Gender-specific correlates of perceived life stress: a population-based study, Montreal, Canada, 2012

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Abstract

Objectives To identify the gender-specific correlates of perceived life stress in a representative sample of the Montreal population.

Method Data were extracted from the Local Health Survey Program (called “TOPO”) collected in 2012. TOPO-2012 provided information on chronic diseases, their determinants and risk factors, as well as lifestyle and health services utilization. Poisson regression was used to identify significant correlates of perceived life stress.

Results Single-parent females were 21% more likely (RR = 1.21; 95% CI = 1.04–1.42) to report stressful life compared to females living alone. Females born in Canada or established female immigrants were significantly more likely to report stressful life (respectively RR = 1.34; 95% CI = 1.12–1.60 and RR = 1.31; 95% CI = 1.08–1.58) than recent female immigrants. Furthermore, females living in a privileged material neighbourhood reported significantly higher perceived life stress (14% higher) than females living in a deprived neighbourhood. On the other hand, males with higher annual household income were 9% more likely (OR = 1.09; 95% CI = 1.05–1.14) to perceive life stress than males reporting a lower income. Also, overweight males reported higher stress (RR = 1.13; 95% CI = 1.01–1.26) than their normal weighted counterparts. Additionally, males who were diagnosed with a physical health problem were more likely to report stressful life (RR = 1.44; 95% CI = 1.28–1.61) than males who did not report any physical health problem.

Conclusion Identifying correlates of stress at the population level may help researchers characterize people vulnerable to daily stress, provide health agencies the advantage to forecast and prevent its occurrence and diseases associated with it, as well as offer policy advocates a pivotal edge to reduce disparities in population health.

Résumé

Objectifs Identifier, séparément pour chaque sexe, les variables associées au niveau de stress perçu dans un échantillon représentatif de la population montréalaise.

Méthode Les données proviennent de l'enquête TOPO 2012. Celle-ci documente les maladies chroniques, leurs déterminants, les facteurs de risque associés, ainsi que les habitudes de vie et l'utilisation des services de santé. Des régressions de Poisson ont été utilisées pour identifier les associations avec le stress perçu.

Résultats Les mères monoparentales sont 21 % plus susceptibles (RR = 1,21; 95% CI = 1,04–1,42) de rapporter un niveau de stress élevé comparativement aux femmes vivant seules. Les femmes nées au Canada et les immigrantes établies sont significativement plus susceptibles (RR = 1,34; 95% CI = 1,12–1,60 et RR = 1,31; 95% CI = 1,08–1,58, respectivement) de déclarer vivre du stress que les nouvelles arrivantes. En outre, les femmes vivant dans des quartiers favorisés sur le plan matériel rapportent significativement plus de stress perçu (14 %) que les femmes de quartiers défavorisés. Par ailleurs, les hommes dont le revenu annuel du ménage est élevé sont 9 % plus susceptibles (RR = 1,09; 95% CI = 1,05–1,14) de ressentir un stress élevé que ceux qui rapportent un revenu plus faible. Aussi, les hommes en surpoids présentent un stress plus élevé (RR = 1,13; 95%

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CI = 1,01–1,26) que ceux avec un poids santé. Finalement, les hommes avec un problème de santé physique diagnostiqué sont plus susceptibles de rapporter un niveau de stress élevé (RR = 1,44; 95% CI = 1,28–1,61) que ceux qui ne mentionnent aucun problème de santé.

Conclusion L'identification de variables associées au stress au niveau populationnel peut aider les chercheurs à caractériser les personnes vulnérables au stress quotidien, fournir aux agences de santé la possibilité de prédire et de prévenir son occurrence de même que celle des maladies qui lui sont associées, ainsi que suggérer des pistes pour la réduction des inégalités de santé.

Keywords Perceived stress · Gender-specific · Cross-sectional study · Logistic regression

Mots-clés Stress perçu · Sexospécifique · Étude transversale · Régression de Poisson

Introduction

Stress, in its acute or chronic form, is a familiar emotional strain that may originate from expected or unexpected life events or difficult life situations, such as those related to work (promotion or job loss), school (graduation or failing grade), family (new-born or death), relationship (marriage or divorce), friendship (love or assault), as well as instant occurrences (winning a lottery or automobile accident), and disasters whether natural (earthquake or floods) or man-made (war or famine). Additionally, stress may be related to health conditions, financial worries as well as environmental factors, such as neighbourhoods people live in (American Psychological Association 2017a; Schneiderman et al. 2005). However, irrespective of the source of the stress, the human body's reaction to a stressful situation seems to be similar in terms of the changes in the serum hormone level, or its response to initiate a fight-or-flight mechanism (Ranabir and Reetu 2011). On the other hand, the manifestation of stress may have a wide range of health consequences, ranging from occasional episodes of headaches to life-threatening outcomes such as suicide. Hence, stress management and restoration of health to a non-stressful level may be a complicated endeavour due to different sources of stressors, their temporal occurrences, as well as differences in the availability of resources and coping mechanisms (American Psychological Association 2017a).

