Determinants of Life Satisfaction and Self-Perceived Health in Nationally Representative Population-Based Samples, Canada, 2009 to 2018

Yingying Su[1,2] · Carl D'Arcy[3,4] · Muzi Li[1,2] · Xiangfei Meng[1,2]

Abstract

We aim to 1) examine changes in the relationship between self-perceived health and life satisfaction; 2) explore potential attributable factors associated with life satisfaction and self-perceived health, and 3) investigate the role of social support in these relationships. Data analyzed were from ten national Canadian Community Health Surveys from 2009 to 2018. We found that self-perceived health and life satisfaction were positively and significantly correlated with each other, and their correlation increased over time. However, life satisfaction and self-perceived health were correlated with different sets of socio-demographic characteristics. The relationship between self-perceived health and life satisfaction varied across different levels of social support, and an additive interaction between social support and self-perceived health was observed in life satisfaction. The combined effect of both self-perceived health as 'good' and high social support on life satisfaction was approximately two to four times higher than what was expected from the sum of the effects of social support and self-perceived health alone. The study findings suggest targeting health promotions for population well-being should focus on identified characteristics and pay particular attention to the additive effect of self-perceived health and social support.

✉ Xiangfei Meng
   xiangfei.meng@mcgill.ca

1   Department of Psychiatry, Faculty of Medicine and Health Sciences, McGill University, 6875 Boulevard LaSalle, QC H4H 1R3 Montreal, Canada

2   Douglas Research Centre, Montreal, QC, Canada

3   School of Public Health, University of Saskatchewan, Saskatoon, SK, Canada

4   Department of Psychiatry, College of Medicine, University of Saskatchewan, Saskatoon, SK, Canada

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Introduction

Life satisfaction (LS) and self-perceived health (SPH) assess different dimensions of health. LS refers to an individual's overall feelings about his or her life (Prasoon & Chaturvedi, 2016). It can be seen as the cognitive component of subjective wellbeing and involves a global evaluation of the quality of one's life. Even though there are some overlaps across the existing definitions of happiness, LS, subjective wellbeing, and quality of life in the literature, LS appears to be more stable, long-lived and broader in scope.

Self-perceived health (SPH), also known as self-rated health, is a frequently used global health indicator reflecting a person's subjective general perception of health (Idler & Benyamini, 1997). Although it does not focus on a specific dimension of health, it provides a succinct way of summarizing diverse components of health (Ware Jr, 1986). It has been suggested that it captures a holistic health perception that includes physical, mental, and social wellbeing (Idler & Benyamini, 1997). SPH is one of the best predictors of future health, healthcare services use and costs, mortality patterns, and quality of life (Stiefel et al., 2010; Su et al., 2011). The consistent reliability, validity, and predictive power of SPH in different populations raise an important question as to what are the potential attributes contributing to it (Shields & Shooshtari, 2001).

A growing body of literature has been exploring the relationship between LS and SPH (Herman et al., 2013; Lucas et al., 2013; Marques et al., 2017). Diener et al. (1999) pointed out that there is a strong relationship between subjective well-being and SPH. A longitudinal study of 9,981 respondents in Australia showed that better SPH was associated with higher LS (Siahpush et al., 2008). Similarly, a comparative Canada-United States study on health conducted between 2002 and 2003 containing 3,505 Canadians and 5,183 Americans found that individuals with a low level of LS were more likely to report higher rates of poor SPH compared to their counterparts (Prus, 2011). However, the research on the relationship between LS and SPH has been primarily focused on specific population groups. For example, Atienza-González et al. (2020) explored the relationship between LS and SPH and the roles of age and gender in this relationship among adolescents. There has been a lack of research on the understanding of the relationship between LS and SPH among general populations using nationally or internationally representative samples. Furthermore, there is even less research conducted to explore changes in the relationship between LS and SPH over time. Both LS and SPH can provide valuable and timely information to policymakers and other leaders on population levels of mental health and wellbeing (Diener & Tay, 2015; Diener et al., 2015). LS together with SPH are associated with other emotional, social and behavioral constructs (Atienza-González et al., 2020). An in-depth understanding of determinants of LS and SPH can provide more explicit information on variations of LS and SPH among different subgroups of the population and these associated characteristics could be potential targets for policymaking and promoting changes to improve population wellbeing.

Social support is an important correlate of both LS and SPH (Zhou & Lin, 2016). It can be defined as information that leads an individual to believe that

he or she is cared for and loved and is a valued member of a network of mutual obligation (Cobb, 1976). The important positive role of social support on health, well-being, and LS is well documented (Cohen & Mckay, 1984; Park et al., 2016; St John et al., 2015; Su et al., 2020). Social support profoundly influences LS (Kasprzak, 2010), and it contributes to the improvement in health and wellbeing (Khan & Husain, 2010). A population-based study of Canadian children also provided evidence of the promotive association of social support with LS (Emerson et al., 2018). Similar evidence of a positive association between a higher level of social support and good health perception has been found among Canadian community dwelling populations over 65 years old (Zunzunegui et al., 2004). According to the stress buffering hypothesis (Cohen & Wills, 1985), social support buffers the impact of stressful events by the perceived availability of interpersonal resources and assesses a person's degree of integration in a large social network. Supportive social relationships are associated with longevity, less cognitive decline with aging, greater resistance to infections, and better management of chronic illnesses (Cohen, 2004; Cohen et al., 2001; Holt-Lunstad et al., 2010; House et al., 1982, 1988; Konrath et al., 2012). The moderating effect of social support on the relations of health and LS has also been documented (Dumitrache et al., 2017). However, the studies on social support primarily focused on LS or SPH, separately. To our knowledge, no study has yet assessed the role of social support in the relationship between LS and SPH in a general Canadian population. Given the protective effect of social support, identification of how social support is involved in the relationship of LS and SPH over time can further corroborate the evidence on its function and that is critical to decision making when developing intervention strategies for optimizing LS and SPH at an individual and population level.

The present study examines changes in the relationship between LS and SPH over time, explores determinants associated with LS and SPH, and identifies the role of social support in the relationship between LS and SPH in a series of large repeated cross-sectional national health surveys from 2009 to 2018 in Canada.

Methods

Data Sources

Data analyzed were from annual Canadian Community Health Surveys (CCHS) from 2009 to 2018. The CCHS is a population-based, cross-sectional health survey conducted by Statistics Canada. It is a main data source for the information on population health in Canada and collects a broad range of information on health and wellbeing, factors that affect health, as well as a standard set of demographic and socioeconomic characteristics. Acknowledging the federal nature of Canada and that provinces have jurisdiction with respect to health, the CCHS generally has two components, 1) core content which is collected on all Canadians, and 2) optional content, which each individual province and territory can decide to include or not in the data collection in their jurisdiction. Life satisfaction and self-rated health

and socio-demographic survey items are core content whereas other content such as social support has been optional. The CCHS surveys cover Canadians aged ≥ 12 years living in privately occupied dwellings in the 10 provinces and 3 territories of Canada. Canadians living on First Nations Reserves, residing in institutions, fully employed in the Canadian Forces, and living in certain remote regions are not sampled. The sampling frame of the CCHS is representative of 98% of the Canadian population; the sampling method involved multistage cluster sampling of individuals within household clusters by health region strata, and data were obtained via in-person and telephone interviews. Participants in the original survey signed informed consent and voluntarily participated in the survey. For those below18 years old, informed consent was obtained from their guardians. The original CCHS survey received ethical approval through Statistics Canada procedures. The present study was approved by the Faculty of Medicine and Health Sciences Institutional Ethical Board, McGill University (#20–08-040). Figure 1 summarizes the study cohort of all the ten CCHS datasets used in the present study.

