

# Self-rated health and ethnicity: focus on indigenous populations

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**Objectives.** Self-rated health (SRH) is a commonly used measure in surveys to assess general health status or health-related quality of life. Differences have been detected in how different ethnic groups and nationalities interpret the SRH measure and assess their health. This review summarizes the research conducted on SRH within and between ethnic groups, with a focus on indigenous groups.

**Study design and methods.** A search of published academic literature on SRH and ethnicity, including a comprehensive review of all relevant indigenous research, was conducted using PubMed and summarized.

**Results.** A wide variety of research on SRH within ethnic groups has been undertaken. SRH typically serves as an outcome measure. Minority respondents generally rated their health worse than the dominant population. Numerous culturally-specific determinants of SRH have been identified. Cross-national and cross-ethnicity comparisons of the associations of SRH have been conducted to assess the validity of SRH. While SRH is a valid measure within a variety of ethnicities, differences in how SRH is assessed by ethnicities have been detected. Research in indigenous groups remains generally under-represented in the SRH literature.

**Conclusions.** These results suggest that different ethnic groups and nationalities vary in SRH evaluations, interpretation of the SRH measure, and referents employed in rating health. To effectively assess and redress health disparities and establish culturally-relevant and effective health interventions, a greater understanding of SRH is required, particularly among indigenous groups, in which little research has been conducted.

Keywords: *self-rated health (SRH); ethnicity; indigenous health; health measures; surveys*

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Self-rated health (SRH) is a measure frequently employed in surveys to serve as a substitute for clinical health status or as a measure of health-related quality of life. SRH has independently been shown to predict mortality (1–3), and researchers have sought the referents that individuals incorporate into their self-evaluations that produce such consistent results. One factor whose relationship to SRH has been investigated in some populations is ethnicity. Ethnicity can be defined as “... an aspect of social relationship between persons who consider themselves as essentially distinctive from members of other groups of who they are aware and with whom they enter into relationships” (4). A substantial body of international research has developed on differences in how ethnic groups rate their health. Evidence suggests that ethnic groups differ in their self-perceptions of health, their conceptualization of what constitutes health, and the determinants that factor into their self-assessments of health. Developing a greater understanding of how different ethnicities and nations rate their health will allow for more valid cross-national

and cross-ethnic comparisons, a better understanding of health disparities, and may aid in the development of more culturally-appropriate and effective intervention strategies. This may be of particular relevance in increasingly diverse nations (5). One area which has been especially under-represented in the academic literature is SRH in indigenous populations. The purpose of this review is to selectively examine studies that have investigated the relationship between SRH and ethnicity, with a particular emphasis on studies involving indigenous populations.

## Material and methods

A general search on SRH and ethnicity was conducted in PubMed. This initial review established a foundation on which to examine the more specific literature pertaining to SRH and indigenous populations. Given potentially analogous experiences as historically colonized groups who currently occupy minority statuses in North America, Mexican-, Hispanic, and Latino-American relevant literature was also a primary focus in this initial review. To identify literature relating to SRH and indigenous

populations, the following search terms were employed in all possible permutations, for all available years: “self-rated health”, “self-perceived health” “general health perceptions”, “self-assessed health”, “self-evaluated health”, “Aboriginal”, “American Indian”, “Alaska Native”, “indigenous”, “First Nations”, “Métis”, and “Inuit”.

## Results

### *Self-rated health as predictor and outcome by ethnic group*

The health ratings of various ethnic groups have been assessed in numerous studies, which employ SRH principally as an indicator of health status or health-related quality of life. Typically, ethnic minorities rate their health worse than Whites in British and American samples (6–11), although there is evidence that Asians or Pacific Islanders may be less likely to rate their health poorly compared to other Americans (11). While non-White Canadians reported better health than non-White Americans, and there were greater discrepancies between White and non-White Americans than between White and non-White Canadians (12), differences in SRH between ethnic groups in Canada have been identified. Among Canadians, those respondents who self-identified as Aboriginal or both Aboriginal and White or Chinese were more likely to rate their health poorer than respondents who identified themselves as White (13). One study found that older Manitobans of Eastern European ethnic background were significantly more likely to rate their health as fair, poor, or bad compared to older Manitobans who self-identified as British or Canadian (14). Besides Canadians who self-identified as Aboriginal, East and Southeast Asian Canadians had lower than average SRH, and English, French, and Black Canadians had better than average SRH (15).