Although some stress may accompany most of our life experiences, nonetheless, prolonged exposure to a stressor and its poor management is associated with poor emotional, physical and mental well-being of the individual (Vancampfort et al. 2017). Sociological, psychological and epidemiological studies have contributed towards the understanding of stress from diverse perspectives. For instance, socio-demographic variables, such as gender, occupation, marital status, economy, education and social class in sociological studies, have incorporated the role of socio-demographic factors in stress perception (Au 2017; Pearlin 1989). Psychological studies have attempted to explain the association between stress and personality traits such as resilience, coping style and cognitive flexibility (Folkman et al. 1986; Bratte et al. 2013), while epidemiological studies have tried to establish the link between the psychosocial factors,

occurrences of diseases and stress experiences in the population (Schneiderman et al. 2005; Marmont 2003; Susser 1981). According to the American Psychological Association (APA), there are significant differences in stress reporting between men and women. For instance, substantially more women (28%) report higher stress than men (20%). Women mention money (79%) as the main source of stress, while men mention work (32%) as the main source of stress. APA reports gender differences in the physical symptoms of stress as well. For example, women are more likely to report feeling like they could cry (44%), headache (41%) and indigestion (32%) than men (15%, 30% and 21%, respectively). In terms of strategies for managing stress, APA states that women are significantly more likely to read (57%), spend time with friends and family (54%) and go to religious services (27%) than men (34%, 39% and 18%, respectively) (The American Psychological Association 2017b).

Since the prevalence of stress is different between men and women, and they also report different reactions to stress and to stress management, it may be reasonable to study whether there are gender-specific determinants of stress. Furthermore, to our knowledge, no previous study has investigated the correlates of stress specifically in the population of Montreal (Canada). Accordingly, this paper proclaims to describe and identify the gender-specific correlates of perceived life stress of the Montreal population.

Methods

Data and sample

Data of the study were extracted from the 2012 edition of Montreal's Local Health Survey Program called "TOPO-2012" (TOPO is not an acronym; it mimics but does not infer "topology"). The initial sample, comprised of 10,726 individuals (4807 men and 5919 women), represented an estimated 1,650,000 inhabitants of Montreal, Canada, in 2012. However, due to missing dependent variable data, the analysis of the current study is based on 10,676 subjects (4784 males

and 5892 females). Collected information included chronic diseases and their major determinants and risk factors: social conditions (employment, education, immigration, material deprivation), lifestyle (smoking, physical activity, food consumption) and the use of health care services. The study was approved by the Quebec Provincial Public Health Ethics Committee. Data were collected from February 27, 2012, through November 11, 2012, under the supervision of Le Secteur Surveillance de l'État de Santé à Montréal (Health Surveillance in Montreal, Canada).

The sample of this study was extracted in three waves from the Quebec Health Insurance Registry (RAMQ), which covered more than 95% of the Quebec population aged 15 years or older. Collected data included variables such as sex, date of birth, home address, daytime and nighttime telephone numbers, and names of people living at the same address. First, the sample was stratified by 12 local health units in Montreal and by sex and seven age groups (15–24, 25–34, 35–44, 45–54, 55–64, 65–74, ≥ 75 years). Then, a stratified random sample ($n = 28,940$) was drawn from the RAMQ database by setting the number of respondents to 900 per local health unit on the basis of a minimum event prevalence of 5%, a maximum coefficient of variation of 15%, a response rate of 45%, a design effect of 1.1 and an eligibility rate of 90%.

Further to sample extraction, personalized letters were sent to the postal address of these people explaining the purpose of the survey and inviting them to access the questionnaire on the Internet. Subjects were followed up with telephone calls during the data collection period to confirm receipt of the invitation letter and to complete the survey over the telephone if the recipient did not intend to complete it online. Detailed information on the survey process is available elsewhere (Frigault et al. 2013; Ait Kaci Azzou and Frigault 2015).

Data were weighted and adjusted for nonresponse. Demographic information was used on respondents and non-respondents in the sample to form homogeneous groups by using the χ^2 automatic interaction detector method where the adjustment was done for each created group. The final sample ($n = 10,726$) was weighted to make statistical inferences to the estimated 1,650,000 inhabitants of the city. The response rate (41.4%) was computed by using the standard definition of the American Association for Public Opinion Research (AAPOR) (Kass 1980; AAPOR 2011).

Variables

The main dependent variable of this study was perceived life stress reported by the individual. Life stress was measured by a question with five possible answers: “*Thinking about the amount of stress in your life, would you say that most days are: not at all stressful; not very stressful; a bit stressful; quite*

a bit stressful; extremely stressful”. Perceived life stress was considered affirmative if the response was either “quite a bit stressful” or “extremely stressful”. This dichotomy was based on the health indicator profile reported by Health Canada (Statistics Canada 2016). Independent variables or correlates of stress were selected based on literature review and availability of data. They comprised socio-demographic variables (i.e., sex (male, female), age (15–24, 25–34, 35–44, 45–54, 55–64, 65 or older), education (less than secondary, secondary to less than university, university studies or more), language most often spoken at home (French, English, other), household status (living alone, single-parent, couples/other), and residency status (born in Canada; immigrants less than 10 years; immigrant 10 years or more), socio-economic variables (i.e., employment (yes, no), annual household income, material- and social deprivation indexes), body weight, lifestyle (i.e., physical activity, smoking status, fruits and vegetables intake, alcohol consumption), and health-related variables (i.e., hospitalization or bed stay due to illness or injury, diagnoses of physical or mental problems, as well as perceived physical or mental health).

