

Aging and Frailty in First Nations Communities*

First Nations Information Governance Centre¹ and Jennifer D. Walker²

ABSTRACT

This study, the first published overview of aging in a nationally representative sample of First Nations seniors, used data from the First Nations Regional Health Survey Phase 2 (FNRHS 2). It is also the first application of a validated frailty index to describe aging experiences in First Nations communities. Responding to the survey were 11,043 First Nations adults. Of the 1,820 First Nations seniors who responded, 52.7 per cent (95% CI [49.4–56.1]) were not frail. The maintenance of non-frail status in First Nations adults appeared to decrease in each middle-adult age group (from 87.9% in ages 35–44 through to 63.1% in ages 55–64) and to plateau after age 65. The findings are a key step in documenting the experiences of First Nations seniors nationally from a First Nations perspective. They also highlight the key need for supportive health services and chronic disease management at younger ages.

RÉSUMÉ

Cette étude est le premier aperçu publié sur le vieillissement utilisant dans un échantillon représentatif au plan national de personnes âgées vivant dans des communautés des Premières Nations, à partir des données générées par la Phase 2 de l'Enquête régionale sur la santé des Premières Nations (ERSPN-2). Il s'agit également de la première application de l'indice de fragilité validé pour décrire les expériences de vieillissement dans les communautés des Premières Nations. Il y avait 11 043 adultes des Premières Nations qui ont répondu à l'ERSPN-2. Sur les 1 820 aînés des Premières Nations qui ont répondu à l'ERSPN-2, 52,7% (IC 95%: 49,4 à 56,1) n'étaient pas fragiles. Le maintien d'un statut non fragile chez les adultes des Premières Nations semble diminuer dans chaque groupe d'adultes d'âge moyen (de 87,9% chez les 35-44 ans à 63,1% chez les 55-64 ans) et se stabiliser en plateau après 65 ans. Les résultats contribueront à documenter l'expérience du vieillissement chez les membres plus âgés des Premières Nations au plan national, du point de vue des Premières Nations. Ils mettent également en évidence les besoins importants en services de soutien en santé et en gestion des maladies chroniques à un jeune âge dans les communautés des Premières Nations.

¹ First Nations Information Governance Centre Head Office, Akwesasne, Ontario

² School of Rural and Northern Health, Laurentian University

* FNIGC thanks all who participated directly or indirectly in the First Nations RHS process; our regional partners; the communities; and our peoples.

Manuscript received: / manuscrit reçu : 24/06/16

Manuscript accepted: / manuscrit accepté : 20/02/17

Keywords: aging, First Nations, frailty, survey

Mots clés : vieillissement, Premières Nations, fragilité, étude

La correspondance et les demandes de tire-à-part doivent être adressées à : / Correspondence and requests for offprints should be sent to:

Jennifer D. Walker, Ph.D.

Assistant Professor

School of Rural and Northern Health

Laurentian University

935 Ramsey Lake Rd.

Sudbury ON, P3E 2C6

<jenniferwalker@laurentian.ca>

Population projections show that the number of First Nations people in Canada is expected to increase by 40 per cent between 2006 and 2031 (Malenfant & Morency, 2011). A disproportionate amount of the growth will be among those aged 60 and older, who are expected to more than triple in number to 184,334 by 2031 (Malenfant & Morency, 2011). First Nations populations have higher rates of many age-related chronic diseases compared with other populations in Canada (First Nations Information Governance Centre [FNIGC], 2012; Malenfant & Morency, 2011; Reading, 2009; Riediger, Lix, Lukianchuk, & Bruce, 2014) with documented younger average age of onset for some conditions, such as diabetes, renal disease, and dementia (Jacklin, Walker, & Shawande, 2012). In addition, older First Nations adults are more likely to report experiencing more than one chronic condition concurrently (FNIGC, 2012; Wilson, Rosenberg, & Abonyi, 2011). This confluence of factors produces a complex set of health care needs in a population that reports experiencing higher than average barriers in accessing health care (FNIGC, 2012). However, in the face of multiple competing pressures, little priority has been placed on improving infrastructure and organization of health and support services to address the projected increases in age-related chronic conditions and accompanying increases in frailty (Withrow, Amartey, & Marrett, 2014).

In contemporary aging research, particular emphasis has been placed on frail, older adults with complex health needs (Bunn et al., 2014). Frailty is a syndrome in older adults that represents a reduction in physiological reserve, a limited ability to resist environmental stressors, and an increased risk of functional decline (Bergman et al., 2007; Strandberg & Pitkala, 2007). To date, no investigations have been made into frailty levels for First Nations populations; collaborative community-based research is required to explore the multiple facets of aging well in First Nations communities. How do First Nations people experience aging and navigate complex health systems with complex medical conditions within complex social and historical conditions? What does “frailty” mean for First Nations people and communities?

As a starting point, we aimed to apply a definition of frailty that has been validated in the general Canadian population (Hoover, Rotermann, Sanmartin, & Bernier, 2013) to First Nations populations using data from the First Nations Regional Health Survey Phase 2. Hoover et al. (2013) at Statistics Canada developed and validated a frailty index for use with Canadian Community Health Survey (CCHS) data. The CCHS-based frailty index has been shown to predict hospitalizations and institutionalization rates for community-dwelling older adults in the general Canadian population. There is a clear linear relationship between age group and frailty

prevalence among seniors (Figure 1), with 16 per cent of the Canadian population aged 65–74 being classified as frail, rising to 52 per cent of those aged 85 and older (Hoover et al., 2013). This direct relationship between age and frailty at a population level, and the approximate level of frailty by age group, have been repeatedly shown using other Canadian data sources, including the National Population Health Survey (Rockwood, Song, & Mitnitski, 2011; Song, Mitnitski, & Rockwood, 2010) and the Canadian Study on Health and Aging (Jones, Song, Mitnitski, & Rockwood, 2005; Rockwood et al. 2004).