A variety of determinants of SRH in specific ethnic minorities have been identified. Among Mexican and Hispanic Americans, poorer SRH has been found to be associated with female gender; higher age; depressive affect; low socioeconomic status; cognitive impairment; low self-esteem; limited acculturation; heroin use; religiously mandated silent suffering; discrimination; chronic disease; co-morbidity; and neighbourhood characteristics. In these populations, SRH was positively associated with social support, religiosity; education; trust; and better physical and mental health (7,16–25).

The determinants of SRH have been studied in other ethnic minorities. In African American respondents with diabetes, passive coping with racism, but not exposure to racism, was negatively associated with SRH (26). Among Asian Indian immigrants in the United States, SRH was negatively associated with age, female gender, BMI, and co-morbidity, and positively associated with social support (27).

Researchers have begun to explore the impact of the intersectionality of race, gender, and class on SRH (28). Veenstra describes intersectionality theory as “a way of understanding social inequalities by race, gender, class, and sexuality that emphasizes their mutually constitutive natures” (28). These axes of inequalities should further be conceptualized as contributing to discrimination in a multiplicative, rather than an additive manner, and as being irreducibly intertwined (28). Given the diversity of living conditions experienced by indigenous peoples globally, intersectionality theory is an important consideration in understanding indigenous health and health inequities. Intersectionality allows for an understanding of how indigenous individuals may perceive their health as members of cultural communities amongst those with whom they may share certain, but not other, identity affiliations.

Being a homosexual man with low socio-economic status and being a poor South Asian woman demonstrated a multiplicative effect on producing poorer SRH. However, in general, examining the multiplicative effects of class, race, and sexuality on SRH added little to explaining the variability of SRH in comparison to examining these factors in an additive model. Further research concerning SRH and intersectionality is necessary, especially relating to class, as frequent under-reporting of income among immigrants may compromise findings (24).

Few studies employ SRH as an independent variable. Number of chronic illnesses and SRH predicted cognitive functioning in elderly African Americans (29). Among Asian Indian Americans, SRH independently predicted the metabolic syndrome (30).

### *Self-rated health and validity: objective health and cross-group comparisons*

SRH has demonstrated validity in multiple ethnic groups (10). SRH’s validity was examined as early as 1958 and reviewed in 1978 (31,32). Early studies established SRH was generally, at least, moderately correlated with objective health assessments (31–36).

Within ethnic minorities, discrepancies between objective health measures and SRH have been identified. In phone interviews, self-identified overweight Hispanic and African American respondents over-rated their health compared to their degree of obesity, self-reported morbidity status, and probable objective morbidity status based on national prevalence data. The African American respondents rated their health better than Hispanics, despite having higher rates of self-reported obesity and co-morbidities (37). Angel and Guarnaccia found Hispanic Americans frequently underestimated their health compared to a physician’s assessment, and this discrepancy was particularly pronounced among those taking the survey in Spanish, suggesting a language

or acculturation effect (16). Chandola and Jenkinson found that the association between SRH and objective health measures did not differ between British ethnic groups, suggesting that all ethnicities incorporated similar referents in their self-assessments (10). Ferraro and Farmer have reported differences in the relationship between objective health and SRH between White and African Americans. While self-reported morbidity was the stronger predictor in both groups, African Americans' health assessments were only associated with self-reported morbidity and not with physician-evaluated morbidity, while White Americans' SRH was associated with both kinds of measures (38).