Total household income in the past 12 months was grouped into \$20,000 intervals. Material and social deprivation indices were adopted from the literature (Pampalon et al. 2009). These indices represented neighbourhood-level characteristics based on the smallest geographic area for which all census data were disseminated as defined by Statistics Canada (2014). Material deprivation was computed based on the education, employment and income characteristics of the census tracts, while the computation of the social deprivation was based on family status—living alone; separated, divorced, widowed; single-parent family. Each index was derived using principal component analysis in each geographic area and the factor score of the components was ranked into quintiles ranging from the most privileged (quintile 1) neighbourhood to the most deprived (quintile 5). Body weight was estimated using body mass index (BMI). BMI was the ratio of body weight (in kilograms) to body height (in metres square). Both weight and height were self-reported. Body weight was grouped according to the Canadian guidelines for body weight classification: underweight ($\text{BMI} < 18.5 \text{ kg/m}^2$), normal weight ($18.5 \text{ kg/m}^2 \leq \text{BMI} < 25.0 \text{ kg/m}^2$), overweight ($25 \text{ kg/m}^2 \leq \text{BMI} < 30 \text{ kg/m}^2$) and obese ($\text{BMI} \geq 30 \text{ kg/m}^2$) (Health Canada 2011). Physical activity during past 7 days was computed using the short form of the International Physical Activity Questionnaire (IPAQ). Responses were grouped into low, moderate and high categories based on the Metabolic Equivalent Task minutes per week (MET-minutes/week) (IPAQ Committee Research 2005). Smoking behaviour described the current smoking status (smoking, not smoking). Daily intake of fruits and vegetables was measured by number of servings (per day, per week, or per month) subjects consumed during the past 6 months. The frequencies were

recorded separately for fruits and for vegetables, but they were then combined and dichotomized (< 5 servings and ≥ 5 servings a day) based on Canada's Food Guide (Health Canada 2007). Alcohol consumption was recorded by the frequency and quantity of drinks reported by the individual during the past 12 months. A drink constituted the following: (a) one bottle or can of beer or a glass of draft, or (b) one glass of wine or a wine cooler, or (c) one drink or cocktail with 1 or $\frac{1}{2}$ ounces of liquor. Excessive alcohol consumption was defined to represent five or more drinks (six for men) on the same occasion at least 12 times in the last year. Accessibility to health care services was determined through two questions: (a) having a family physician (yes, no), and (b) having a usual source of care (yes, no). If either response was affirmative then health care was considered accessible; if neither response was affirmative then health care was considered not accessible. Hospitalization or bed stay due to illness/injury was measured on a yes/no scale by a direct question disclosing the utilization of health care services during the past 14 days. Physical health problems were self-reported, however, they were diagnosed by health professionals. These included asthma, fibromyalgia, arthritis, back pain, high blood pressure, chronic bronchitis, emphysema or chronic obstructive pulmonary disease, diabetes, heart disease or cardiac problem, and cancer; diagnosed mental health illnesses were mood disorder (depression, bipolar disorder, mania, or dysthymia including manic depression) and anxiety (phobia, obsessive-compulsive disorder or panic disorder). Finally, perceived physical and mental health represented the respondent's self-rated physical or mental overall health. Each was measured on a five-level scale but regrouped into good (excellent, very good), moderate (good) and poor (fair, poor).

Data analysis

All analyses were stratified by gender. Frequency distributions of the socio-demographic and economic variables as well as lifestyle and health-related variables were presented to describe our population estimates. Bivariate analyses were performed to verify association between perceived life stress and its correlates. The bivariate associations were tested by Rao Scott Chi-square and significance was set at $p < 0.05$ (Rao and Thomas 1989). For multivariable analysis, Poisson regression with robust error variance was used to identify significant correlates of perceived life stress. All statistically significant variables, for either gender, at the bivariate level were considered in the multivariable analysis. Results were reported as adjusted relative risks (RR) and their 95% confidence interval (95% CI). The estimated RR was considered significant if its 95% CI did not include unity. All analyses were performed using SAS version 9.1.4 (SAS Institute, Inc.).

Results

The distribution of socio-demographic, economic, lifestyle and health-related variables for the study population are provided in Table 1. Our sample is 55.2% female, 46.4% have university education or more, 52.4% speak French at home, 26.5% live alone or are single-parent and 64.5% are born in Canada. The prevalence of perceived life stress in this population is 28.0%; 95% CI = 27.1–28.8.

Table 2 is the gender-stratified bivariate analysis of perceived life stress by study variables. Gender-specific results show that language spoken at home, household and residency status, and hospitalization are significantly associated with perceived life stress for females only, while diagnosis with a physical problem variable is significant only for males. Some variables such as social deprivation, physical activity, daily intake of fruits/vegetables and accessibility to health care services are not significantly associated with the outcome variable for either sex, while all the other variables (age, education, employment, household income, material deprivation, body weight, smoking status, alcohol consumption, mental and physical health) are significantly associated for both sexes.