Measurements

Life Satisfaction Respondents were asked a single question: "Using a scale of 0 to 10, where 0 means "Very dissatisfied" and 10 means "Very satisfied", how do you feel about your life as a whole right now?" This is a standard global life satisfaction
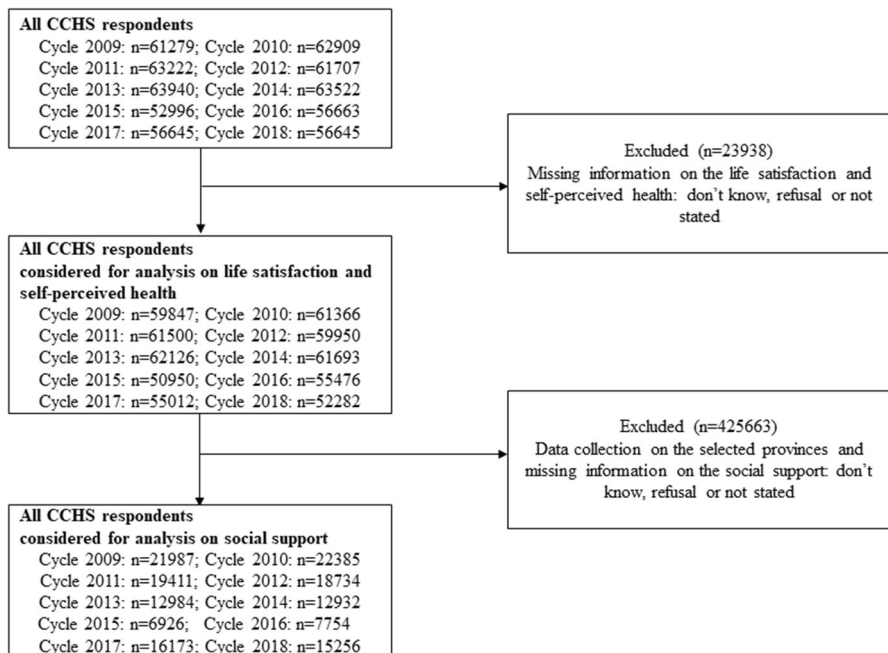

Fig. 1 Sample size flow chart for the analytic analysis

question. The responses were not influenced by the day of the week or month in which the survey was completed (Bonikowska et al., 2014). Previous research suggested that a score of 9 or 10 corresponded to a high-level life satisfaction (Lu et al., 2015). The item has been widely used and considered as a reliable and valid measure to assess life satisfaction (Diener et al., 2012).

Self-Perceived Health Respondents were asked to use their judgment to respond to a single question on health status: "In general, would you say your health is…?" Answers include "Excellent", "Very good", "Good", "Fair", and "Poor". This is a global assessment question widely used in research studies and has been documented as a very good predictor of future health and use of health services (Faytong-Haro & Santos-Lozada, 2021). Self-perceived health was further dichotomized in this present study, with 'excellent', 'very good', and 'good' responses being categorized as 'good', and 'fair' and 'poor' responses being categorized as 'poor'.

Social Support From 2009 to 2010, social support was measured by the Medical Outcomes Study Social Support Survey (Sherbourne & Stewart, 1991). The total scores of 20 items covering four sub-scales, namely, tangible support, positive social interaction, emotional or informational support, and affection were derived from this survey. From 2011 to 2018, social support was measured by a 10-item version of the Social Provisions Scale (SPS) developed by Cutrona and Russell (1987). It includes five main social provisions measuring attachment, guidance, social integration, reliable alliance, and reassurance of worth. The psychometric properties of the 10-item SPS have been published elsewhere (Steigen & Bergh, 2019). Because data collection on social support varied among the provinces and territories during the study period, we only analyzed the 2011 and 2018 datasets, which had more comparable data on social support at a national level.

Socio-Demographic Characteristics Respondents were also asked to complete information on the following characteristics: age (categorized as:12–19/20–29/30–39/40–49/50–59/60–69/70+), gender (men/women), ethnicity (white/non-white), immigration status (yes/no), personal income (categorized as: less than $20,000/$20,000-$39,000/$40,000-$59,000/$60,000-$79,000/$80,000 or more), education (grouped into less than secondary degree/secondary degree/some post-secondary degree/post-secondary degree), marital status (couple/single/widowed or divorced), and place of residence (categorized as: rural vs. urban using Statistics Canada definitions).

Statistical Analyses

To explore determinants of LS and SPH, generalized linear regression (GLM) was used to examine potential attributable sociodemographic characteristics for each dataset from 2009 to 2018. We also explored the relationship between LS and SPH while considering the presence of sociodemographic characteristics. Analyses

were based on the sample weights and the bootstrap program released by Statistics Canada.

The role of social support in the associations between LS and SPH was only examined in the datasets of 2011 and 2018, which had consistent social support measurements. Two interaction approaches, multiplicative and additive interactions, were tested. When the total effect of two variables exceeds the multiplication of these two variables, the interaction is multiplicative. In contrast, when the total effect exceeds the sum of these two individual effects, the interaction is additive. In the present study, we examined both the multiplicative and additive interactions between social support and SPH. The additive interaction was considered significant when the 95% CIs of relative excess risk due to interaction (RERI) and attributable proportion (AP) both excluded zero (Andersson et al., 2005). The multiplicative interaction was tested by calculating the interaction of odds ratio (IOR) and its 95% CI and significant multiplicative interaction existed if the 95%CI of IOR did not contain one (Greenland, 1998; Knol et al., 2007). The level of significance was set at a P-value of < 0.05. All the analyses were conducted using STATA software, version 9.0 (StataCorp, 2011).

Results

Changes in the Relationship Between Self-Perceived Health and Life Satisfaction

Overall, SPH and LS were positively and significantly correlated with each other from 2009 to 2018. The correlation steadily increased except for a slight decrease in 2018. There was approximately a 20% increase in the strength of this correlation, from 0.66 in 2009 to 0.75 in 2018. The increase in the correlation was also evident in different subgroups of the population. The strength of correlation remained consistently stronger among women, those aged 50 to 59, and single individuals. Correlations between LS and SPH were more pronounced among Whites, non-immigrants, those with less than a secondary degree, and those reporting earning less than $20,000 annually. Table 1 and Fig. 2 provide details on the relationship between LS and SPH across key sociodemographic subgroups from 2009 to 2018. Notably, the correlation between LS and SPH was more pronounced among people with low levels of social support across the study period. In 2009, the correlation between LS and SPH among those who had a lower level of social support was 0.68, whereas the correlation increased to 0.97 by 2018. In contrast, the increase in the correlation between LS and SPH among those with a higher level of social support ranged from 0.44 in 2009 to 0.63 in 2018.