Access to reliable data describing health status and health systems use among First Nations populations in Canada has been a perennial challenge. This often leaves communities and organizations with limited ability to adequately predict and plan for health services (Minore, Katt, & Hill, 2009). A vital component of any effort to improve health outcomes for older First Nations people and to plan for the future is the use of high-quality, relevant, and accessible data – and these data must be used in ways that reflect indigenous conceptions of health and well-being, respect First Nations governance of data, and promote culturally safe health and supportive care. The First Nations Regional Health Survey (FNRHS) represents First Nations people living on-reserve and in northern First Nations communities. The development, governance, and implementation of the FNRHS are done by First Nations across Canada and built around the principles of OCAP® (First Nations ownership, control, access, and possession of their own data and information). It is also based on the First Nations Regional Health Survey cultural framework, which conceptualizes health from First Nations perspectives as the “total health of the total person in the total environment” (Dumont, 2005, pg. 15).

The primary objective of the study described in this article was to apply a frailty index that was validated in the general Canadian older population to describe aging experiences in First Nations populations living on-reserve and in northern communities. The results are a key step in documenting the experiences of older First Nations people at a national level from a First Nations perspective.

Methods

Data Source

The FNRHS is a cross-sectional survey and is the only source of national health-related First Nations on-reserve data that is fully under First Nations ownership and control. Phase 1 of the survey began in 1996. Data are available for phases 1 and 2 of the FNRHS, and data collection is currently under way for Phase 3. Data for the FNRHS Phase 2 were collected between

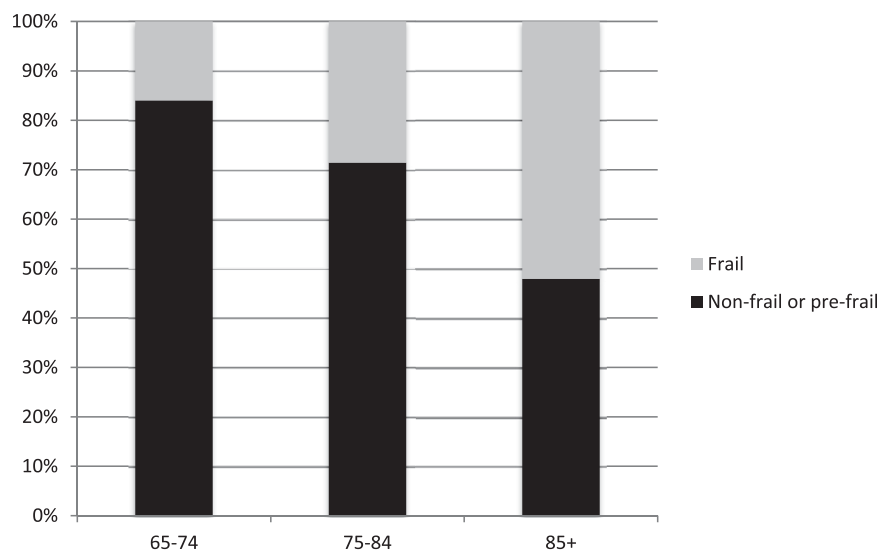


Figure 1: Frailty patterns over age groups in the general Canadian population. Canadian Community Health Survey, as published by Hoover et al. (2013)

June 2008 and November 2010 in 216 First Nations communities across Canada (outside of Nunavut). The sample is designed to represent First Nations populations living on-reserve and in northern communities (above the 60th parallel). In all, 5.6 per cent of the target population was sampled in the FNRHS Phase 2 (FNIGC, 2012), and the response rate was 73.6 per cent. For the FNRHS Phase 2, the sample design incorporated a two-stage sampling strategy: the first stage involved the selection of communities to participate in the survey. First Nations communities were stratified by region, sub-region, and community size (large [1,500+ people], medium [300–1,499 people], and small [<300 people]). Large communities were automatically included, whereas medium and small communities were randomly selected with equal probability within their respective strata. The second stage of sampling pertained to the selection of individuals within each community sampled. Community members were identified using band membership lists. Data were gathered to represent eight categories of the community population (gender by four age groups). The sampling rate within each community was determined as a function of the overall sub-region probability (within regions) and the probability of selection of the community (within sub-region).

Individual responses were weighted, using registry counts from indigenous and Northern Affairs Canada, to reflect, with greater accuracy, the representation of the population by the sample. We randomly selected participants from community membership lists, stratified by age group and sex. We obtained informed consent for participation in the survey but not for linkage of survey results to other data sets. If the selected participant

was not able to provide informed consent or to complete the questionnaire due to cognitive impairments, a proxy was used. Interviews were computer-assisted or paper-based and took, on average, 46 minutes to complete.

At a national level, the First Nations Information Governance Centre (FNIGC) coordinates the development and implementation of the FNRHS and centrally holds the national data in ways that are in keeping with First Nations principles of OCAP. We undertook this study on aging and frailty in First Nations communities in full collaboration with the FNIGC, respecting First Nations ethical protocols for research involving First Nations as defined under OCAP and as outlined in the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans*, Chapter 9 (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, and Social Sciences and Humanities Research Council of Canada, 2014). The FNIGC provided an anonymized data file of the 2008–2010 FNRHS Phase 2 as well as ongoing guidance on research questions, interpretation, and methodology. The analyses were conducted on-site at the First Nations Data Centre under strict privacy and confidentiality protocols. The file included all 11,043 respondents to the adult survey (available at fnigc.ca), which was administered to participants aged 18 and older.

Variable Definitions

Social and Cultural Determinants of Health

We obtained social, demographic, and cultural variables from self-reported responses to the questions on the FNRHS Phase 2 and selected a wide range of variables

on the basis of their relevance to aging and health over the life course. To guide the selection of variables, we drew on the FNRHS Cultural Framework (Dumont, 2005) as well as the Integrated Life Course and Social Determinants Model of Aboriginal Health (Reading & Wien, 2009). This approach ensured that the cross-sectional evaluation espoused by the FNRHS was contextualized as an accumulation of risk, exposures, and outcomes across the life course that include indigenous-specific considerations, such as colonization and contemporary political realities. Selected social determinants focused on living environment, food security, traditional culture and education, residential school attendance, and lifestyle factors. This helped to ensure that the oft-considered proximal determinants were placed into the context of the more distal determinants of health and well-being.

Chronic Conditions

We described the unadjusted prevalence of health conditions experienced by First Nations people aged 65 and older living on-reserve and in northern communities. This was based on the self-reported response to the question: "Have you been told by a health care professional that you have any of the following health conditions?" In total, 28 chronic health conditions were asked in the FNRHS, and those in Table 1 were chosen to structure the frailty index to most closely replicate the CCHS-based frailty index that was validated for the general population of Canada.