Table 3 presents the gender-specific adjusted relative risk for perceived life stress in the population. Results, for both males and females, show that the likelihood of perceived life stress is greater for younger and middle-aged groups compared to older population; greater for population having higher education than lower education; greater for employed than non-employed; greater for smokers than non-smokers; and greater for people with diagnosed or perceived mental health problems and perceived physical problem. In addition to these significant correlates which are common for both males and females, there are some significant gender-specific correlates. For instance, single-parent females are 21% more likely (RR = 1.21; 95% CI = 1.04–1.42) to report stressful life compared to females living alone. Canadian-born females or females living in Canada for 10 years or more (established immigrants) are significantly more likely to report stressful life (respectively RR = 1.34; 95% CI = 1.12–1.60 and RR = 1.31; 95% CI = 1.08–1.58) than female immigrants less than 10 years duration (recent immigrants) in Canada. Furthermore, females living in privileged material neighbourhood report significantly higher perceived life stress (about 14% higher) than females living in a deprived neighbourhood. As for the male population, higher annual household income and being overweight significantly increase the likelihood of stress perception (RR = 1.09; 95% CI = 1.05–1.14 and RR = 1.13; 95% CI = 1.01–1.26, respectively). Moreover, males with diagnosed physical health problem are more likely to report stressful life (RR = 1.44; 95% CI = 1.28–1.61) than males with no physical health diagnosis.

Table 1 Distribution of characteristics of 15 years and older population, Montreal, Canada, 2012

Characteristics	Male (<i>n</i> = 4784) Proportion (95% CI)	Female (<i>n</i> = 5892) Proportion (95% CI) ^a	Total (<i>n</i> = 10,676) Proportion (95% CI)
Age (years)			
15 to 24	14.3 (13.9–14.7)	13.3 (13.0–13.7)	13.8 (13.5–14.1)
25 to 34	19.3 (18.8–19.9)	18.6 (18.2–19.0)	19.0 (18.7–19.3)
35 to 44	19.2 (18.7–19.8)	16.5 (16.1–17.0)	17.8 (17.5–18.2)
45 to 54	16.9 (16.4–17.4)	15.5 (15.1–15.9)	16.2 (15.9–16.5)
55 to 64	14.0 (13.6–14.5)	14.2 (13.8–14.6)	14.1 (13.9–14.4)
65 and older	16.2 (15.9–16.5)	21.9 (21.6–22.2)	19.1 (18.9–19.3)
Education			
Less than secondary	16.3 (15.2–17.3)	17.8 (16.8–18.7)	17.0 (16.3–17.8)
Secondary to less than university	36.4 (35.0–37.8)	36.8 (35.5–38.1)	36.6 (35.7–37.6)
University studies or more	47.3 (45.9–48.7)	45.5 (44.3–46.7)	46.4 (45.5–47.3)
Language spoken at home			
French	51.5 (20.1–52.8)	53.2 (52.0–54.4)	52.4 (51.4–53.3)
English	24.2 (23.0–25.5)	23.1 (22.0–24.2)	23.6 (22.8–24.5)
Other	24.3 (23.1–25.6)	23.7 (22.6–24.9)	24.0 (23.2–24.9)
Household status			
Living alone	16.8 (15.7–17.9)	22.8 (21.8–23.8)	19.9 (19.1–20.6)
Single-parent	4.4 (3.8–5.1)	8.6 (7.9–9.4)	6.6 (6.1–7.1)
Couples/other ^b	78.8 (77.6–80.0)	68.6 (67.4–69.8)	73.6 (72.7–74.4)
Residency status			
Canadian (born in Canada)	63.0 (61.6–64.3)	65.9 (64.7–67.1)	64.5 (63.6–65.4)
Established immigrant (10 years or more)	21.9 (20.7–23.1)	21.0 (19.9–22.0)	21.4 (20.6–22.2)
Recent immigrant (less than 10 years)	15.1 (14.2–16.10)	13.2 (12.3–14.0)	14.1 (13.5–14.8)
Currently employed			
Yes	65.8 (64.6–67.1)	54.9 (53.8–56.0)	60.2 (59.4–61.1)
No	34.2 (32.9–35.4)	45.1 (44.0–46.2)	39.8 (38.9–40.6)
Household income (annual)			
Less than \$20,000	14.3 (13.2–15.3)	19.2 (18.2–20.3)	16.8 (16.1–17.6)
\$20,000 to \$39,999	22.2 (21.0–23.4)	25.5 (24.4–26.7)	23.9 (23.1–24.7)
\$40,000 to \$59,999	18.2 (17.0–19.3)	17.4 (16.4–18.4)	17.8 (17.0–18.5)
\$60,000 to \$79,999	12.7 (11.7–13.7)	11.0 (10.2–11.8)	11.8 (11.2–12.5)
\$80,000 and more	32.7 (31.3–34.1)	26.9 (25.7–28.0)	29.7 (28.8–30.6)
Material deprivation index ^c			
Most privileged (quintile 1)	22.2 (21.0–23.4)	22.5 (21.4–23.6)	22.4 (21.6–23.2)
Privileged (quintile 2)	21.1 (19.8–22.3)	21.3 (20.2–22.4)	21.2 (20.3–22.0)
Average (quintile 3)	19.6 (18.4–20.8)	20.1 (19.0–21.2)	19.9 (19.1–20.7)
Deprived (quintile 4)	20.0 (18.8–21.2)	19.3 (18.3–20.4)	19.6 (18.8–20.4)
Most deprived (quintile 5)	17.2 (16.1–18.2)	16.8 (15.9–17.8)	17.0 (16.3–17.7)
Social deprivation index ^d			
Most privileged (quintile 1)	19.6 (18.5–20.7)	19.9 (18.9–20.9)	19.7 (19.0–20.5)
Privileged (quintile 2)	20.7 (19.4–21.9)	20.6 (19.5–21.7)	20.6 (19.8–21.4)
Average (quintile 3)	19.9 (18.7–21.1)	20.8 (19.7–21.9)	20.4 (19.5–21.2)
Deprived (quintile 4)	20.9 (19.8–22.1)	19.6 (18.6–20.7)	20.3 (19.5–21.1)
Most deprived (quintile 5)	18.9 (17.8–20.0)	19.1 (18.1–20.2)	19.0 (18.3–19.8)
Perceived life stress ^e			
No (not at all/not very/a bit stressful)	72.8 (71.5–74.0)	71.4 (70.2–72.6)	72.0 (71.2–72.9)
Yes (quite a bit/extremely stressful)	27.3 (26.0–28.5)	28.6 (27.5–29.8)	28.0 (27.1–28.8)