Characteristics Associated with Good Self-Perceived Health or more Satisfied Life

We identified different sets of characteristics correlated with LS and SPH. Tables 2 and 3 summarize these correlations for LS and SPH, separately. Characteristics, including gender, age, marriage, personal income, and place of residence were

Table 1 Correlations between life satisfaction and self-perceived health, Canada, 2009–2018, by social support and socio-demographic characteristics

Variable	2009 Coef (95%CI)	2010 Coef (95%CI)	2011 Coef (95%CI)	2012 Coef (95%CI)	2013 Coef (95%CI)	2014 Coef (95%CI)	2015 Coef (95%CI)	2016 Coef (95%CI)	2017 Coef (95%CI)	2018 Coef (95%CI)
National level	0.66 (0.63, 0.68)	0.66 (0.64, 0.69)	0.67 (0.65, 0.70)	0.69 (0.66, 0.72)	0.72 (0.70, 0.75)	0.71 (0.68, 0.74)	0.72 (0.701, 0.75)	0.79 (0.77, 0.82)	0.79 (0.76, 0.81)	0.75 (0.73, 0.78)
Social support										
High	0.44 (0.39, 0.49)	0.50 (0.44, 0.56)	0.56 (0.50, 0.62)	0.56 (0.50, 0.62)	0.61 (0.55, 0.66)	0.61 (0.54, 0.69)	0.63 (0.56, 0.70)	0.71 (0.64, 0.78)	0.67 (0.63, 0.72)	0.63 (0.59, 0.68)
Low	0.68 (0.63, 0.73)	0.65 (0.60, 0.70)	0.60 (0.52, 0.68)	0.80 (0.69, 0.90)	0.85 (0.73, 0.97)	0.71 (0.55, 0.88)	0.83 (0.68, 0.97)	0.87 (0.76, 0.98)	0.95 (0.87, 1.03)	0.97 (0.87, 1.07)
Gender										
Men	0.64 (0.60, 0.68)	0.64 (0.60, 0.68)	0.65 (0.61, 0.69)	0.69 (0.65, 0.73)	0.72 (0.68, 0.76)	0.70 (0.65, 0.75)	0.73 (0.69, 0.77)	0.76 (0.72, 0.80)	0.78 (0.75, 0.82)	0.73 (0.69, 0.77)
Women	0.67 (0.64, 0.71)	0.68 (0.65, 0.72)	0.69 (0.66, 0.73)	0.70 (0.66, 0.74)	0.73 (0.69, 0.77)	0.72 (0.68, 0.76)	0.72 (0.68, 0.75)	0.83 (0.79, 0.87)	0.79 (0.76, 0.82)	0.78 (0.74, 0.81)
Age, years										
12–19	0.53 (0.47, 0.60)	0.51 (0.46, 0.57)	0.60 (0.52, 0.68)	0.49 (0.41, 0.57)	0.54 (0.46, 0.61)	0.52 (0.46, 0.58)	0.56 (0.48, 0.63)	0.75 (0.67, 0.83)	0.71 (0.64, 0.77)	0.69 (0.61, 0.77)
20–29	0.61 (0.54, 0.67)	0.57 (0.50, 0.63)	0.58 (0.52, 0.65)	0.62 (0.55, 0.69)	0.63 (0.57, 0.70)	0.67 (0.60, 0.74)	0.62 (0.55, 0.69)	0.68 (0.60, 0.76)	0.72 (0.66, 0.79)	0.69 (0.62, 0.77)
30–39	0.69 (0.61, 0.77)	0.64 (0.57, 0.70)	0.59 (0.53, 0.66)	0.58 (0.51, 0.65)	0.73 (0.64, 0.81)	0.67 (0.58, 0.77)	0.67 (0.61, 0.74)	0.73 (0.66, 0.79)	0.71 (0.65, 0.77)	0.74 (0.66, 0.82)
40–49	0.66 (0.59, 0.72)	0.73 (0.65, 0.80)	0.67 (0.58, 0.75)	0.79 (0.70, 0.89)	0.82 (0.74, 0.91)	0.75 (0.64, 0.87)	0.75 (0.68, 0.83)	0.76 (0.69, 0.84)	0.84 (0.78, 0.90)	0.78 (0.70, 0.85)
50–59	0.74 (0.67, 0.81)	0.75 (0.68, 0.81)	0.79 (0.71, 0.87)	0.78 (0.72, 0.84)	0.80 (0.73, 0.87)	0.80 (0.72, 0.88)	0.80 (0.74, 0.86)	0.89 (0.83, 0.94)	0.85 (0.79, 0.91)	0.86 (0.79, 0.93)
60–69	0.73 (0.67, 0.78)	0.70 (0.64, 0.76)	0.77 (0.71, 0.83)	0.73 (0.67, 0.80)	0.74 (0.69, 0.80)	0.70 (0.65, 0.76)	0.81 (0.76, 0.86)	0.89 (0.81, 0.98)	0.87 (0.81, 0.93)	0.77 (0.72, 0.83)

Table 1 (continued)

Variable	2009 Coef (95%CI)	2010 Coef (95%CI)	2011 Coef (95%CI)	2012 Coef (95%CI)	2013 Coef (95%CI)	2014 Coef (95%CI)	2015 Coef (95%CI)	2016 Coef (95%CI)	2017 Coef (95%CI)	2018 Coef (95%CI)
70+	0.72 (0.67, 0.77)	0.73 (0.68, 0.79)	0.77 (0.71, 0.82)	0.82 (0.76, 0.88)	0.78 (0.73, 0.83)	0.82 (0.76, 0.88)	0.78 (0.73,0.84)	0.87 (0.80, 0.93)	0.80 (0.75, 0.85)	0.80 (0.75,0.85)
Education										
Less than a secondary degree	0.78 (0.70, 0.86)	0.77 (0.70, 0.84)	0.85 (0.74, 0.96)	0.76 (0.66, 0.85)	0.81 (0.74, 0.88)	0.91 (0.81, 1.01)	0.87 (0.79, 0.95)	0.97 (0.89, 1.05)	0.86 (0.77, 0.94)	0.87 (0.78, 0.96)
Secondary degree	0.65 (0.57, 0.72)	0.69 (0.61, 0.77)	0.67 (0.58, 0.76)	0.72 (0.62, 0.81)	0.77 (0.70, 0.85)	0.80 (0.66, 0.95)	0.78 (0.72, 0.84)	0.78 (0.71, 0.85)	0.84 (0.77, 0.90)	0.79 (0.73, 0.85)
Some post-secondary degree	0.70 (0.61, 0.80)	0.73 (0.59, 0.87)	0.67 (0.53, 0.81)	0.78 (0.67, 0.90)	0.95 (0.79, 1.10)	0.70 (0.57, 0.83)	0.76 (0.69, 0.83)	0.90 (0.77, 1.03)	0.80 (0.72, 0.87)	0.79 (0.73, 0.86)
Post-secondary degree	0.63 (0.60, 0.66)	0.64 (0.61, 0.66)	0.66 (0.63, 0.69)	0.67 (0.64, 0.71)	0.69 (0.66, 0.72)	0.67 (0.64, 0.70)	0.68 (0.65, 0.71)	0.76 (0.73, 0.79)	0.76 (0.73, 0.79)	0.73 (0.69, 0.76)
Ethnicity										
White	0.65 (0.63, 0.68)	0.67 (0.65, 0.70)	0.70 (0.67, 0.73)	0.71 (0.68, 0.73)	0.72 (0.69, 0.75)	0.73 (0.69, 0.76)	0.73 (0.71, 0.76)	0.82 (0.79, 0.85)	0.79 (0.77, 0.82)	0.77 (0.74, 0.79)
Non-white	0.65 (0.57, 0.74)	0.61 (0.53, 0.69)	0.54 (0.47, 0.62)	0.64 (0.55, 0.72)	0.75 (0.67, 0.82)	0.64 (0.54, 0.75)	0.69 (0.61, 0.77)	0.71 (0.63, 0.78)	0.77 (0.71, 0.84)	0.70 (0.62, 0.79)
Immigrant status										
Yes	0.67 (0.60, 0.73)	0.65 (0.58, 0.71)	0.65 (0.58, 0.72)	0.64 (0.57, 0.71)	0.73 (0.67, 0.79)	0.67 (0.59, 0.75)	0.71 (0.65, 0.77)	0.72 (0.66, 0.79)	0.78 (0.72, 0.83)	0.74 (0.67, 0.80)
No	0.65 (0.62, 0.67)	0.66 (0.64, 0.74)	0.68 (0.65, 0.71)	0.71 (0.68, 0.74)	0.72 (0.69, 0.75)	0.72 (0.69, 0.75)	0.73 (0.70, 0.75)	0.82 (0.79, 0.85)	0.79 (0.76, 0.81)	0.76 (0.73, 0.79)
Rural–urban										
Urban	0.66 (0.60, 0.73)	0.66 (0.63, 0.68)	0.68 (0.65, 0.71)	0.70 (0.67, 0.74)	0.74 (0.71, 0.77)	0.70 (0.67, 0.74)	0.73 (0.70, 0.76)	0.80 (0.77, 0.84)	0.80 (0.77, 0.83)	0.75 (0.72, 0.78)