Life Balance and Well-Being

We also considered a set of four variables about life balance that engender a First Nations-based view of well-being as a balance in the physical, emotional, mental, and spiritual. The questions asked, "How often do you feel that you are in balance in the four aspects of your life (physical, emotional, mental, and spiritual)?" For each, the possible responses were All the time, Most of the time, Some of the time, Almost none of the time. We created binary variables that combined "all" with "most of the time" and "some" with "almost none of the time".

Frailty Outcome

We modified a frailty index that was developed using variables from the CCHS and was validated with the general Canadian population over age 65 (Hoover et al., 2013). The original index employed an accumulation of deficits approach to measuring frailty whereby the number of deficits that a person experienced was divided by the total number of deficits included in the index to create a frailty score between 0 and 1. Higher scores indicated higher levels of frailty. The original index contained 30 deficits and a scoring algorithm for different

levels of each deficit. Deficits included self-rated health, body mass index, change in health status, and function related to vision, hearing, mobility, cognition, pain, and so on among other items. The index was created according to established criteria for creating frailty indices from existing survey data (Searle, Mitnitski, Gahbauer, Gill, & Rockwood, 2008). The original validation exercise determined that "frail" was defined as a score above 0.21. An additional "pre-frail" category emerged between scores 0.10 and 0.21.

Using the FNRHS, we were able to map 26 of the 30 deficits in the original index. Table 1 is a complete listing of deficits in the adapted version, with key differences highlighted in the footnote. Overall, 76.7 per cent of the adult surveys in the FNRHS were not missing information in any of the deficits included in the frailty index calculation; 13.8 per cent were missing one deficit; and 6.2 per cent were missing two to five deficits. We coded the frailty index score as missing when there were more than five deficits missing (3.4% of cases).

Analysis

We conducted all analyses in the First Nations Data Centre at the FNIGC offices in Ottawa, Canada, under the supervision of FNIGC staff. We used SPSS version 20 with the Complex Sampling Module to account for the sampling design in the FNRHS.

We created a profile of First Nations seniors living in First Nations communities by calculating percentages and 95 per cent confidence intervals across selected social determinants of health that are measured in the FNRHS. We also determined the most prevalent health conditions affecting First Nations seniors (aged 65 and older) by ranking the unadjusted prevalence of the health conditions in the FNRHS. We tested bivariate relationships between frailty and (1) the selected socio-demographic/cultural determinants of health, (2) the self-rated health and life balance outcomes (as a validation approach), and (3) the most common chronic conditions, using chi-square tests. To account for spurious associations that might have arisen from conducting multiple comparisons, we adjusted our threshold for statistical significance to a more conservative $p = 0.01$. We also calculated crude and age/sex adjusted odds ratios for each with 95 per cent confidence intervals. As part of the frailty profile, we calculated the age-specific frailty prevalence for ages 65–74, 75–84, and 85 and older for comparison with the estimates produced for the general Canadian population by Hoover et al. (2013). In addition, for exploratory purposes to better understand the patterns of frailty in First Nations populations, we produced age-specific frailty estimates for middle-aged adults aged 45–54 and 55–64 years.

Table 1: Description of deficits included in the FNRHS-based frailty index

Deficit	FNRHS-based Frailty Index
Self-perceived health	0.00 = Excellent/Very good 0.50 = Good 1.00 = Fair/Poor
Change in health status	0.00 = Much better/Somewhat better/About the same 0.50 = Somewhat worse 1.00 = Much worse
Body mass index	0.00 = Normal/Overweight 0.50 = Obese 1.00 = Underweight
Participation and activity limitations	0.00 = Never 0.50 = Sometimes 1.00 = Often
Speech	0.00 = Understood by everyone or only those who know them 0.50 = Partially understood by everyone 1.00 = Not understood by anyone or partially understood by those who know them
Emotional health	0.00 = Happy and interested in life 0.25 = Somewhat happy 0.50 = Somewhat unhappy 0.75 = Very unhappy 1.00 = So unhappy that life is not worthwhile
Pain	0.00 = None 0.25 = Pain does not prevent activity 0.50 = Pain prevents a few activities 0.75 = Pain prevents some activities 1.00 = Pain prevents most activities
Vision	0.00 = Sees with/without glasses 0.25 = Reads newsprint with/without glasses; cannot see person across street with glasses 0.50 = Sees person across street with/without glasses; cannot read newsprint with glasses 0.75 = Cannot read newsprint or see person across street with glasses 1.00 = Cannot see
Hearing	0.00 = Hears in group without hearing aid (HA) 0.20 = Hears one-on-one without HA; needs HA for group 0.40 = Can hear with HA 0.60 = Hears one-on-one without HA; cannot hear with HA in group 0.80 = Hears one-on-one with HA; cannot hear with HA in group 1.00 = Cannot hear
Mobility	0.00 = Walks without difficulty and without aids 0.20 = Walks outside with difficulty; no help/aids needed 0.40 = Walks outside with aids; no help of another person 0.60 = Walks short distances unaided; needs wheelchair for longer distances 0.80 = Walks short distances with help; needs wheelchair for longer distances 1.00 = Cannot walk
Cognition	0.00 = Can remember most things, think clearly, solve problems 0.20 = Remembers most things; some difficulty to think, solve problems 0.40 = Somewhat forgetful but thinks, solves problems 0.60 = Somewhat forgetful; some difficulty to think, solve problems 0.80 = Very forgetful; great difficulty to think, solve problems 1.00 = Unable to remember anything, think, solve problems
Dexterity	0.00 = Full use of two hands and 10 fingers 0.20 = Limited use of hands, no help needed 0.40 = Limited use of hands, uses special tools 0.60 = Limited use of hands, needs help for some tasks 0.80 = Limited use of hands, needs help for most tasks 1.00 = Limited use of hands, needs help for all tasks
Chronic conditions ^a	0.00 = Absence of each condition 1.00 = Presence of each condition diagnosed by a health professional <i>Conditions:</i> arthritis, rheumatism, back problems other than arthritis, high blood pressure, chronic bronchitis, emphysema, heart disease, diabetes, cancer, effects of stroke, cognitive or mental disability

Continued

Table 1: Continued

Deficit	FNRHS-based Frailty Index
Limited in activities of daily living ^a	0.00 = Able to perform activities of daily living (eat, bathe, dress, use the toilet) independently without difficulty 1.00 = Unable to perform activities of daily living independently without difficulty
Fall-related injuries	0.00 = No fall-related injury (past 12 months) 1.00 = Fall-related injury
Walking for exercise ^a	0.00 = Walked for exercise (past 12 months) 1.00 = No walking for exercise

Note. CCHS = Canadian Community Health Survey. FNRHS = First Nations Regional Health Survey.

a The FNRHS-based frailty index differed from the CCHS-based frailty index in the following ways.