Table 1 (continued)

Characteristics	Male (<i>n</i> = 4784) Proportion (95% CI)	Female (<i>n</i> = 5892) Proportion (95% CI) ^a	Total (<i>n</i> = 10,676) Proportion (95% CI)
Body weight			
Underweight (BMI < 18.5)	1.7 (1.3–2.2)	4.6 (3.9–5.2)	3.2 (2.8–3.5)
Normal weight (18.5 ≤ BMI < 25.0)	40.9 (39.4–42.4)	53.9 (52.6–55.3)	47.5 (46.5–48.5)
Overweight (25.0 ≤ BMI < 30.0)	42.1 (40.6–43.6)	25.5 (24.3–26.7)	33.7 (32.7–34.7)
Obese (BMI ≥ 30.0)	15.3 (14.2–16.4)	16.0 (15.0–17.0)	15.7 (14.9–16.4)
Physical activity status (past 7 days)			
Low	19.4 (18.3–20.6)	26.3 (25.2–27.5)	23.0 (22.2–23.8)
Moderate	36.7 (35.2–38.1)	42.5 (41.1–43.8)	39.6 (38.7–40.6)
Intense	43.9 (42.5–45.4)	31.2 (30.0–32.5)	37.4 (36.5–38.4)
Current smoking status			
Smoking	21.5 (20.3–22.7)	16.5 (15.6–17.5)	19.0 (18.2–19.7)
Not smoking	78.5 (77.3–79.7)	83.5 (82.5–84.4)	81.0 (80.3–81.8)
Daily intake of fruits and vegetables			
Less than five servings	64.7 (63.3–66.1)	53.6 (52.3–55.0)	59.0 (58.0–60.0)
Five servings and more	35.3 (33.9–36.8)	46.4 (45.0–47.7)	41.0 (40.0–42.0)
Alcohol consumption			
Not excessive	80.8 (79.7–81.9)	90.1 (89.3–90.8)	85.6 (84.9–86.2)
Excessive	19.2 (18.1–20.3)	9.9 (9.2–10.7)	14.4 (13.8–15.1)
Accessibility to health care services			
Accessible	85.8 (84.8–86.9)	91.9 (91.2–92.6)	89.0 (88.4–89.6)
Not accessible	14.2 (13.1–15.2)	8.1 (7.4–8.8)	11.0 (10.4–11.7)
Bed stay due to illness or injury/hospitalization (past 14 days)			
Yes	3.6 (3.1–4.2)	6.4 (5.7–7.0)	5.0 (4.6–5.5)
No	96.4 (95.8–96.8)	93.7 (93.0–94.3)	95.0 (94.6–95.4)
Diagnosed with a physical health problem ^f			
No	56.9 (55.5–58.3)	51.8 (50.5–53.1)	54.2 (53.3–55.2)
Yes	43.1 (41.7–44.5)	48.2 (46.9–49.5)	45.8 (44.8–46.7)
Diagnosed with a mental health problem ^e			
Yes	9.6 (8.7–10.5)	13.3 (12.4–14.2)	11.5 (10.9–12.1)
No	90.4 (89.5–91.3)	86.7 (85.8–87.7)	88.5 (87.9–89.2)
Physical health (perceived)			
Good	55.9 (54.5–57.4)	52.8 (51.5–54.1)	54.3 (53.3–55.3)
Moderate	33.6 (32.2–35.0)	34.7 (33.4–36.0)	34.2 (33.2–35.1)
Poor	10.5 (9.6–11.4)	12.5 (11.6–13.4)	11.5 (10.9–12.2)
Mental health (perceived)			
Good	74.1 (72.8–75.4)	70.9 (69.7–72.1)	72.5 (71.6–73.4)
Moderate	21.1 (19.9–22.3)	23.8 (22.6–24.9)	22.5 (21.7–23.3)
Poor	4.8 (4.2–5.4)	5.3 (4.7–5.9)	5.1 (4.6–5.5)

^a 95% confidence interval^b Couples with or without children and other family categories^c An ecological measure of socio-economic condition calibrated in quintiles^d An ecological measure of socio-demographic conditions calibrated in quintiles^e Mood disorder (depression, bipolar disorder, mania, or dysthymia including manic depression) and anxiety (phobia, obsessive-compulsive disorder or panic disorder)^f Asthma, fibromyalgia, arthritis, back pain, high blood pressure, chronic bronchitis, emphysema or chronic obstructive pulmonary disease, diabetes, heart disease or cardiac problem, and cancer