Differences in determinants and referents of SRH between ethnicities have been detected. In a qualitative study, non-White Americans focused on health problems in rating their health, while White Americans focused on physical functioning (39). Higher income, but not higher education, among Black Americans attenuated the disparities in SRH between Black and White Americans; however, no such effects were found between Hispanic and White Americans (6). In 1 study, foreign-born Hispanic, and particularly Asian, immigrants were as likely or more likely to rate their health poorly as United States-born Hispanics and Asians, despite reporting fewer health problems (40). In a study comparing SRH in Finns and Italians, SRH was lower among Finns compared to Italians, despite very similar distributions and correlational compositions of SRH determinants and assessments (41). Psychosocial factors and physical tiredness were of more importance in assessing self-health in a French occupational cohort compared to a British occupational cohort, despite similar health profiles (42). Canadians report less extreme, and the Japanese worse, SRH than Americans, despite better mortality outcomes (4). Biomarkers mediate the relationship between education and health to a weaker extent in higher income countries, likely due to greater degrees of social stratification (43).

The strength of the association between SRH and mortality differs by ethnic group. SRH was a weaker predictor of mortality in less acculturated, compared to more acculturated, American Hispanics (44). Among Finns and Italians, SRH did not retain a graded, inverse association with mortality risk after controlling for health and education variables. However, Italians who rated their health as poor did have a significantly increased risk of mortality compared to Italians who rated their health as better than poor (41). While Dutch males were more likely to rate their health better than Lithuanian males, Appels and colleagues found that poor health independently predicted mortality in both Lithuanian and Dutch males (45).

The studies reviewed above demonstrate ethnic and national differences in how individuals assess SRH.

These differences are augmented by variation in language and acculturation. Ethnic differences are also present in the degree to which objectively measurable and mortality-relevant health status is incorporated in SRH.

### *Self-rated health in indigenous populations*

Little research has been conducted specifically on SRH within North American indigenous populations, although North American indigenous populations may form 1 ethnic sub-grouping of national American (9,46–48) or Canadian data (13,15). These Canadian data do not include individuals on reserves. Both the Canadian and American Aboriginal groups had poorer SRH than most other groups studied. Additionally, in examining racialized identity and SRH and how socioeconomic status mediated these relationships, socioeconomic status was only a relevant determinant of SRH among respondents identifying as either Aboriginal or both Aboriginal and White (13).

Some SRH information for on reserve Canadian First Nations (FN) communities is available from the 1991 Aboriginal Peoples Survey (APS) and the 1997 and the 2002–2003 First Nations and Inuit Regional Health Survey (RHS). Comparisons between the 1991 APS and General Social Survey determined that after age and sex standardization, Aboriginal Canadians (particularly those residing on-reserve) rated their health worse than the general population (49). Poorer SRH among all participants, regardless of ethnicity, was found to predict number of family physician visits in a dose-dependent manner. Aboriginal Canadians who reported excellent health were less likely to visit a physician than were Canadians in general with excellent SRH, even when income was controlled (49). This is suggestive of cultural differences impacting assessments of SRH and subsequent decisions regarding health care, as well as potential health care access issues. Based on the 2001 APS, it was also determined that among off-reserve Aboriginal females, receiving an HIV test was associated with reporting good or fair/poor SRH; however, the opposite effect was seen in males (50).

The 2002–2003 RHS confirmed that a greater percentage of FN and Inuit individuals rated their health as poor, and a lower percentage rated it as excellent or very good, compared to non-FN Canadians. These differences were present in all age groups, although these differences were not tested for statistical significance (51). For example, 20.4% of on-reserve FN and Inuit adults 18 years or older rated their health as poor or fair compared to 11.9% of non-FN Canadians (52). These results remained consistent when analyzed by income and disability status. The analysis focused predominantly on how disability affected SRH among FN and Inuit individuals. Disabled FN and Inuit adults were more likely to rate their health as fair or poor compared to

non-disabled FN and Inuit adults and non-FN adults with or without disabilities, although the differences between FN and Inuit and other Canadians were not tested for statistical significance. Older disabled FN and Inuit individuals were more likely to report poor health compared to younger individuals, but there were minimal differences between the sexes. Generally, higher income was associated with better SRH and those individuals who reported excellent or very good health attributed their health status to good social supports and sleep. Those with diabetes were more likely to rate their health as poor, fair, or good relative to those without diabetes and were less likely to rate their health as excellent. This is similar to earlier findings that FN and Inuit individuals suffering from chronic disease were more likely to rate their health as poor and less likely to rate their health as excellent compared to healthy individuals (53).