Table 1 (continued)

Variable	2009 Coef (95%CI)	2010 Coef (95%CI)	2011 Coef (95%CI)	2012 Coef (95%CI)	2013 Coef (95%CI)	2014 Coef (95%CI)	2015 Coef (95%CI)	2016 Coef (95%CI)	2017 Coef (95%CI)	2018 Coef (95%CI)
Rural	0.64 (0.59, 0.68)	0.69 (0.64, 0.74)	0.65 (0.60, 0.70)	0.65 (0.61, 0.69)	0.67 (0.62, 0.72)	0.73 (0.65, 0.81)	0.68 (0.64, 0.72)	0.76 (0.71, 0.80)	0.73 (0.69, 0.77)	0.77 (0.73, 0.81)
Marital status										
Couple	0.60 (0.57, 0.63)	0.62 (0.58, 0.65)	0.62 (0.59, 0.66)	0.64 (0.60, 0.68)	0.69 (0.66, 0.73)	0.67 (0.62, 0.72)	0.66 (0.63, 0.70)	0.72 (0.69, 0.76)	0.71 (0.68, 0.74)	0.68 (0.65, 0.72)
Single	0.74 (0.67, 0.82)	0.77 (0.71, 0.84)	0.78 (0.72, 0.84)	0.77 (0.71, 0.82)	0.79 (0.71, 0.86)	0.81 (0.74, 0.88)	0.84 (0.78, 0.90)	0.92 (0.86, 0.98)	0.88 (0.83, 0.94)	0.88 (0.82, 0.93)
Widowed or divorced	0.69 (0.65, 0.73)	0.65 (0.61, 0.69)	0.67 (0.62, 0.72)	0.75 (0.69, 0.80)	0.73 (0.68, 0.78)	0.73 (0.68, 0.77)	0.74 (0.69, 0.79)	0.85 (0.79, 0.92)	0.86 (0.81, 0.90)	0.81 (0.76, 0.85)
Personal income										
Less than $20,000	0.83 (0.75, 0.92)	0.85 (0.76, 0.94)	0.78 (0.69, 0.87)	0.88 (0.81, 0.96)	0.85 (0.73, 0.93)	0.89 (0.78, 0.99)	0.86 (0.77, 0.96)	1.00 (0.89, 1.11)	0.95 (0.87, 1.03)	0.92 (0.85, 1.00)
$20,000–$39,000	0.68 (0.62, 0.74)	0.68 (0.62, 0.75)	0.71 (0.65, 0.77)	0.74 (0.68, 0.81)	0.81 (0.74, 0.87)	0.76 (0.66, 0.85)	0.75 (0.69, 0.81)	0.83 (0.77, 0.89)	0.85 (0.79, 0.91)	0.80 (0.74, 0.85)
$40,000–$59,000	0.59 (0.54, 0.65)	0.58 (0.52, 0.64)	0.65 (0.59, 0.71)	0.67 (0.60, 0.74)	0.63 (0.57, 0.69)	0.65 (0.58, 0.71)	0.72 (0.66, 0.77)	0.75 (0.68, 0.82)	0.75 (0.70, 0.81)	0.73 (0.66, 0.80)
$60,000–$79,000	0.58 (0.50, 0.66)	0.55 (0.47, 0.62)	0.59 (0.52, 0.66)	0.56 (0.50, 0.63)	0.63 (0.56, 0.70)	0.64 (0.58, 0.70)	0.65 (0.58, 0.72)	0.75 (0.67, 0.84)	0.74 (0.66, 0.81)	0.75 (0.67, 0.83)
$80,000 or more	0.59 (0.56, 0.63)	0.61 (0.57, 0.64)	0.57 (0.52, 0.63)	0.55 (0.50, 0.60)	0.62 (0.58, 0.66)	0.56 (0.52, 0.60)	0.60 (0.56, 0.63)	0.70 (0.66, 0.74)	0.70 (0.67, 0.74)	0.66 (0.63, 0.70)

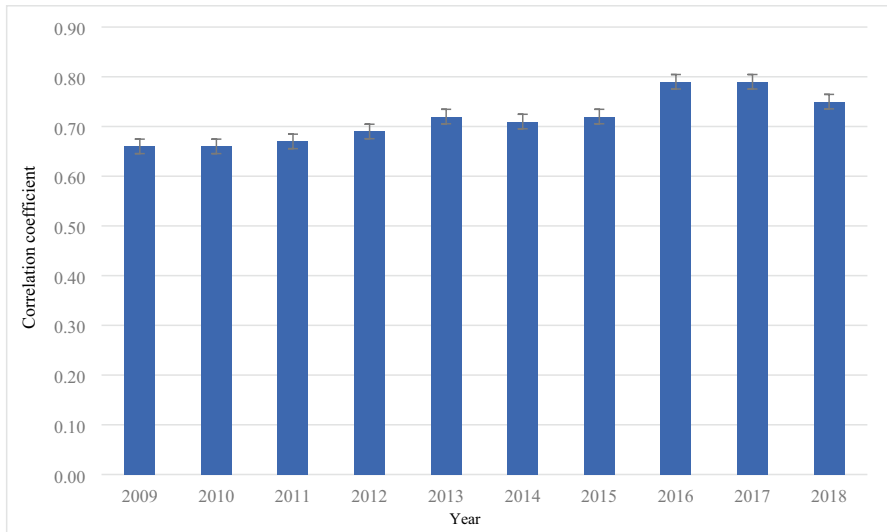Coef: coefficient; 95%CI: 95% confidence interval

Fig. 2 The relationships between life satisfaction and self-perceived health in Canada between 2009 and 2018

correlated with LS. Within the study period, women consistently reported that they had more satisfied lives than men although the difference between women and men narrowed during the study time period. The odds of women reporting more satisfied life was 1.17 in 2009 compared to 1.06 in 2018. We also observed age differences in LS. Compared to older age groups (70 or above), middle-aged individuals had the lowest level of LS, whereas those aged 12 to 19 years old had the highest level of LS. This finding was consistent across the study period. Respondents who were married or common-in law, making $40,000 + annually, or living in the rural regions were more likely to report a higher level of LS during the study period. However, educational attainment, ethnicity, and immigrant status were not correlated with LS.

For SPH, we did not find consistent patterns in the SPH between men and women over time. Unlike the "U" shape of age in LS, there was a consistent decrease in SPH as people aged with narrowing differences over time. Individuals who had a post-secondary education rated their health as good. Those with personal income of $20,000 per year or greater were more likely to report their health as good compared to those with an annual income of less than $20,000. The rest of the studied characteristics, including ethnicity, marital status, immigration status, or place of residence, were not correlated with SPH.