Table 2 Gender-stratified proportion of perceived stress (and 95% CI) for 15 years and older population by several selected variables, Montreal, Canada, 2012

	Males (<i>n</i> = 4784)		Females (<i>n</i> = 5892)	
	Proportion (95% CI) ^a	<i>p</i> value ^b	Proportion (95% CI) ^a	<i>p</i> value ^b
Perceived stress ^c	27.3 (26.0–28.5)	–	28.6 (27.5–29.8)	–
Age (years)		< 0.001		< 0.001
15 to 34	25.8 (23.5–28.1)		31.0 (28.8–33.3)	
35 to 54	35.4 (33.1–37.8)		37.6 (35.4–39.9)	
55 and older	18.8 (16.8–20.8)		18.2 (16.5–19.9)	
Education		< 0.001		< 0.001
Less than secondary	16.6 (13.8–19.4)		17.1 (14.5–19.6)	
Secondary to less than university	24.1 (22.0–26.2)		27.3 (25.4–29.3)	
University studies and more	33.5 (31.4–35.5)		34.5 (32.6–36.3)	
Language spoken at home		0.179		0.002
French	28.3 (26.6–30.0)		30.2 (28.7–31.8)	
English	27.2 (24.3–30.1)		29.0 (26.4–31.6)	
Other	25.1 (22.5–27.8)		24.7 (22.3–27.1)	
Household status		0.769		< 0.001
Living alone	26.3 (23.2–29.5)		25.6 (23.3–28.0)	
Single-parent	27.2 (20.8–33.5)		38.0 (33.6–42.4)	
Couples/other ^d	27.6 (26.2–29.1)		28.6 (27.1–30.0)	
Residency status		0.117		< 0.001
Canadian (born in Canada)	28.0 (26.4–29.6)		30.2 (28.7–31.6)	
Established immigrant (10 years or more)	27.5 (24.7–30.3)		27.8 (25.1–30.4)	
Recent immigrant (less than 10 years)	24.0 (20.7–27.3)		22.4 (19.3–25.6)	
Currently employed		< 0.001		< 0.001
Yes	33.4 (31.7–35.1)		37.1 (35.5–38.8)	
No	15.7 (13.8–17.6)		18.2 (16.6–19.8)	
Household income (annual)		< 0.001		< 0.001
Less than \$20,000	21.3 (18.1–24.5)		25.0 (22.3–27.6)	
\$20,000 to \$39,999	21.9 (19.4–24.5)		23.3 (21.0–25.5)	
\$40,000 to \$59,999	24.8 (21.8–27.8)		28.9 (26.0–31.7)	
\$60,000 to \$79,999	28.1 (24.5–31.7)		28.3 (24.7–31.9)	
\$80,000 and more	34.5 (32.1–37.0)		36.3 (33.9–38.8)	
Material deprivation index ^e		0.002		0.009
Privileged (quintiles 1, 2)	30.0 (28.0–32.1)		29.9 (28.0–31.8)	
Average (quintile 3)	25.8 (22.9–28.7)		30.1 (27.4–32.8)	
Deprived (quintiles 4, 5)	24.9 (22.8–27.0)		26.0 (24.1–27.9)	
Social deprivation index ^f		0.222		0.072
Privileged (quintiles 1, 2)	25.9 (23.8–28.0)		26.8 (24.8–28.7)	
Average (quintile 3)	27.7 (24.7–30.6)		29.6 (26.9–32.3)	
Deprived (quintiles 4, 5)	28.5 (26.4–30.6)		29.8 (27.8–31.7)	
Body weight		0.020		< 0.001
Underweight/normal (BMI < 25.0)	26.2 (24.2–28.2)		30.4 (28.7–32.1)	
Overweight (25.0 ≤ BMI < 30.0)	30.4 (28.3–32.6)		24.7 (22.3–27.0)	
Obese (BMI ≥ 30.0)	28.4 (24.9–31.8)		31.5 (28.3–34.7)	
Physical activity status (past 7 days)		0.178		0.200
Low	29.1 (26.1–32.2)		27.2 (24.8–29.5)	
Moderate	27.8 (25.6–29.9)		28.6 (26.8–30.4)	
Intense	25.9 (24.0–27.9)		30.1 (27.9–32.3)	
Current smoking status		< 0.001		< 0.001

Table 2 (continued)