The 2006 APS also provided data on the SRH of Canadian Métis adults (54). These findings suggested more favourable SRH among Canadian Métis than FN or Inuit samples. SRH was similar between males and females and remained consistent between the 2001 and 2006 cycles. Over-all, Métis were less likely to rate their health as excellent or very good, compared to the general Canadian population (58% vs. 62%). This trend was particularly evident in those over 35. However, compared to the general Canadian population, Métis were more likely to rate their health as excellent or very good between the ages of 15–19 and had very similar SRH in those aged 20–34.

Some studies have been conducted using SRH in adolescent North American Indians and Alaska Natives. These groups had substantially poorer SRH compared to other North American adolescents (55,56). SRH was negatively associated with suicide attempts, physical or sexual abuse, drug use, poor school performance, poor body image and weight preoccupation, and being a female from a poorer income family (55–57). Having a recent physical examination, social competence, and school achievement were positively associated with SRH among adolescent American Indians and Alaska Natives (55–56). Not smoking tobacco was associated with excellent SRH among Canadian Aboriginal adolescents and young adults (58).

SRH among elderly Native North Americans has also been investigated. In 1 study, older disabled American Indians and Alaska Natives were more likely to report poor or fair health than White or Asian Americans (59). Poorer SRH predicted specialist use in a sample of older rural dwelling individuals with type 2 diabetes, a quarter of who were Native Americans (60). In a study examining predictors of SRH among elderly Native Americans, being younger, having a higher income, having more education, and exercising predicted better SRH (61). Tobacco use, greater nutritional risk, and longer time since using alcohol predicted poorer SRH. Barriers to

health care predicted worse SRH only when these health risk behaviours were not considered (61). In the Lakota and Navajo subsample of the International Collaborative Sample II (ICS-II), the poorest ratings of health were identified in the middle-age cohort of the subsample (46). In a rare study examining SRH among a general American Indian adult cohort, leisure time inactivity was associated with poor or fair SRH within a number of Nebraska and Minnesota communities (62).

In one of the few studies focusing on SRH and validity within a North American Indian population, the congruency between physician assessments and older American Indians' SRH was examined (63). Patients and physicians (4 out of 7 of whom were also American Indians) agreed on 60% of the physicians' assessments of patients' health. Similar to Angel and Guarnaccia's findings among Hispanic Americans (16), the majority of discrepancies occurred when physicians chose a higher rating than patients. These differences were greater for those individuals who weakly associated with White American cultural identity, but individuals' affiliation with American Indian culture did not significantly affect the discrepancy between ratings. As all physicians were strongly affiliated with White American culture, these findings may suggest that having a similar cultural identity to one's provider may facilitate congruent health assessments more so than only sharing ethnic heritage.

Recently research has explored the effect of sexual orientation on SRH in American indigenous populations. Chae and Walters found that gay, lesbian, bisexual, transgender, or 2-spirit American Indians and Alaska Natives reported high levels of poor and fair SRH. Age and education were positively associated with SRH, while possessing public insurance and being disabled were negatively associated with SRH. Discrimination was not associated with poor or fair SRH, and its effect was attenuated by a positive racial attitude (64).