- **Chronic conditions:** CCHS asked if the condition had lasted (or was expected to last) at least 6 months. CCHS included combined arthritis or rheumatism, combined chronic bronchitis or emphysema, urinary incontinence, Alzheimer's disease/dementia (instead of cognitive or mental disability).
- **Activities of Daily Living:** CCHS considered each ADL as a separate variable whereas FNRHS had only one ADL variable. CCHS included preparing meals; getting to appointments and running errands; doing everyday housework; personal care such as washing, dressing, moving inside the house; and looking after personal finances.
- **Walking for exercise:** CCHS had a 3-month timeframe.

Results

Overall, 1,820 people aged 65 and older responded to the FNRHS, representing a weighted count of 20,824 people and 8 per cent of the First Nations adult population living on-reserve or in northern First Nations communities.

Social Determinants of Health Profile of First Nations Seniors aged 65 and Older

Table 2 provides a snapshot of key social and cultural determinants of health for First Nations seniors living on-reserve and in northern communities. In all, slightly more First Nations seniors were women (54.2%) than men (45.8%). Slightly over half of First Nations seniors were from rural, remote, or special access communities (55.0%), and 44.3 per cent lived outside of their First Nations community at some point. More than nine out of 10 First Nations seniors reported living in uncrowded living conditions (92.8%), and 62.8 per cent reported being food secure.

A substantial majority (85.4%) of the seniors understood or spoke a First Nations language, and roughly half (51.0%) reported that traditional spirituality was important to them despite high levels of direct experience with cultural assimilation in the form of residential school attendance (43.9%). Over half (53.2%) reported that religion (as distinct from traditional spirituality) was important. A quarter (25.5%) of seniors reported regularly taking part in community cultural events. Thirty-one per cent had pursued some form of post-secondary education, and 34.4 per cent had consulted a traditional healer at some point. Half (50.0%) of First Nations seniors reported eating a nutritious, balanced diet. Three quarters (75.1%) were non-smokers, and 72.1 per cent reported living in a smoke-free home.

The majority avoided unhealthy relationships with alcohol, with 88.6 per cent reporting no current binge-drinking behaviours. There were high rates of overweight and obesity, with 4 in 5 reporting a body mass index (BMI) over 25. Only 28.1 per cent reported being at least moderately physically active despite 42.6 per cent reporting no activity limitations resulting from physical or mental health conditions.

On measures of well-being, First Nations seniors demonstrated low levels of excellent or very good self-rated health (18.8%), yet high levels of physical (71.9%), emotional (76.0%), mental (77.5%), and spiritual (79.3%) balance.

Health Conditions Profile of First Nations Seniors aged 65 and Older

Figure 2 depicts the reported health conditions of First Nations seniors living on-reserve and in northern First Nations communities. Only 10.5 per cent of First Nations seniors reported having no health conditions. The most prevalent health conditions reported were as follows: high blood pressure (53.7%), arthritis (51.2%), type 2 diabetes (33.9%), hearing impairment (31.4%), cataracts (27.7%), chronic back pain (25.3%), and heart disease (25.3%). Of note, although only 10.9 per cent of the older group reported being injured in the past 12 months, half (53.2%, 95% CI [43.7–62.5]) of those injuries were because of a fall or trip (not shown in Figure 2).

Frailty Profile for First Nations Seniors

All told, 47.3 per cent (95% CI [43.9–50.6]) of First Nations people aged 65 and older were classified as frail. Table 3 displays the socio-demographic and health-related variables that had a statistically significant relationship with frailty at a bivariate level ($p < 0.01$).

Table 2: Social determinants of health profile for First Nations seniors (age 65 and older) living on-reserve and in northern First Nations communities (weighted $n = 20, 824$)

Parameter	Value	Percent of First Nations Seniors (95% CI)
Age	65–74	67.7(64.2–71.0)
	75+	32.3(29.0–35.8)
Gender	Female	54.2 (52.2–56.2)
	Male	45.8 (43.8–47.8)
Lives in rural, remote or special access community	Yes	55.0 (49.6–60.3)
	No	45.0 (39.7–50.4)
Has lived outside of his/her First Nations community	Yes	44.3 (40.7–48.0)
	No	55.7 (52.0–59.3)
Lives in uncrowded housing	Yes	92.8 (91.0–94.3)
	No	7.2 (5.7–9.0)
Food secure	Yes	62.8 (59.4–66.1)
	No	37.2 (33.9–40.6)
Understands or speaks a First Nations language	Yes	85.4 (81.0–88.9)
	No	14.6 (11.1–19.0)
Attended residential school	Yes	43.9 (40.4–47.5)
	No	56.1 (52.5–59.6)
Had a parent who attended residential school	Yes	33.4 (30.3–36.7)
	No	66.6 (63.3–69.7)
Attended post-secondary education	Yes	30.9 (27.1–34.9)
	No	69.1 (65.1–72.9)
Has ever consulted a traditional healer	Yes	34.4 (31.7–37.2)
	No	65.6 (62.8–68.3)
Takes part in community cultural events: always or almost always	Yes	25.5 (22.4–28.8)
	No	74.5 (71.2–77.6)
Feels that traditional spirituality is very important	Yes	51.0 (47.6–54.5)
	No	49.0 (45.5–52.4)
Feels that religion is very important	Yes	53.2 (49.4–57.0)
	No	46.8 (43.0–50.6)
Eats traditional meat often	Yes	43.1 (39.8–46.4)
	No	56.9 (53.6–60.2)
Eats a nutritious, balanced diet	Yes	50.0 (46.6–53.5)
	No	50.0 (46.5–53.4)
Current non-smoker	Yes	75.1 (72.1–77.9)
	No	24.9 (22.1–27.9)
Lives in a smoke-free home	Yes	72.1 (68.5–75.4)
	No	27.9 (24.6–31.5)
Current pattern of binge drinking	Yes	11.4 (9.6–13.4)
	No	88.6 (86.6–90.4)
Physically active	Yes	28.1 (25.3–31.1)
	No	71.9 (68.9–74.7)
Body Mass Index under 25	Yes	19.8 (17.8–22.1)
	No	80.2 (77.9–82.2)
Self-rated health: excellent or very good	Yes	18.8 (16.8–21.2)
	No	81.2 (78.8–83.4)
Physical balance: all or most of the time	Yes	71.9 (68.8–74.8)
	No	28.1 (25.2–31.2)
Emotional balance: all or most of the time	Yes	76.0 (73.3–78.5)
	No	24.0 (21.5–26.7)
Mental balance: all or most of the time	Yes	77.5 (74.9–80.0)
	No	22.5 (20.0–25.1)
Spiritual balance: all or most of the time	Yes	79.3 (76.7–81.6)
	No	20.7 (18.4–23.3)
Frailty	Yes	47.3 (43.9–50.6)
	No	52.7 (49.4–56.1)