Roles of Social Support and Self-Perceived Health in Life Satisfaction

We examined the roles of both SPH and social support in LS using both the 2011 and the 2018 CCHS datasets. Table 4 summarizes the findings for SPH and social support in LS. In 2011, those who had both a high level of social support and good

Table 2 Correlates of high-level of life satisfaction, Canada, 2009–2018, by socio-demographic characteristics

Variable	2009 OR(95%CI)	2010 OR(95%CI)	2011 OR(95%CI)	2012 OR(95%CI)	2013 OR(95%CI)	2014 OR(95%CI)	2015 OR(95%CI)	2016 OR(95%CI)	2017 OR(95%CI)	2018 OR(95%CI)
Gender										
Men	1	1	1	1	1	1	1	1	1	1
Women	1.17 (1.10, 1.24)	1.15 (1.08, 1.22)	1.10 (1.04, 1.18)	1.14 (1.07, 1.22)	1.20 (1.12, 1.27)	1.20 (1.12, 1.28)	1.14 (1.07, 1.21)	1.13 (1.06, 1.20)	1.08 (1.01, 1.14)	1.06 (1.00, 1.13)
Age, years										
12–19	1.66 (1.45, 1.91)	1.63 (1.42, 1.88)	1.39 (1.20, 1.62)	1.73 (1.49, 2.01)	1.51 (1.30, 1.74)	1.47 (1.27, 1.71)	2.02 (1.73, 2.37)	2.50 (2.16, 2.90)	2.02 (1.74, 2.35)	2.18 (1.87, 2.54)
20–29	1.06 (0.94, 1.20)	1.13 (1.01, 1.27)	0.79 (0.69, 0.90)	1.01 (0.89, 1.15)	0.84 (0.74, 0.95)	0.84 (0.73, 0.95)	0.93 (0.81, 1.06)	1.13 (1.00, 1.28)	0.91 (0.80, 1.03)	0.98 (0.86, 1.11)
30–39	0.84 (0.75, 0.93)	0.88 (0.79, 0.98)	0.72 (0.64, 0.82)	0.84 (0.75, 0.94)	0.69 (0.61, 0.77)	0.67 (0.60, 0.76)	0.67 (0.60, 0.75)	0.90 (0.81, 1.01)	0.80 (0.72, 0.89)	0.79 (0.71, 0.89)
40–49	0.67 (0.60, 0.75)	0.70 (0.62, 0.79)	0.62 (0.54, 0.70)	0.66 (0.59, 0.75)	0.56 (0.50, 0.64)	0.61 (0.54, 0.69)	0.60 (0.53, 0.67)	0.78 (0.69, 0.87)	0.72 (0.65, 0.81)	0.63 (0.56, 0.71)
50–59	0.72 (0.65, 0.80)	0.76 (0.68, 0.85)	0.63 (0.56, 0.71)	0.71 (0.63, 0.80)	0.63 (0.56, 0.70)	0.66 (0.59, 0.74)	0.66 (0.59, 0.74)	0.78 (0.70, 0.87)	0.67 (0.61, 0.75)	0.70 (0.63, 0.78)
60–69	0.96 (0.87, 1.05)	0.95 (0.86, 1.05)	0.83 (0.75, 0.92)	0.89 (0.80, 0.99)	0.82 (0.75, 0.91)	0.84 (0.77, 0.93)	0.85 (0.77, 0.95)	0.91 (0.82, 1.00)	0.80 (0.73, 0.88)	0.90 (0.81, 1.00)
70+	1	1	1	1	1	1	1	1	1	1
Education										
Less than a secondary degree	1	1	1	1	1	1	1	1	1	1
Secondary degree	1.16 (1.02, 1.32)	1.01 (0.88, 1.15)	1.07 (0.94, 1.22)	0.98 (0.85, 1.13)	0.99 (0.86, 1.14)	1.04 (0.91, 1.18)	0.88 (0.77, 1.00)	0.93 (0.82, 1.05)	0.90 (0.79, 1.01)	0.94 (0.82, 1.07)
Some post-secondary degree	0.95 (0.81, 1.12)	0.90 (0.77, 1.06)	0.95 (0.79, 1.14)	0.94 (0.77, 1.17)	0.95 (0.77, 1.19)	0.93 (0.76, 1.14)	0.93 (0.81, 1.07)	0.92 (0.81, 1.05)	0.93 (0.82, 1.06)	0.87 (0.75, 1.00)

Table 2 (continued)

Variable	2009 OR(95%CI)	2010 OR(95%CI)	2011 OR(95%CI)	2012 OR(95%CI)	2013 OR(95%CI)	2014 OR(95%CI)	2015 OR(95%CI)	2016 OR(95%CI)	2017 OR(95%CI)	2018 OR(95%CI)
Post-secondary degree	1.13 (1.01, 1.26)	1.07 (0.97, 1.20)	1.02 (0.91, 1.14)	1.03 (0.92, 1.16)	1.05 (0.93, 1.20)	0.97 (0.87, 1.08)	0.99 (0.88, 1.12)	1.06 (0.95, 1.18)	1.02 (0.92, 1.14)	1.02 (0.90, 1.15)
Ethnicity										
White	1.26 (1.11, 1.42)	1.18 (1.04, 1.33)	1.10 (0.97, 1.25)	1.25 (1.09, 1.43)	1.21 (1.07, 1.37)	1.10 (0.97, 1.25)	0.99 (0.88, 1.12)	1.16 (1.04, 1.31)	1.16 (1.04, 1.30)	1.06 (0.94, 1.20)
Non-white	1	1	1	1	1	1	1	1	1	1
Immigrant status										
Yes	0.95 (0.86, 1.05)	0.88 (0.79, 0.97)	0.87 (0.78, 0.97)	0.89 (0.80, 1.00)	0.89 (0.80, 0.98)	0.94 (0.84, 1.05)	0.97 (0.87, 1.07)	0.98 (0.89, 1.08)	1.06 (0.96, 1.17)	1.01 (0.91, 1.12)
No	1	1	1	1	1	1	1	1	1	1
Rural–urban										
Urban	1	1	1	1	1	1	1	1	1	1
Rural	1.24 (1.17, 1.33)	1.25 (1.17, 1.34)	1.21 (1.14, 1.30)	1.17 (1.09, 1.26)	1.18 (1.10, 1.26)	1.17 (1.09, 1.26)	1.26 (1.18, 1.35)	1.25 (1.17, 1.33)	1.23 (1.15, 1.31)	1.19 (1.11, 1.27)
Marital status										
Couple	1.64 (1.50, 1.80)	1.77 (1.61, 1.94)	1.56 (1.41, 1.71)	1.77 (1.61, 1.96)	1.69 (1.53, 1.86)	1.74 (1.57, 1.93)	1.79 (1.61, 1.98)	1.93 (1.76, 2.11)	1.62 (1.47, 1.78)	1.86 (1.69, 2.05)
Widowed or divorced	1.05 (0.93, 1.19)	1.02 (0.90, 1.15)	0.88 (0.78, 0.99)	1.16 (1.01, 1.33)	1.03 (0.91, 1.17)	1.08 (0.95, 1.23)	1.09 (0.96, 1.23)	1.29 (1.15, 1.45)	0.99 (0.88, 1.11)	1.12 (0.99, 1.25)
Single	1	1	1	1	1	1	1	1	1	1
Personal income										
Less than $20,000	1	1	1	1	1	1	1	1	1	1
$20,000-$39,000	1.08 (0.95, 1.23)	1.12 (0.97, 1.30)	1.10 (0.97, 1.24)	1.15 (1.01, 1.31)	1.20 (1.05, 1.37)	1.14 (0.99, 1.32)	1.07 (0.93, 1.23)	1.11 (0.96, 1.28)	1.28 (1.12, 1.46)	1.00 (0.86, 1.18)

Table 2 (continued)