SRH research has also been conducted among Australian and New Zealand indigenous populations. Among Australian Aborigines, poor or fair SRH is associated with increasing age (apart from the eldest age groups), presence and number of health conditions, recent health actions, employment status, disability, and primary language spoken not being English (65). This association of poor or fair health among Australian Aboriginal individuals who do not primarily speak English is inconsistent with morbidity and mortality data and may reflect a lack of validity (65,66). This language effect may also account for contradictory findings in Steven and Young's study on gambling problems and SRH among Aboriginal Northern Territory residents, which differed from the typically negative effect of gambling problems on SRH in the general Australian population (67). Among urban Australian Aborigines, SRH is relatively poor and associated with depression, age, waist-to-hip ratio



(WHR), especially for women, and smoking status, particularly in men. In this sample, SRH was not associated with systolic blood pressure, alcohol or marijuana use, diabetes, or inactivity (68). In New Zealand, Māori respondents are significantly more likely to report poor health than New Zealanders of European ancestry, until adjustments are made for all of sex, age, racial discrimination, and deprivation (69).

Minimal research has been conducted on other indigenous populations. The Charmorro of Guam report lower SRH than Filipinos, and SRH was positively associated with income and education and negatively associated with body mass index (BMI) (70). Among the Inuit in Greenland, poorer SRH is associated with a

history of abuse, particularly in women (71). Studies of Taiwanese Aboriginal women found SRH was negatively associated with suicidal thoughts, menopausal symptoms, and depression (72,73). SRH is lower in the Norwegian Sami, compared to the general Norwegian population, particularly among women living outside the designated Sami area (74). Men experienced better SRH than women, as did those with more education and income, and health disparities were particularly evident in middle-aged or older groups. In explaining inequalities in SRH between Sami and non-Sami Norwegians, self-reported ethnic discrimination and socioeconomic status are particularly powerful predictors (74) (See Table I).

*Table I.* Summary of studies on SRH in indigenous populations

Author, year	Indigenous population	SRH measure	SRH as outcome or predictor
McGee et al., 1999 (9)	Native Americans	Dichotomous	Predictor
Veenstra, 2009 (13)	Aboriginal Canadians	Dichotomous	Outcome
Wu and Schimmele, 2005 (15)	Aboriginal Canadians	Scale	Outcome
Veenstra, 2011 (28)	Aboriginal Canadians	Dichotomous	Outcome
Atchinson et al., 1996 (46)	Native Americans	Scale	Outcome
Zahran et al., 2005 (47)	AI/AN	Ordinal	Outcome
Liao et al., 2011 (48)	AI	Dichotomous	Outcome
Newbold, 1997 (49)	Aboriginal Canadians	Dichotomous	Outcome/predictor
Orchard et al., 2010 (50)	Aboriginal Canadians	Ordinal	Predictor
FN Centre, 2002–2003 (51)	Canadian FN/Inuit	Ordinal	Outcome
Health Canada, 2009 (52)	Canadian FN/Inuit	Ordinal	Outcome
Young et al., 1998 (53)	Canadian FN/Inuit	Dichotomous	Outcome
Statistics Canada, 2009 (54)	Canadian Métis	Ordinal	Outcome
Blum et al., 1992 (55)	AI/AN	Ordinal	Outcome
Parker, 2004 (56)	AI	Scale	Outcome
Grossman et al., 1991 (57)	AI/AN	Dichotomous	Predictor
Ritchie and Reading, 2003 (58)	Aboriginal Canadians	Dichotomous	Predictor
Okoro et al., 2007 (59)	AI/AN	Dichotomous	Outcome
Bell et al., 2005 (60)	Native Americans	Dichotomous	Predictor
Ruthig et al., 2009 (61)	Native American	Scale	Outcome
Fischer et al., 1999 (62)	AI	Dichotomous	Predictor
Garrouette et al., 2006 (63)	AI	Scale	Outcome
Chae and Walters, 2009 (64)	AI/AN	Dichotomous	Outcome
Sibthorpe et al., 2001 (65)	Aboriginal Australians	Dichotomous	Outcome
Wiseman, 1999 (66)	Aboriginal Australians	Review	Outcome
Stevens and Young, 2009 (67)	Aboriginal Australians	Ordinal	Predictor
Spurling and Hayman, 2010 (68)	Urban indigenous people	Dichotomous	Outcome
Harris et al., 2006 (69)	New Zealand Maori	Dichotomous	Outcome
Pinhey et al., 1994 (70)	Guamanian Chamorros	Scale	Outcome
Curtis et al., 2002 (71)	Greenland Inuit	Dichotomous	Outcome
Chen et al., 2008 (72)	Taiwanese Aborigines	Dichotomous	Predictor
Yen et al., 2009 (73)	Taiwanese Aborigines	Scale	Predictor
Hansen et al., 2010 (74)	Norwegian Sami	Dichotomous	Outcome