	Males (<i>n</i> = 4784)		Females (<i>n</i> = 5892)	
	Proportion (95% CI) ^a	<i>p</i> value ^b	Proportion (95% CI) ^a	<i>p</i> value ^b
Smoking	32.1 (29.1–35.0)		37.2 (34.1–40.2)	
Not smoking	25.9 (24.4–27.3)		26.9 (25.6–28.2)	
Daily intake of fruits and vegetables		0.554		0.552
Less than five servings	27.1 (25.4–28.7)		29.2 (27.6–30.9)	
Five servings and more	27.9 (25.7–30.1)		28.5 (26.7–30.2)	
Alcohol consumption		0.005		< 0.001
Not excessive	26.3 (24.9–27.8)		27.7 (26.4–28.9)	
Excessive	31.1 (28.0–34.1)		37.8 (33.9–41.8)	
Accessibility to health care services		0.391		0.268
Accessible	27.3 (25.9–28.7)		28.4 (27.2–29.6)	
Not accessible	29.0 (25.4–32.5)		30.9 (26.6–35.2)	
Hospitalization (past 14 days)/bed stay due to illness or injury		0.054		0.001
Yes	34.6 (27.2–41.9)		36.0 (31.1–40.9)	
No	27.0 (25.7–28.3)		28.2 (26.9–29.3)	
Diagnosed with a physical health problem ^g		< 0.001		0.885
No	23.8 (22.0–25.5)		28.2 (26.4–29.9)	
Yes	30.5 (28.4–32.6)		28.4 (26.6–30.1)	
Diagnosed with a mental health problem ^h		< 0.001		< 0.001
Yes	44.3 (39.5–49.1)		47.4 (43.7–51.1)	
No	24.9 (23.6–26.2)		25.2 (23.9–26.4)	
Physical health (perception)		< 0.001		< 0.001
Good	24.7 (23.1–26.4)		27.0 (25.4–28.6)	
Moderate	28.7 (26.4–30.9)		29.0 (27.0–31.1)	
Poor	35.9 (31.5–40.3)		34.5 (30.9–38.1)	
Mental health (perception)		< 0.001		< 0.001
Good	24.1 (22.7–25.6)		23.6 (22.3–24.9)	
Moderate	31.8 (28.8–34.7)		36.3 (33.7–38.9)	
Poor	56.3 (49.6–63.0)		61.4 (55.7–67.1)	

^a 95% confidence interval^b Based on Rao Scott chi-square test^c Perceived stress in life: quite a bit stressful or extremely stressful^d Couples with or without children and other family categories^e An ecological measure of socio-economic condition calibrated in quintiles^f An ecological measure of socio-demographic condition calibrated in quintiles^g Asthma, fibromyalgia, arthritis, back pain, high blood pressure, chronic bronchitis, emphysema or chronic obstructive pulmonary disease, diabetes, heart disease or cardiac problem, and cancer^h Mood disorder (depression, bipolar disorder, mania, or dysthymia including manic depression) and anxiety (phobia, obsessive-compulsive disorder or panic disorder)

Discussion

This paper studied the association of socio-demographic, socio-economic, lifestyle and health-related variables with perceived life stress to identify significant gender-specific correlates of stress in a representative sample of Montreal population. The prevalence of perceived life stress in our study

population was 27.3% (95% CI = 26.0–28.5) for males and 28.6% (95% CI = 27.5–29.8) for females; a combined rate of 28.0% (95% CI = 27.1–28.8). These estimates were similar to the prevalence of perceived life stress obtained from the Canadian Community Health Survey for 15 years and older population in Montreal in 2012, namely, 25.3% (95% CI = 20.8–29.7) for males and 26.7% (95% CI = 22.4–31.0) for

Table 3 Gender-specific adjusted relative risk (and 95% CI) of perceived stress for 15 years and older population in Montreal, Canada, 2012

	Adjusted RR (95% CI) ^a	
	Males	Females
Age (years)		
15 to 34	1.50 (1.27–1.77)	1.41 (1.22–1.63)
35 to 54	1.61 (1.39–1.83)	1.56 (1.37–1.78)
55 and older	Ref.	Ref.
Education		
Less than secondary	Ref.	Ref.
Secondary to less than university	1.06 (0.87–1.30)	1.29 (1.08–1.53)
University studies and more	1.36 (1.11–1.66)	1.52 (1.26–1.82)
Language spoken at home		
French	1.04 (0.89–1.20)	1.04 (0.91–1.20)
English	0.90 (0.75–1.07)	0.93 (0.80–1.09)
Other	Ref.	Ref.
Household status		
Living alone	Ref.	Ref.
Single-parent	1.08 (0.83–1.42)	1.21 (1.04–1.42)
Couples/other ^b	1.06 (0.91–1.23)	0.99 (0.88–1.12)
Residency status		
Canadian (born in Canada)	1.12 (0.93–1.35)	1.34 (1.12–1.60)
Established immigrant (10 years or more)	1.18 (0.98–1.43)	1.31 (1.08–1.58)
Recent immigrant (less than 10 years)	Ref.	Ref.
Currently employed		
Yes	1.84 (1.57–2.14)	1.62 (1.44–1.83)
No	Ref.	Ref.
Household income (annual)		
Increment of \$20,000	1.09 (1.05–1.14)	1.03 (0.99–1.07)
Material deprivation index ^c		
Privileged (quintiles 1, 2)	1.12 (1.00–1.275)	1.14 (1.02–1.27)
Average (quintile 3)	1.04 (0.90–1.20)	1.13 (1.00–1.28)
Deprived (quintiles 4, 5)	Ref.	Ref.
Body weight		
Underweight/normal (BMI < 25.0)	Ref.	Ref.
Overweight (25.0 ≤ BMI < 30.0)	1.13 (1.01–1.26)	0.94 (0.84–1.05)
Obese (BMI ≥ 30.0)	1.04 (0.89–1.22)	1.09 (0.97–1.24)
Current smoking status		
Smoking	1.16 (1.03–1.31)	1.17 (1.05–1.30)
Not smoking	Ref.	Ref.
Alcohol consumption		
Not excessive	Ref.	Ref.
Excessive	0.94 (0.83–1.07)	1.02 (0.90–1.16)
Hospitalization (past 14 days) / bed stay due to illness or injury		
Yes	1.13 (0.88–1.43)	1.04 (0.90–1.21)
No	Ref.	Ref.
Diagnosed with a physical health problem ^d		
No	Ref.	Ref.
Yes	1.44 (1.28–1.61)	1.09 (0.99–1.20)
Diagnosed with a mental health problem ^e		
No	Ref.	Ref.