First Nations women had a higher prevalence of frailty than men, with a 63 per cent elevated odds of being frail than did men. Other variables that significantly

increased the odds of being frail included a belief in traditional spirituality (adjusted odds ratio [AOR] = 1.42, 95% CI [1.12–1.81]) and having consulted a traditional

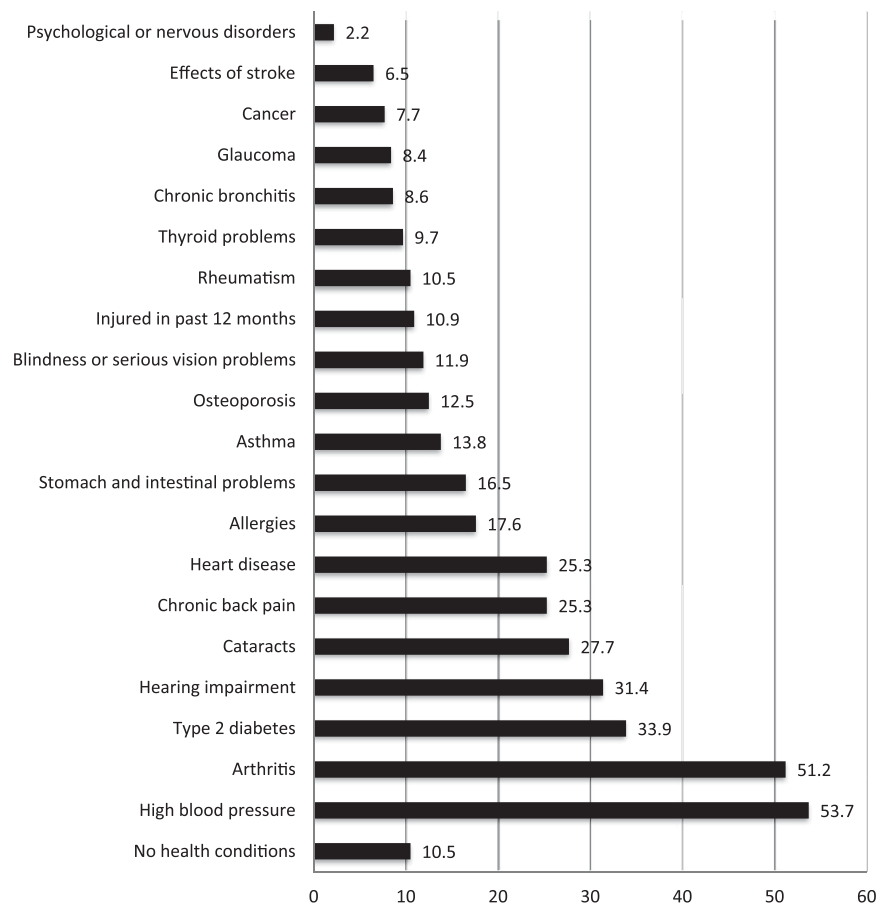


Figure 2: Unadjusted prevalence of reported chronic health conditions among First Nations adults aged 65 and older living in First Nations communities per 100 population

healer (AOR = 2.01, 95% CI [1.51–2.68]). Frailty was inversely associated with higher levels of physical activity and with having a current pattern of binge drinking, both of which indicate robust levels of physical health.

Not surprisingly, the strongest relationships and most substantially elevated odds ratios were between frailty and self-rated health (AOR = 9.00, 95% CI [6.25–12.93]) and the most common individual health conditions, many of which are components of the frailty index. Of the health conditions, the highest odds of frailty were for the two pain-related conditions: arthritis (AOR = 8.81, 95% CI [6.66–11.67]) and chronic back pain (AOR = 7.26, 95% CI [5.21–10.11]). Clear inverse relationships were also evident between frailty and the measures of physical, emotional, mental, and spiritual balance.

Age and Frailty

Because frailty did not show the increasing pattern with age that we would have expected, we examined the other adult age groups and plotted frailty by age group (Figure 3). The expected increase in frailty occurred at younger ages, between the 35–44 and 55–64 age groups.

At age 65, approximately 50 per cent of the population was categorized as frail, with insubstantial further declines with increased age. In a supplemental appendix available online, we provide the social and cultural snapshot and the frailty profile for younger First Nations adults aged 35–64 years.

Discussion and Conclusions

This study is the first published health profile of First Nations seniors living in First Nations communities across Canada. The most striking and policy-relevant finding was the evident early-onset frailty that appears to be affecting First Nations communities. Previous research indicates that frailty predicts death, hospitalization, institutionalization, falls, and worsening health status, independently of age (Hoover et al., 2013; Mitnitski, Graham, Mogilner, & Rockwood, 2002; Searle et al., 2008). First Nations frailty levels in the 45–54-year-old age group were similar to those for aged 65–74 in the general population, which has substantial consequences on the need for supportive services and ongoing management of pain and disability in First Nations communities, particularly through

Table 3: Frailty profile for First Nations seniors (age 65 and older) living on-reserve and in northern First Nations communities (weighted $n = 20,305^a$)