Notes: SRH Measure: Ordinal scale consisting of 4 or 5-item response: “excellent”, “very good”, “good”, “fair”, “poor” (or equivalent); Dichotomous response: “poor” and “fair” vs. all others combined. AI, American Indians; AN, Alaska Natives; FN, First Nations.

## Discussion and conclusions

The studies reviewed contribute to researchers' understanding of SRH in a variety of cross-national, minority, and indigenous populations. While SRH appears to be a valid measure for assessing health and health-related quality of life, there are potential cultural differences in how ethnic groups and nationalities assess their health. This diversity must be taken into consideration when making comparisons between populations. In general, minority and indigenous groups rate their health poorer than majority populations, and a variety of culturally-specific determinants of SRH have been identified. In order to accurately assess health and address health disparities both within and between nations, however, a better understanding of how different cultures perceive their health and what contributes to these perceptions is required.

Given the variety of socio-cultural, economic, and environmental conditions that indigenous peoples experience globally, it is likely that more than material deprivation operates to produce SRH disparities between indigenous and non-indigenous peoples. It has been suggested that social comparison in socioeconomically inequitable, developed nations may produce health-compromising chronic stress and adverse emotions (75,76). That is, if one compares one's socioeconomic positioning relative to a more advantaged individual, this may result in negative emotions such as anxiety and shame. Ultimately, these assessments will adversely affect health through impacted psychosocial pathways. Additionally, the direct effects of hierarchical conflict may similarly disrupt optimal neuroendocrine functioning via subordination-resultant chronic stress (75,76). This latter mechanism is largely based on primate research, and it is debatable the extent to which primate models may be relevant in explaining human behaviour (76).

It is plausible that either mechanism may impact the objective and self-rated health of the indigenous groups examined. Indigenous individuals may experience stress induced by a lack of education and employment opportunities, discrimination, and acculturation and language tensions. While a more equitable society may ameliorate these effects for all individuals, indigenous people may find these issues compounded by an awareness of their positioning within national social hierarchies and their history of colonization. Thus, in societies in which socio-economic disparities are especially pervasive and disadvantage visible minorities and indigenous populations, somatic, psychological, and subsequent self-rated health may suffer.

The cumulative physiological effects of chronic stress and the body's attempt to compensate for them has been termed allostatic load (77). Repeated stress, an ineffective stress response, and compensatory over-secretion of stress hormones may result in a hyperactive stress response

system that progresses to a "burned-out" state as manifested in dysregulation of the hypothalamus-pituitary-adrenal (HPA) axis or sympathetic nervous system (SNS) (77). This dysregulation has been associated with accumulation of visceral body fat, insulin resistance, dyslipidemia, elevated blood pressure, impaired glucose metabolism, the metabolic syndrome, and an increased incidence of type 2 diabetes and cardiovascular disease (78–81).