Table 3 (continued)

	Adjusted RR (95% CI) ^a	
	Males	Females
Yes	1.39 (1.19–1.62)	1.36 (1.20–1.54)
Physical health (perception)		
Good	Ref.	Ref.
Moderate	1.04 (0.92–1.18)	1.00 (0.90–1.12)
Poor	1.19 (1.00–1.43)	1.24 (1.06–1.45)
Mental health (perception)		
Good	Ref.	Ref.
Moderate	1.22 (1.06–1.39)	1.35 (1.20–1.51)
Poor	1.93 (1.57–2.37)	1.98 (1.66–2.35)

^a Relative risk and 95% confidence interval^b Couples with or without children and other family categories^c An ecological measure of socio-economic condition calibrated in quintiles^d Asthma, fibromyalgia, arthritis, back pain, high blood pressure, chronic bronchitis, emphysema or chronic obstructive pulmonary disease, diabetes, heart disease or cardiac problem, and cancer^e Mood disorder (depression, bipolar disorder, mania, or dysthymia including manic depression) and anxiety (phobia, obsessive-compulsive disorder or panic disorder)

females (a combined rate of 26.0% (95% CI = 23.0–29.0) (Statistics Canada 2016). Some of the socio-demographic variables that characterized our sample who reported significantly higher perceived life stress were middle-aged or younger individuals, subjects with higher education, single-parent females, and females born in Canada or living in Canada for more than 10 years. The negative association between age and stress we found was confirmed by another population-based study (Rebbeck et al. 2013); however, the directions of the association of other socio-demographic correlates were not necessarily supported by the literature. For instance, contrary to our findings, Nielsen et al. (2008) reported higher stress with lower education, while Bak et al. (2012) reported higher stress in immigrant population, and no association with household status. These results might reflect real differences due to stress measurement scale, or due to the study population. For instance, the study of Bak et al. (2012) used the Perceived Stress Scale to measure daily stress as opposed to our single-question measurement. In addition, their study was conducted among residents of a deprived neighbourhood (Bak et al. 2012), while ours represented the general population.

The perception of life stress was significantly associated with three variables pertaining to the general socio-economic status of our population; these were current employment status, annual household income and material deprivation index. While higher perception of life stress was reported for being employed for both sexes, the association of stress with the other two socio-economic correlates was gender specific: for males, higher stress was associated with higher annual household income, and for females, higher stress was associated

with lower material deprivation index. The association between socio-economic inequalities and stress realized in our study was different than those reported by others. For instance, Wang et al. (2015) reported higher stress with lower income and lower regional per capita gross domestic product, while Barnay (2016) found a varying relationship depending on the employment arrangement and working conditions. Also, in our male sample, overweight was significantly associated with perceived stress. However, gender did not modify the association between perceived stress and body weight in other studies, although perceived stress was associated with eating behaviours (Barrington et al. 2012, 2014).

Among several lifestyle variables considered in our analysis, only smoking status was retained at the multivariable level. The higher prevalence of stress reported by smokers compared to non-smokers was documented in the literature and their association was explained by the nicotine resource or deprivation models (Parrott and Murphy 2012). Finally, the negative association between stress and health condition was also reported in previous research (Keller et al. 2012), namely, stress was more prevalent in people who were diagnosed with health problems or who perceived to suffer from poor health status. Our results confirmed these findings. Indeed, the association of poor mental health with perceived life stress was particularly noticeable for both sexes in our sample; there was a remarkable increase in perception of stress for males (98%) and for females (93%) in the “poor mental health” category compared to their “good mental health” counterparts.

In summary, while the literature reveals some appreciable differences in the reporting, the manifestations and the management of stress between men and women, this study found

some gender-specific correlates of perceived life stress such as higher household income, body weight (overweight) and being diagnosed with a physical problem in males, and household (single-parent) and residency (recent immigrants) status as well as lower material deprivation in females.

Limitations

Being a population survey, our data were based on self-reported information and included only private households. The former may lead to a misclassification bias if the information is wrongly reported which may limit the generalizability of the findings. Also, the low response rate may introduce a selection bias and may not be representative of the population, if a particular characteristic of the sample is misrepresented. However, our data were weighted and adjusted for nonresponse and the distributions of several socio-demographic variables were comparable to those of the census data. Finally, due to the cross-sectional nature of the study, it is not possible to infer any causal relationship between perceived life stress and the correlates considered in this study.

Conclusion

This study showed a significant association between some socio-demographic, socio-economic, lifestyle and health-related variables with perceived life stress in a representative sample of the Montreal population. A recent publication by Strang et al. (2017) suggested that daily stress recognition and its management must rank high in the national prevention agenda to sustain health care in Canada, especially because medical literature consistently shows that perceived stress is significantly associated with a range of physical and mental problems (Ranabir and Reetu 2011; Martin 2016; Vancampfort et al. 2017). Therefore, identifying correlates of stress at the population level may help researchers characterize people vulnerable to daily stress, provide health agencies the advantage to forecast and prevent its occurrence and diseases associated with it, as well as offer policy advocates a pivotal edge to reduce disparities in population health.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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