Variable	2009 OR(95%CI)	2010 OR(95%CI)	2011 OR(95%CI)	2012 OR(95%CI)	2013 OR(95%CI)	2014 OR(95%CI)	2015 OR(95%CI)	2016 OR(95%CI)	2017 OR(95%CI)	2018 OR(95%CI)
$40,000-$59,000	1.21 (1.06, 1.39)	1.26 (1.08, 1.46)	1.28 (1.12, 1.46)	1.37 (1.20, 1.57)	1.41 (1.23, 1.62)	1.35 (1.16, 1.56)	1.36 (1.18, 1.57)	1.30 (1.12, 1.51)	1.22 (1.06, 1.39)	1.07 (0.91, 1.25)
$60,000-$79,000	1.27 (1.10, 1.47)	1.37 (1.17, 1.61)	1.41 (1.23, 1.62)	1.42 (1.23, 1.63)	1.49 (1.30, 1.72)	1.65 (1.42, 1.92)	1.42 (1.22, 1.64)	1.30 (1.11, 1.52)	1.44 (1.25, 1.65)	1.24 (1.06, 1.46)
$80,000 or more	1.52 (1.34, 1.73)	1.59 (1.38, 1.83)	1.65 (1.45, 1.88)	1.74 (1.53, 1.98)	1.78 (1.56, 2.03)	2.09 (1.81, 2.41)	1.87 (1.63, 2.15)	1.64 (1.43, 1.89)	1.72 (1.52, 1.95)	1.44 (1.24, 1.67)

OR: Odds ratio; 95%CI: 95% confidence interval

Table 3 Correlates of good self-perceived health, Canada, 2009–2018, by socio-demographic characteristics

Variable	2009 OR(95%CI)	2010 OR(95%CI)	2011 OR(95%CI)	2012 OR(95%CI)	2013 OR(95%CI)	2014 OR(95%CI)	2015 OR(95%CI)	2016 OR(95%CI)	2017 OR(95%CI)	2018 OR(95%CI)
Gender										
Men	1	1	1	1	1	1	1	1	1	1
Women	1.07 (0.98, 1.17)	1.13 (1.03, 1.25)	1.03 (0.93, 1.14)	1.08 (0.97, 1.20)	1.14 (1.03, 1.25)	1.14 (1.03, 1.27)	1.03 (0.93, 1.14)	0.94 (0.85, 1.04)	0.97 (0.88, 1.06)	0.96 (0.87, 1.06)
Age, years										
12–19	7.31 (5.73, 9.32)	4.69 (3.65, 6.02)	4.52 (3.46, 5.90)	5.85 (4.50, 7.62)	4.32 (3.33, 5.59)	4.37 (3.34, 5.72)	6.13 (4.58, 8.22)	6.11 (4.31, 8.67)	5.11 (3.85, 6.80)	4.62 (3.39, 6.29)
20–29	5.57 (4.55, 6.83)	5.11 (4.13, 6.33)	3.97 (3.12, 5.04)	3.77 (3.00, 4.75)	3.69 (2.91, 4.69)	3.30 (2.59, 4.19)	3.19 (2.50, 4.05)	3.62 (2.89, 4.53)	3.13 (2.56, 3.82)	3.30 (2.66, 4.10)
30–39	4.32 (3.63, 5.14)	3.25 (2.64, 3.99)	2.96 (2.40, 3.65)	3.09 (2.53, 3.79)	2.47 (2.03, 3.01)	2.37 (1.92, 2.92)	2.16 (1.79, 2.62)	2.89 (2.41, 3.46)	2.46 (2.08, 2.92)	2.55 (2.06, 3.15)
40–49	2.43 (2.08, 2.85)	2.01 (1.70, 2.38)	1.80 (1.49, 2.18)	1.87 (1.53, 2.29)	1.45 (1.22, 1.74)	1.69 (1.40, 2.05)	1.60 (1.34, 1.91)	1.73 (1.44, 2.08)	1.64 (1.40, 1.92)	1.66 (1.40, 1.96)
50–59	1.62 (1.41, 1.86)	1.37 (1.18, 1.60)	1.40 (1.20, 1.62)	1.37 (1.17, 1.60)	1.02 (0.88, 1.18)	1.11 (0.94, 1.32)	1.14 (0.98, 1.32)	1.11 (0.96, 1.28)	1.10 (0.95, 1.27)	1.25 (1.09, 1.44)
60–69	1.36 (1.21, 1.53)	1.24 (1.10, 1.41)	1.17 (1.01, 1.36)	1.24 (1.09, 1.42)	1.04 (0.91, 1.19)	1.09 (0.96, 1.25)	1.07 (0.93, 1.23)	1.11 (0.97, 1.27)	0.95 (0.84, 1.07)	1.12 (0.99, 1.27)
70+	1	1	1	1	1	1	1	1	1	1
Education										
Less than a secondary degree	1	1	1	1	1	1	1	1	1	1
Secondary degree	1.35 (1.14, 1.60)	1.28 (1.15, 1.58)	1.16 (0.97, 1.38)	1.18 (0.99, 1.40)	1.30 (1.10, 1.55)	1.37 (1.16, 1.62)	1.24 (1.06, 1.45)	1.36 (1.17, 1.59)	1.19 (1.02, 1.37)	1.43 (1.22, 1.67)
Some post-secondary degree	1.31 (1.07, 1.61)	1.12 (0.93, 1.39)	1.45 (1.14, 1.83)	1.21 (0.91, 1.60)	1.07 (0.82, 1.39)	1.46 (1.13, 1.88)	1.31 (1.10, 1.55)	1.17 (0.97, 1.41)	1.30 (1.11, 1.54)	1.50 (1.26, 1.78)

Table 3 (continued)

Variable	2009 OR(95%CI)	2010 OR(95%CI)	2011 OR(95%CI)	2012 OR(95%CI)	2013 OR(95%CI)	2014 OR(95%CI)	2015 OR(95%CI)	2016 OR(95%CI)	2017 OR(95%CI)	2018 OR(95%CI)
Post-secondary degree	1.59 (1.40, 1.80)	1.62 (1.43, 1.84)	1.52 (1.31, 1.77)	1.45 (1.27, 1.67)	1.75 (1.49, 2.05)	1.61 (1.41, 1.84)	1.64 (1.41, 1.90)	1.73 (1.50, 2.00)	1.88 (1.65, 2.15)	1.98 (1.72, 2.28)
Ethnicity										
White	1.15 (0.95, 1.39)	1.09 (0.87, 1.36)	0.91 (0.72, 1.15)	1.16 (0.93, 1.44)	0.91 (0.73, 1.13)	0.93 (0.75, 1.16)	0.90 (0.73, 1.11)	1.02 (0.83, 1.24)	1.03 (0.85, 1.24)	1.16 (0.89, 1.51)
Non-white	1	1	1	1	1	1	1	1	1	1
Immigrant status										
Yes	1.03 (0.90, 1.17)	0.97 (0.84, 1.13)	0.97 (0.81, 1.17)	1.16 (1.00, 1.35)	1.03 (0.88, 1.21)	1.03 (0.88, 1.21)	1.17 (1.00, 1.37)	0.92 (0.79, 1.07)	1.05 (0.91, 1.22)	1.40 (1.14, 1.71)
No	1	1	1	1	1	1	1	1	1	1
Rural – urban										
Urban	1	1	1	1	1	1	1	1	1	1
Rural	0.98 (0.89, 1.08)	1.02 (0.92, 1.13)	1.07 (0.96, 1.19)	1.06 (0.95, 1.17)	1.09 (0.98, 1.21)	1.21 (1.09, 1.34)	1.04 (0.94, 1.15)	1.00 (0.90, 1.12)	1.05 (0.96, 1.15)	1.16 (1.05, 1.27)
Marital status										
Couple	1.21 (1.06, 1.38)	1.06 (0.91, 1.22)	1.30 (1.12, 1.52)	1.25 (1.07, 1.46)	1.06 (0.91, 1.23)	1.13 (0.97, 1.31)	1.29 (1.11, 1.49)	1.28 (1.11, 1.48)	1.27 (1.12, 1.44)	1.21 (1.04, 1.41)
Widowed or divorced	1.09 (0.94, 1.27)	0.88 (0.74, 1.04)	1.03 (0.86, 1.24)	1.05 (0.87, 1.27)	1.08 (0.91, 1.28)	1.10 (0.94, 1.29)	1.10 (0.93, 1.29)	1.17 (1.00, 1.36)	0.95 (0.82, 1.10)	1.08 (0.92, 1.26)
Single	1	1	1	1	1	1	1	1	1	1
Personal income										
Less than $20,000	1	1	1	1	1	1	1	1	1	1
$20,000-$39,000	1.76 (1.54, 2.01)	1.75 (1.50, 2.03)	1.50 (1.31, 1.72)	1.54 (1.32, 1.80)	1.70 (1.47, 1.96)	1.41 (1.22, 1.64)	1.60 (1.39, 1.84)	1.67 (1.43, 1.96)	1.58 (1.38, 1.80)	1.57 (1.35, 1.82)