Chronic stress may also contribute to chronic disease through indirect, behaviourally-mediated pathways dependent upon individuals' varied coping mechanisms and lifestyle choices, such as inactivity, nutrient-poor diet, alcohol consumption, and tobacco use (77). The relationship between stress and food intake is particularly relevant in examining the effect of chronic stress on chronic, cardiometabolic disease. High stress-related cortisol secretion has been found to predict food intake (82,83), and self-reported stress-eating and a cortisol pattern suggestive of HPA axis "burn-out" has been associated with increased BMI (83–88). Cortisol may mediate other stress-related factors linked to fat-regulation and cardiometabolic health such as leptin, neuropeptide Y, and cytokines (82). Rat models suggest that in the presence of insulin, palatable food consumption reduces HPA axis activity, thereby diminishing the unpleasant effects of a chronically-stimulated stress response via an abdominal fat-associated, negative-feedback signal or the dopaminergic "reward" system (89). Stress-related neuroendocrine dysfunctions and subsequent adverse health behaviour may produce the subclinical chronic disease symptoms that individuals incorporate into their self-ratings of health.

Attempts to link the physiological indicators of chronic stress to SRH have revealed that SRH is associated with a number of stress-related biomarkers. Hasson and colleagues determined that SRH is associated with a variable they termed allostatic load, composed of WHR, BMI, triglycerides, prolactin, dehydroepiandrosterone sulphate (DHEAS), cholesterol measures, glycosylated hemoglobin, and blood pressure in middle-aged Swedish women (90). Higher levels of circulating inflammatory cytokines were also associated with poorer SRH in Swedish women but not men (91). In middle-aged Swedish men, the stress-related indicators, increased s-prolactin and decreased s-testosterone, were associated with a decline in SRH at follow-up, although not at baseline or in those whose SRH improved or remained unchanged over time (92).

Neighbourhood problems and deprivation may serve as a health-impacting form of chronic stress (93,94). Given some of the non-salubrious conditions in which some indigenous communities live, this may be a potent contributor to poor SRH in indigenous communities. Associations between various neighbourhood factors and

SRH have also been identified (20,22,93). Indigenous individuals who are dissatisfied with their community conditions may view this as a persistent form of stress that they have no power to address, and the physiological effects of this unrelenting stress may manifest in bodily and psychological symptoms that result in individuals rating their health as poor.

An emerging area of interest in SRH research concerns the extent to which individuals may be aware of somatic impairments in pre-diagnosed or prodromal states. While initially hypothesized by Idler and Benyamini in 1997 (2), researchers have recently begun to more thoroughly investigate this possibility. The relationships between SRH and biomarkers have been examined to determine the extent to which individuals may be aware of bodily dysregulation not yet clinically detected. Asymptomatic risk factors found to have been associated with SRH including high blood pressure, cholesterol measures, the metabolic syndrome, glycosylated hemoglobin, and insulin levels, and insulin resistance (30,95,96). The association between SRH and stress in indigenous communities may thus arise both from an immediate awareness of the psychological impacts of stress in promoting anxiety and distress and from the manner in which stress may compromise bodily health. Therefore, aspects of daily life that may promote stress, such as discrimination, exclusion, socioeconomic disparities, negative community attributes, and poor health, theoretically may also contribute to an individual's perceived worse health by elevating stress levels.

Importantly, when addressing both the impacts of material deprivation and social comparison-induced ill health, it is essential not to discount human agency, but also to refrain from "blaming the victim" by ignoring actual structural barriers to potentially health-improving behaviours. Studies in diverse populations have identified associations between increased perceptions of control and self-rated health (e.g. 97,98). While this is a positive development, it is ethically essential that these programs focus on the broader social context that produces these perceptions of control, rather than on simply altering the control beliefs themselves (99).

Generally, in the populations included in this review, minority and indigenous population were more likely to perceive their health as worse than majority populations. It may be that addressing general health disparities in the nations examined will provide benefits to all citizens, as more equitable societies, via the mechanisms of social comparison and complex psychosocial pathways, improve the health of entire populations (75). In order to better understand SRH within indigenous populations, further studies are recommended in a number of areas. Comparative studies are necessary between indigenous and non-indigenous populations, as well as studies comparing indigenous communities residing in diverse

socioeconomic and environmental conditions. More data is also essential from on reserve communities. Many studies including national comparative statistics often do not include these communities and this potentially weakens evidence used in program and policy planning.

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