Parameter	Value	Mean Frailty Index score (se)	Frailty Prevalence % (95% CI)	Crude Odds Ratio of Frail or Most Frail vs Pre-frail or Not Frail (95% CI)	Age/Sex Adjusted Odds Ratio (95% CI)
Sex/Gender	Female	0.227 (0.005)	52.8 (48.5–57.1)	1.63 (1.28–2.09)	1.63 (1.28–2.09)
	Male ^b	0.202 (0.004)	40.7 (36.1–45.4)		
Has ever consulted a traditional healer	Yes	0.242 (0.006)	60.0 (54.7–65.1)	2.00 (1.50–2.69)	2.01 (1.51–2.68)
	No ^b	0.204 (0.005)	42.7 (38.3–47.3)		
Feels that traditional spirituality is very important	Yes	0.221 (0.005)	50.9 (46.4–55.4)	1.43 (1.12–1.82)	1.42 (1.12–1.81)
	No ^b	0.208 (0.005)	42.0 (37.7–46.5)		
Current pattern of binge drinking	Yes	0.185 (0.008)	32.6 (25.9–40.0)	0.49 (0.34–0.71)	0.55 (0.37–0.81)
	No ^b	0.221 (0.004)	49.4 (45.6–53.2)		
Food secure	Yes	0.195 (0.004)	39.6 (35.7–43.7)	0.43 (0.33–0.55)	0.43 (0.33–0.56)
	No ^b	0.254 (0.007)	60.6 (55.6–65.5)		
Physically active	Yes	0.174 (0.005)	31.9 (27.2–37.1)	0.42 (0.32–0.56)	0.44 (0.33–0.59)
	No ^b	0.231 (0.005)	52.7 (48.2–57.1)		
Self-rated health	Poor, Fair, Good	0.235 (0.004)	55.1 (51.1–59.0)	9.03 (6.26–13.01)	9.00 (6.25–12.93)
	Excellent or Very Good ^b	0.125 (0.005)	11.9 (8.9–15.8)		
Physical balance	Some or almost none of the time	0.269 (0.007)	68.8 (63.3–73.8)	3.53 (2.61–4.77)	3.59 (2.66–4.83)
	All or most of the time ^b	0.194 (0.004)	38.5 (34.5–42.6)		
Emotional balance	Some or almost none of the time	0.251 (0.008)	60.4 (54.5–66.0)	2.04 (1.53–2.73)	2.11 (1.58–2.81)
	All or most of the time ^b	0.203 (0.004)	42.8 (38.8–46.8)		
Mental balance	Some or almost none of the time	0.251 (0.008)	60.5 (54.6–66.1)	2.02 (1.51–2.70)	2.08 (1.56–2.77)
	All or most of the time ^b	0.205 (0.004)	43.1 (39.1–47.2)		
Spiritual balance	Some or almost none of the time	0.239 (0.009)	56.9 (49.9–63.6)	1.65 (1.21–2.26)	1.72 (1.27–2.33)
	All or most of the time ^b	0.208 (0.004)	44.4 (40.6–48.2)		
High blood pressure	Yes	0.258 (0.004)	63.3 (58.5–67.8)	4.22 (3.18–5.60)	4.22 (3.20–5.57)
	No ^b	0.167 (0.005)	29.0 (24.9–33.5)		
Arthritis	Yes	0.274 (0.005)	71.7 (67.1–75.9)	8.84 (6.67–11.72)	8.81 (6.66–11.67)
	No ^b	0.156 (0.003)	22.3 (19.2–25.8)		
Diabetes	Yes	0.273 (0.006)	66.0 (60.3–71.2)	3.56 (2.66–4.76)	3.53 (2.64–4.73)
	No ^b	0.179 (0.004)	35.3 (31.6–39.1)		
Hearing impairment	Yes	0.261 (0.007)	64.3 (57.2–70.8)	2.80 (2.01–3.91)	3.12 (2.25–4.33)
	No ^b	0.193 (0.004)	39.1 (35.6–42.8)		
Cataracts	Yes	0.274 (0.008)	70.1 (63.5–75.9)	3.83 (2.72–5.39)	3.75 (2.70–5.23)
	No ^b	0.190 (0.004)	37.9 (34.3–41.7)		
Chronic back pain	Yes	0.300 (0.007)	79.7 (74.7–83.9)	6.87 (4.95–9.54)	7.26 (5.21–10.11)
	No ^b	0.187 (0.004)	36.3 (32.8–40.0)		
Heart disease	Yes	0.298 (0.008)	75.4 (68.5–81.3)	5.04 (3.46–7.35)	5.51 (3.84–7.90)
	No ^b	0.188 (0.003)	37.8 (34.2–41.7)		

a Approximate value. Missing values vary slightly by indicator.**b** Referent category.

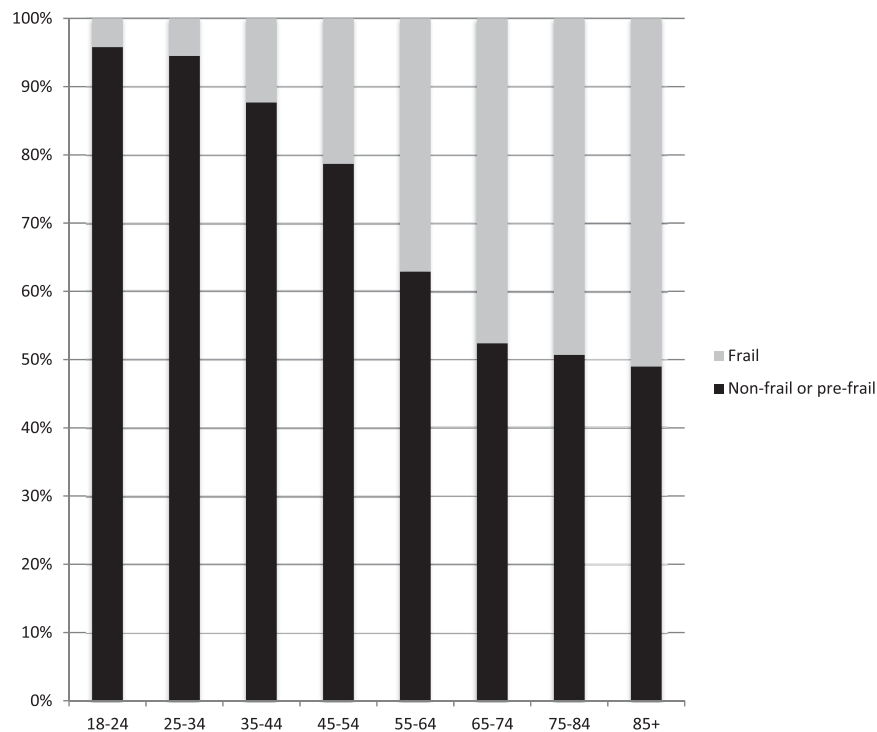


Figure 3: Frailty categories across age groups in First Nations people living on-reserve and in northern First Nations communities

home care services. In First Nations communities, home care services are under the jurisdiction of the federal government (in contrast to the provincial home care systems that are offered off-reserve). First Nations leadership, service providers, and families must be aware of the need for a distinct mix of services in their communities for people who are younger than what the typical age criteria specifies for home care services. This need for support has substantial implications for policy and care delivery planning with the goal of ensuring that First Nations adults can thrive in their communities.