Table 3 (continued)

Variable	2009 OR(95%CI)	2010 OR(95%CI)	2011 OR(95%CI)	2012 OR(95%CI)	2013 OR(95%CI)	2014 OR(95%CI)	2015 OR(95%CI)	2016 OR(95%CI)	2017 OR(95%CI)	2018 OR(95%CI)
$40,000-$59,000	2.52 (2.17, 2.93)	2.72 (2.26, 3.27)	2.18 (1.85, 2.56)	2.34 (1.98, 2.78)	2.67 (2.27, 3.15)	2.3 2(1.98, 2.73)	2.54 (2.17, 2.97)	2.25 (1.88, 2.69)	1.90 (1.63, 2.21)	2.08 (1.76, 2.46)
$60,000-$79,000	2.87 (2.39, 3.45)	3.27 (2.66, 4.02)	2.62 (2.18, 3.15)	3.25 (2.68, 3.95)	3.59 (2.98, 4.32)	2.63 (2.19, 3.17)	3.06 (2.54, 3.70)	2.87 (2.32, 3.56)	2.25 (1.87, 2.71)	2.44 (2.04, 2.92)
$80,000 or more	3.08 (2.66, 3.56)	3.29 (2.78, 3.89)	3.42 (2.85, 4.11)	4.32 (3.55, 5.25)	4.68 (3.88, 5.63)	4.07 (3.41, 4.86)	4.04 (3.40, 4.81)	3.98 (3.32, 4.76)	3.09 (2.65, 3.60)	3.43 (2.91, 4.04)

OR: Odds ratio; 95%CI: 95% confidence interval

Table 4 The separate and combined effects of social support and self-perceived health on life satisfaction: Canada, 2011 and 2018

Predictors	High level of life satisfaction			
	OR(95%CI)	AOR(95%CI)	Additivity RERI(95%CI)	Multiplicativity (95%CI)
2011				
Low social support and poor self-perceived health	1.00(Ref)	1.00(Ref)		
High social support	1.68(1.32, 2.14)	1.59(1.25, 2.02)		
Good self-perceived health	3.34(2.77, 4.02)	3.29(2.70, 4.00)		
Both high social support and good self-perceived health	6.52(5.41, 7.85)	6.18(5.13, 7.44)	2.23(1.74, 2.86)	1.81(0.92, 1.51)
2018				
Low social support and poor self-perceived health	1.00(Ref)	1.00(Ref)		
High social support	3.03(2.19, 4.18)	2.85(2.07, 3.94)		
Good self-perceived health	5.63(4.18, 7.58)	5.27(3.89, 7.13)		
Both high social support and good self-perceived health	13.03(9.74,17.42)	11.94(8.93, 15.97)	4.83(3.31, 6.34)	0.80(0.57, 1.12)

OR: Odds ratio; *AOR*: Adjusted odds ratio. Age, gender, ethnicity, immigration status, income, education, marital status, and place of residence were controlled; 95%CI: 95% confidence interval; RERI: relative excess risk due to interaction

SPH were more likely to report a higher level of LS, compared to those with a lower level of social support and poor SPH (OR: 6.52, 95% CI: 5.41–7.85). After adjusting for age, gender, ethnicity, immigration status, personal income, education, marital status, and place of residence, the association attenuated somewhat but remained highly statistically significant (OR: 6.18, 95% CI: 5.13–7.44). The combined effect of good SPH and a higher level of social support in LS was even more substantial compared to those with a lower level of social support and poor SPH in 2018 (OR: 13.03; 95% CI: 9.74–17.42). After taking into account all the studied sociodemographic characteristics, the association remained statistically significant (OR: 11.94, 95% CI: 8.93–15.97). We observed a significant additive interaction between social support and SPH both in 2011 (RERI: 2.23, 95% CI: 1.74–2.86; AP: 0.37, 95% CI: 0.28–0.46) and 2018 (RERI: 4.83, 95% CI: 3.31–6.34; AP: 0.40, 95% CI: 0.17–0.64), respectively. Compared to participants with a lower level of social support and poor SPH, those with higher levels of social support and good SPH were 2.23 times more likely in 2011 and 4.83 times in 2018 to report a high level of LS. No multiplicative interactions were identified between SPH and social support in LS for 2011 and 2018.

Discussion

The present study was one of the first studies thoroughly examining the relationship between LS and SPH and identified the importance of social support in the correlation of LS and SPH using data from repeated nationally representative samples over a 10-year period. SPH and LS were positively and significantly correlated with each other, and their correlation increased over time. Women, those aged 50 to 59 years old, single individuals, Whites, non-immigrants, those with less than a secondary degree, or making less than $20,000 annually, reported stronger correlations. We also examined separately the characteristics that were linked to LS and SPH. Consistently, younger age groups or people with higher income were the most likely to be satisfied with their lives and report good SPH. In addition, women, those who were married or common-in law, or lived in the rural regions, were more likely to report a higher level of LS, whereas those with higher levels of education were consistently associated with good SPH. People with a lower level of social support tended to have a stronger correlation between LS and SPH and experienced a bigger increase in their correlations of LS and SPH over the time period of the study. A significant additive interaction was also found between social support and SPH in LS. People with both a higher level of social support and good SPH would report a higher level of LS than the sum of the individual effects of social support and SPH on LS.

A strong positive correlation between LS and SPH was found, and it increased slightly over the years of the study. In line with our results, a cross-sectional study of young adults in the Netherlands found a positive correlation between SPH and levels of LS (Arrindell et al., 1999). A longitudinal cross-lagged study provides further evidence demonstrating a unidirectional relationship from SPH to LS, suggesting that poor SPH significantly predicts subsequent lower levels of LS (Gana et al.,

2013). The current study adds to the emerging literature by examining comparable repeated cross-sectional studies, which allows for a robust estimation of the changes of relationships between LS and SPH over time. The timing of the changes in the relationship between LS and SPH coincided with the increase in the prevalence of LS. The association between LS and SPH might be explained by several plausible mechanisms. SPH reflects many essential aspects of an individual's life and is therefore a powerful indicator of LS (Kööts-Ausmees & Realo, 2015). Research has also shown that genetic factors account for a considerable amount of the variance in both LS and SPH, thus the relationship between a person's general view on life and perception of their health is, to a certain extent, driven by a set of common genes (Røysamb et al., 2003). In addition, several cultural and societal factors have been shown to affect both LS and SPH, e.g., age, income, education, marital status, rurality, etc. These factors can influence norms for positive emotions and life goals as well as health evaluations and perceptions, and beliefs about diseases (Diener et al., 2003; Staudinger et al., 1999).

