors associated with ratings of healthy aging or the magnitude of the association between some of the studied factors and ratings of healthy aging. Our findings support the notion of promoting healthy aging policies that focus on interventions to improve socio-economic status, health-related behaviours, and disease preventive measures that are culturally sensitive and reduce the demands and unnecessary costs of health care and social supports for caring of an aging ethno-culturally diverse population.

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