These findings concur with those of a recent study of frailty in older Aboriginal populations in remote Australia (Hyde et al., 2016). The researchers found that, similar to our findings, frailty occurred at younger ages in Aboriginal people. They found that 54.9 per cent of 45–49-year-old remote Aboriginal people were already classified as frail. However, they found that, unlike our findings, the frailty rates continued to rise substantially through older age categories, up to 83.3 per cent in those aged 80 and older. This may reflect a difference in the way that frailty was measured, as they were able to include key age-related deficits such as incontinence. However, it may also reflect a policy-driven limitation of studying issues of aging in First Nations communities at a population level. Because health care on-reserve primarily falls under the responsibility of the federal government, there are key health-related policies that determine which older people can stay living

in First Nations communities. The federal programs include time limits on travel reimbursements for the management of chronic conditions (for example, dialysis for renal failure), and this prompts people with complex medical needs to relocate to urban centres. As such, the FNRHS 2 sampling frame includes only older people who have remained healthy enough to continue to live in First Nations communities, leading to a potential survivor bias in recruitment for our study.

The younger frailty profile of ages 20–30 in First Nations communities is consistent with findings related to earlier onset of specific conditions, such as dementia (Jacklin et al., 2012). A key limitation of our study was the lack of information on two important age-related conditions: dementia and urinary incontinence. This may have resulted in an underestimation of frailty in the FNRHS because those two conditions were part of the original CCHS-based frailty index and are important contributors to frailty. The CCHS combined arthritis and rheumatism as one chronic condition whereas the FNRHS counted them separately. Similarly, chronic bronchitis and emphysema were combined in the CCHS and counted separately in the FNRHS. Despite these differences in the way that specific chronic conditions were counted, the frailty index score was calculated independently in each of the surveys using the total number of “deficits” as the denominator for the index. Thus, the indices are understood to have been constructed as similarly as possible but are not identical to one another. Importantly, the questions about chronic

conditions were asked differently in the CCHS and the FNRHS. Unlike the FNRHS respondents, the CCHS respondents were specifically asked if their conditions had lasted (or were expected to last) six months or longer.

We found that most common conditions reported in First Nations seniors were high blood pressure (53.7%), arthritis (51.2%), and diabetes (33.9%). In the general Canadian population, using data from the 2009 CCHS, the three most commonly reported chronic conditions were high blood pressure (52.9%), arthritis (43.4%), and back problems (28.6%). Diabetes ranked seventh at 17.2 per cent (Ramage-Morin, Shields, & Martel, 2010). For a direct comparison between populations, we would need to standardize by age (because First Nations seniors are younger than seniors in the general population) and sex (because First Nations seniors are more likely to be male than seniors in the general population). Although non-standardized proportions are presented because they are important for First Nations communities in understanding the profile of health conditions in older First Nations people, comparisons with non-First Nations rates likely underestimate the differential prevalence of some chronic conditions that are important drivers of frailty levels. For example, arthritis generally increases with age and is more common in women (Statistics Canada, 2010). Because arthritis was associated with an 8-fold increase in the odds of being frail, it is likely a key driver in increased frailty levels and must be a key consideration in service planning for First Nations adults. In addition, the higher prevalence of diabetes and its important association with 3.5 times increased odds of frailty must be a strong consideration in driving the markedly higher levels of frailty among First Nations seniors.

These frailty-related findings, coupled with the high rates of many chronic conditions, reflect a medically complex population that often has limited access to health and health services. Despite this, the population reports high levels of wellness as reflected in the responses to the questions about physical, emotional, spiritual, and mental balance. This paradox warrants further investigation to explore the meanings of aging, frailty, and age-related wellness among First Nations adults.

We applied a frailty index that was validated for the Canadian population over age 65 to a First Nations adult population, including those under age 65. This is an important first step in exploring and further validating frailty in First Nations contexts; however, further validation and development of appropriate indices is necessary for this application. This index was developed using an accumulation-of-deficits approach based on mainstream models of disability, health, and function.

However, in general, deficit-based understandings of health are inconsistent with indigenous models of well-being that are based on balance and strengths. Further qualitative and quantitative research on the meaning and intersection of frailty, wellness, and vitality for First Nations adults is an important line of work that is the subject of current funded research in Ontario, Canada. Although we were limited in this current study to cross-sectional, self-reported data and a deficit-based model of frailty, future work is needed to ensure that new measures of age-related frailty and resilience are developed that reflect indigenous knowledge and that can be modeled in relation to community and individual strengths. Associated outcomes of frailty and resilience can be assessed using longitudinal, community-driven data collection combined with health services data. Enhanced data would provide opportunities for communities and service organizations to evaluate the impact of programs and the trajectories of the younger frail and non-frail First Nations adults to determine the factors associated with resilience over the life course.

At present, the FNRHS does not sample adequate numbers of older people to enable First Nations communities to use the FNRHS frailty index at a community level. However, it can be used to establish national and regional baselines using a measure that is comparable to the general Canadian population. This study provides compelling evidence that First Nations populations are experiencing age-related multimorbidity and functional challenges at younger ages than the general population of Canada. This analysis of frailty as a clinical, deficit-based concept using a validated frailty index is a starting point for measuring age-related frailty and wellness from a First Nations perspective. In addition, the high levels of multimorbidity in First Nations adult populations highlight the importance of a holistic view of health and well-being that is a strength of the frailty index approach because it is not based simply on individual chronic conditions. As we have highlighted, one of the key limitations in using a deficit-based frailty measure is that it frames aging in a negative way. Importantly, a culturally informed index of age-related wellness in First Nations communities would not simply be an inverse of frailty and could be framed using the FNRHS cultural framework (Dumont, 2005) as a starting point. Through community-driven research approaches, First Nations people aging in First Nations communities can take these concepts and reframe them to better reflect their worldview and experiences.