We found that the strength of the correlation between LS and SPH varied by socio-demographic characteristics. Specifically, we found that the correlation was consistently stronger among women, elderly, who were single, Whites, non-immigrants, those with less education, and making lower annual personal income. Consistent with our study, Siedlecki et al. (2008) found there was a strong correlation between health perception and LS and the correlation increased as people aged. A European study showed that the relationship between LS and SPH was pronounced among disadvantaged populations, for instance, those who made less income and had a lower level of education, reported stronger correlations between LS and SPH (Kööts-Ausmees & Realo, 2015). One potential explanation for the phenomenon is a high level of differential discriminatory power of age, gender, and socioeconomic status for LS and SPH (Atienza-González et al., 2020). Men, young population, married/partnered, more educated, and with higher income, were found to be associated with an increased likelihood of being resilient which were the key characteristics accounting for individuals' higher levels of LS and health perception (Infurna et al., 2017). In contrast, immigrants tend to experience economic and social challenges, which can negatively influence their perceptions of health (Kööts-Ausmees & Realo, 2015), leading to a weaker relationship between LS and SPH.

We also found that age and personal income were consistently associated with both LS and SPH across the study years. There was a decline in the percentage of people reporting their health as 'good' as they aged. Previous studies have shown that increased age is frequently associated with an increase in health problems and functional limitations thus negatively affecting health perceptions (Statistics Canada, 2016). However, the relationship between LS and age exhibits a "U" shape with both younger and older adults being more satisfied with life. This is consistent with previous research on LS (Blanchflower & Oswald, 2008; Uppal & Barayandema, 2018). The differential role of age in SPH and LS may be partially explained by two processes. First, as people age, their focus shifts from knowledge-related goals to emotion-related goals (Carstensen, 1991). Older people tended to prioritize emotional satisfaction and this helps to explain why, despite the inevitable losses encountered in old age, older adults nonetheless report higher levels of LS (Herzog & Rodgers,

1981). Second, declines in SPH are often tied to health generally deteriorating with advancing age (Spuling et al., 2017). We also observed in this current study that individuals with a high level of personal income had a higher level of LS and better SPH. This finding is similar to previous studies suggesting that the socio-economic position may be important influences of people's LS and SPH (Fernández-Ballesteros et al., 2001; Kurtinová, 2015). Individuals in lower socioeconomic strata are more likely to experience disadvantaged stressful lives, such as more marital disruptions, inadequate education, and access to medical services, which can trigger a negative view of life and poorer health outcomes (Goldman, 1994).

In addition to those shared determinants of LS and SPH, we also found gender, marital status, and place of residence were only correlated with LS. Specifically, women, who were married or common-in law, lived in the rural regions, were more likely to report a higher level of LS. Gender differences in the LS were also reported in the recent literature (Cavallo et al., 2015; Fortin et al., 2015). Gender-patterned socialization could in part explain different specializations, expectations, and worldviews, and improvements in gender inequality have contributed to the gradual closing of such gender gaps (Graham & Chattopadhyay, 2012). Eckermann (2012) also suggests that resilience is a key factor accounting for women's higher levels of LS. Alongside gender differences in LS, our results indicated that married people were more satisfied with their lives compared to those not married with this gap widening over time. This is consistent with other studies from different countries (Stack, 1998; Verbakel, 2012). For example, Corra et al. (2009) reported this marriage-related LS gap increased in the USA between the years 1973 and 2006, which was explained by the fact that the increased LS among married individuals could be resulting from the improvements in the social conditions of marriage over time. Married couples are at a lower risk of poverty, have higher social integration, or suffer from fewer health problems, which contribute to their higher levels of LS (Waite, 2000). Additionally, rural residents were more satisfied with life compared to those residents living in urban, but this gap shrank during the study period. Our findings are consistent with the evidence supporting an urban–rural happiness gradient in North America and European countries (Helliwell et al., 2019; Sørensen, 2014). Higher LS levels in rural areas are particularly explained by higher degrees of community attachment, housing affordability, and lower living expenses (Burger et al., 2020). However, this urban–rural gap has gradually diminished over studied decade because advancements in communication and transportation have reduced rural–urban disparities.

For SPH, education was found to be an important sociodemographic characteristic influencing health perception. We found this education-health gap remained significant across all years and widened over the study time period. In line with our study findings, Andrade and Mehta (2018) found that respondents with higher education reported better SPH compared to respondents with lower levels of education. The association between education and health is one of the most robust relationships in the social sciences, with substantial evidence indicating that there is a causal influence of education on health (Jindrová & Labudová, 2020; Pärna & Ringmets, 2010).

The relationship between LS and SPH varied across different levels of social support. The correlation between LS and SPH was stronger among people with a

low level of social support compared to those with a high level of social support. Social support could be considered as a protective factor to mitigate the negative effect that health and functional impairment can have on LS (Berg et al., 2009; Lyubomirsky et al., 2005). Thus, for those individuals with a high level of social support, the weaker correlation between SPH and LS might be explained by the fact that health perception is less important for LS when a high level of social support is available. We also identified an additive effect of SPH and social support on LS. In line with our study findings, Dumitrache et al. (2017) found a significant interactive effect of social support and perceived health on LS. Their study showed that participants who had poor health, but enough social support reported higher levels of LS than those who had poor health and lower levels of social support. The additive interaction suggests that public health promotions aimed at improving wellbeing could benefit more by improving both social support and self-perception of health.

The findings of the present study have the potential to influence practice. Factors that are associated with positive psychological health, including SPH and social support, could be the targets to improve an individual's health and well-being, especially their additive effect on LS. Social support can be further categorized into four broad subtypes, which include instrumental support (provision of tangible aid and services), emotional support (provision of empathy, love, trust, and caring), informational support (provision of beneficial advice, suggestions, and information), and appraisal support (provision of constructive feedback and affirmation) (Cohen et al., 2000). These subtypes of social support could then be more specifically focused for more targeted promotion among sub-populations with different sociodemographic characteristics. For instance, instrumental support is much needed for the low socioeconomic status populations. Population health promotion should enable individuals and communities to increase control over and improve their health and well-being.

The findings of the present study also have theoretical implications regarding the processes that lead to the development and maintenance of well-being. So far, the majority of the literature has emphasized the importance of a single factor in health promotion. The identified interactive effect of SPH and social support on LS suggests that there are multiple factors involved in the theoretical framework of well-being and interventions targeting more than one factor at a time could have better achievement in health promotion.

Several limitations of the study should be noted. First, the cross-sectional nature of datasets analyzed in this study cannot support causal inference given it does not have the temporal order of causality. However, this series of national surveys provide insights into dynamic changes in the relationship between LS and SPH and determinants associated with LS and SPH over a decade. Second, self-reported measures of social support, SPH, and LS may introduce measurement errors, which may lead to spurious relationships. However, measurements of social support, SPH, and LS used in the current study have been widely used elsewhere and have been proven to be stable and reliable (Caron, 1996; Faytong-Haro & Santos-Lozada, 2021; Howell et al., 2007). Third, the measurements for social support were different before the year 2010 and after the year 2010. Social support availability was used to assess social support in the years 2009 and 2010. From 2011 onwards, social support was assessed by the Social Provisions Scale, which may affect the comparability among

the findings on the role of social support in the relationships between LS and SPH, thus comparisons cannot be made directly. In addition, we only examined the role of social support in the association between LS and SPH in the datasets of 2011 and 2018, which had the same measurements for social support. Although the findings of the present study allude to the importance of social support in the correlation of LS and SPH, further work is needed to explore how social support is involved in changes in these associations.

Conclusion

SPH and LS were positively and significantly correlated with each other, and this correlation increased over the study time period. LS and SPH were correlated with different sets of socio-demographic characteristics. The relationship between LS and SPH varied across different levels of social support, and an additive interaction between social support and SPH was observed in LS. The findings of the study suggest targeted health promotions for wellbeing should focus on those identified characteristics and pay particular attention to the additive effect of SPH and social support.

Declarations

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