Supplementary Material

To view supplementary material for this article, please visit <https://doi.org/10.1017/S0714980817000319>

References

- Bergman, H., Ferrucci, L., Guralnik, J., Hogan, D. B., Hummel, S., Karunanathan, S., & Wolfson, C. (2007). Frailty: An emerging research and clinical paradigm—Issues and controversies. *Journals of Gerontology, Series A*, 62(7), 731–737.
- Bunn, F., Burn, A. M., Goodman, C., Rait, G., Norton, S., Robinson, L., ... Brayne, C. (2014). Comorbidity and dementia: A scoping review of the literature. *BMC Medicine*, 12(1), 192–207.
- Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, and Social Sciences and Humanities Research Council of Canada. (2014). *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans*. Retrieved from <http://www.pre.ethics.gc.ca/eng/policy-politique/initiatives/tcps2-eptc2/Default/>
- Dumont, J. (2005). *First Nations Regional Longitudinal Health Survey (RHS) cultural framework*. Retrieved from First Nations Information Governance Centre website: http://fnigc.ca/sites/default/files/ENpdf/RHS_General/developing-a-cultural-framework.pdf
- First Nations Information Governance Centre (FNIGC). (2012). *First Nations Regional Health Survey (RHS) 2008/10: National reports on adults, youth and children living in First Nations communities*. Retrieved from http://fnigc.ca/sites/default/files/docs/first_nations_regional_health_survey_rhs_2008-10-national_report.pdf
- Hoover, M., Rotermann, M., Sanmartin, C., & Bernier, J. (2013). Validation of an index to estimate the prevalence of frailty among community-dwelling seniors. *Health Reports*, 24(9), 10–17.
- Hyde, Z., Flicker, L., Smith, K., Atkinson, D., Fenner, S., Skeaf, L., ... Lo Giudice, D. (2016). Prevalence and incidence of frailty in Aboriginal Australians, and associations with mortality and disability. *Maturitas*, 87, 89–94.
- Jacklin, K. M., Walker, J. D., & Shawande, M. (2012). The emergence of dementia as a health concern among First Nations populations in Alberta, Canada. *Canadian Journal of Public Health*, 104(1), e39–e44.
- Jones, D., Song, X., Mitnitski, A., & Rockwood, K. (2005). Evaluation of a frailty index based on a comprehensive geriatric assessment in a population based study of elderly Canadians. *Aging Clinical and Experimental Research*, 17(6), 465–471.
- Malenfant, E.C., & Morency, J.D. (2011). *Population projections by Aboriginal identity in Canada: 2006 to 2031*. Retrieved from Statistics Canada website: <http://www.statcan.gc.ca/pub/91-552-x/91-552-x2011001-eng.htm>
- Minore, B., Katt, M., & Hill, M.E. (2009). Planning without facts: Ontario's Aboriginal health information challenge. *Journal of Agromedicine*, 14(2), 90–96.
- First Nations Information Governance Centre and Jennifer D. Walker
- Mitnitski, A.B., Graham, J.E., Mogilner, A.J., & Rockwood, K. (2002). Frailty, fitness and late-life mortality in relation to chronological and biological age. *BMC Geriatrics*, 2(1), 1–9.
- Ramage-Morin, P.L., Shields, M., & Martel, L. (2010). Health-promoting factors and good health among Canadians in mid- to late life. *Health Reports*, 21(3), 45–53.
- Reading, C.L., & Wien, F. (2009). *Health inequalities and social determinants of Aboriginal peoples' health*. Retrieved from National Collaborating Centre for Aboriginal Health website: http://www.nccah-ccnsa.ca/Publications/Lists/Publications/Attachments/46/health_inequalities_EN_web.pdf
- Reading, J. (2009). *The crisis of chronic disease among Aboriginal peoples: A challenge for public health, population health and social policy*. Retrieved from University of Victoria, Centre for Indigenous Research Community-Led Engagement website: <http://cahr.uvic.ca/nearbc/documents/2009/CAHR-B2-Chronic-Disease.pdf>
- Riediger, N. D., Lix, L. M., Lukianchuk, V., & Bruce, S. (2014). Trends in diabetes and cardiometabolic conditions in a Canadian First Nation community, 2002–2003 to 2011–2012. *Preventing Chronic Disease*, 11(e198), 1–8.
- Rockwood, K., Song, X., & Mitnitski, A. (2011). Changes in relative fitness and frailty across the adult lifespan: Evidence from the Canadian National Population Health Survey. *Canadian Medical Association Journal*, 183(8), E487–E494.
- Rockwood, K., Howlett, S. E., MacKnight, C., Beattie, B. L., Bergman, H., Hébert, R., ... McDowell, I. (2004). Prevalence, attributes, and outcomes of fitness and frailty in community-dwelling older adults: Report from the Canadian Study of Health and Aging. *Journals of Gerontology, Series A: Biological Sciences and Medical Sciences*, 59(12), 1310–1317.
- Searle, S. D., Mitnitski, A., Gahbauer, E. A., Gill, T. M., & Rockwood, K. (2008). A standard procedure for creating a frailty index. *BMC Geriatrics*, 8(1), 24–34.
- Song, X., Mitnitski, A., & Rockwood, K. (2010). Prevalence and 10-year outcomes of frailty in older adults in relation to deficit accumulation. *Journal of the American Geriatrics Society*, 58(4), 681–687.
- Statistics Canada. (2010). *Healthy people, healthy places*. Toronto, ON: Author. Retrieved from <http://www.statcan.gc.ca/pub/82-229-x/82-229-x2009001-eng.htm>
- Strandberg, T. E., & Pitkala, K. H. (2007). Frailty in elderly people. *The Lancet*, 369(9570), 1328–1329.
- Wilson, K., Rosenberg, M. W., & Abonyi, S. (2011). Aboriginal peoples, health and healing approaches: The effects of age and place on health. *Social Science & Medicine*, 72(3), 355–364.
- Withrow, D. R., Amartey, A., & Marrett, L. D. (2014). Cancer risk factors and screening in the off-reserve First Nations, Métis and non-Aboriginal populations of Ontario. *Chronic Diseases and Injuries in Canada*, 34(2–3), 103–112.