QUANTITATIVE RESEARCH

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Physical and mental health inequalities among aging lesbian, gay, and bisexual Canadians: cross-sectional results from the Canadian Longitudinal Study on Aging (CLSA)

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Abstract

Objective International estimates suggest the presence of health inequalities among older sexual minorities (i.e., individuals who identify as lesbian, gay, or bisexual and are 65 years old or above). In this study, we investigated the presence of health inequalities among aging lesbian and bisexual females, as well as aging gay and bisexual males in Canada.

Methods We used baseline data from the Canadian Longitudinal Study on Aging (CLSA) Tracking and Comprehensive cohorts to cross-sectionally compare self-reported physical and mental health indicators by sex and sexual orientation. Within our analysis sample of 51,208 Canadians 45 years old and over, 2% ($n = 1057$) of respondents identified as lesbian, gay, or bisexual.

Results Compared to heterosexual female peers, lesbian and bisexual females had greater odds of heavy drinking (AOR = 1.8, 95% CI = 1.3–2.4) and being a former smoker (AOR = 1.5, 95% CI = 1.2–1.9). Gay and bisexual males had greater odds of reporting a diagnosis of cancer (AOR = 1.5, 95% CI = 1.0–1.9) and currently smoking (AOR = 1.5, 95% CI = 1.1–2.0), compared to heterosexual males. Female and male sexual minorities had greater odds of reporting mood disorders (including depression) and anxiety disorders relative to heterosexual peers of the same sex.

Conclusion These findings highlight the importance of considering both sex and sexual orientation when developing approaches to support the physical and mental health of a diverse aging population in Canada.

Résumé

Objectifs Les estimations internationales suggèrent la présence d'inégalités de santé parmi les minorités sexuelles plus âgées (c'est-à-dire, les personnes ayant 65 ans ou plus et s'identifiant comme étant lesbiennes, gays ou bisexuelles). Dans cette étude, nous avons enquêté la présence d'inégalités en matière de santé chez les femmes lesbiennes et bisexuelles vieillissantes, ainsi que chez les hommes gais et bisexuels vieillissants, au Canada.

Méthode Nous avons utilisé des données de base provenant des cohortes de suivi et des cohortes compréhensives de l'Étude longitudinale canadienne sur le vieillissement (ÉLCV) pour comparer de façon transversale les indicateurs de santé physique et mentale autodéclarés selon le sexe et l'orientation sexuelle. Dans notre échantillon d'analyse de 51 208 Canadiens âgés de 45 ans et plus, 2 % ($n = 1057$) des répondants ont déclaré être lesbiennes, gays ou bisexuels.

Résultats Comparativement aux femmes hétérosexuelles, les femmes lesbiennes et bisexuelles étaient plus probables de consommer l'alcool de manière excessive (AOR = 1,8, IC 95% = 1,3–2,4) et d'être d'anciennes fumeuses (AOR = 1,5, IC 95% = 1,2–1,9). Les hommes gais et bisexuels avaient plus de chances de déclarer un diagnostic de cancer (AOR = 1,5, IC 95% = 1,0–1,9) et d'être fumeurs actuels (AOR = 1,5, IC 95% = 1,1–2,0), comparativement aux hommes hétérosexuels. Les

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minorités sexuelles féminines et masculines étaient plus susceptibles de déclarer des troubles de l'humeur (y compris la dépression) et des troubles anxieux, par rapport aux pairs hétérosexuels du même sexe.

Conclusion Ces résultats soulignent l'importance de tenir compte à la fois du sexe et de l'orientation sexuelle lors de l'élaboration d'approches visant à soutenir la santé physique et mentale d'une population vieillissante diversifiée au Canada.

Keywords Aged · Sexual and gender minorities · Mental health · Gays · Lesbians · Bisexuals · CLSA

Mots-clés Âgé · Minorités sexuelles et de genre · Santé mentale · Gays, lesbiennes, bisexuels · ÉLCV

Introduction

Evidence from population health studies, within Canada and abroad, suggests the presence of health inequalities among adult lesbian, gay, and bisexual (LGB) individuals. In terms of mental health, adult LGB respondents tend to show higher prevalence of mood disorders, anxiety disorders, isolation, psychological distress, and suicidal ideation (Brennan et al. 2010; Chakraborty et al. 2011; Björkenstam et al. 2017; Conron et al. 2010). Adult LGB individuals are more likely to report an activity limitation, chronic pain, asthma, diabetes, and cardiovascular disease risk (Conron et al. 2010; Bränström et al. 2016; Cochran and Mays 2012). Evidence also suggests increased health risk behaviours among LGB individuals. For example, sexual minority women are more likely to report heavy alcohol use relative to heterosexual peers (Conron et al. 2010; Bloomfield et al. 2011).

Health inequalities among LGB individuals have been understood through models of minority stress which posit that the effect of negative social conditions (e.g., stigma, discrimination) adversely affects the health and well-being of minority groups and individuals. Meyer (2003) suggests that, from this perspective, health outcomes among sexual minorities may be linked to experiences of external, objective stressful events and conditions, expectations of such stressful events and associated vigilance, and the internalization of societal attitudes. Aging is also associated with numerous stressors related to biological changes in physical, sensory, and cognitive systems as well as psychosocial changes related to identity and role (Butler-Jones 2010; Alwin and Hofer 2011; Beard et al. 2016). Disadvantages accumulated over time may increase the potential for more pronounced disadvantage in older adulthood (Dannefer 2003; Kail et al. 2009). The long-term effects of disadvantages accumulated throughout the lifespan have been shown to negatively impact health status in older adulthood (Siegrist 2016; Demakakos et al. 2016).

Data also support the presence of health inequalities among older cohorts of LGB individuals (Gonzales and Henning-Smith 2015), albeit fewer studies have addressed this particular topic. For example, recent analysis of data collected in 2013–2014 as part of a national population-based study in the United States (US) (i.e., the National Health Interview Survey; NHIS) showed higher odds of reporting heart attack, stroke, and asthma among lesbian and bisexual older women (relative to same-age heterosexual women), after controlling for socio-economic variables (i.e., age, ethnicity, income, and education) (Fredriksen-Goldsen et al. 2017). Gay and bisexual older men were at greater odds (relative to same-age heterosexual men) of having had a diagnosis of cancer and angina. LGB older adults were also at greater odds of disability, mental distress, excess drinking, and smoking, compared to heterosexual peers of the same sex. Data collected in Austalia from lesbian, gay, bisexual, transgender, and intersex participants aged 50 years and above showed that participants reported lower mental health, lower health status, and higher levels of loneliness relative to the general Australian population (Hughes 2017).

The evidence pointing to health inequalities among LGB older adults primarily originates from outside of Canada. Within the minority stress model, structural factors are critical to understanding the health disparities observed among minority populations. Canada shares numerous similarities with other Western countries, including a similar standard of living and training standards for health professionals (Feeny et al. 2010). Despite these similarities, the Canadian context is also somewhat unique when considering health and aging. For example, Canada maintains a single-payer universal health care system, has two official languages, and has a history that includes events involving LGB communities that is distinct from other countries (e.g., "bath house raids" of 1981[1] and Civil Marriage Act of 2005[2]).

Despite recent policy shifts to promote equal rights among sexual minority communities, the social and historical context of the treatment of these communities has resulted in years of systemic discrimination (Smith 1999; Kinsman and Gentile 2010; Lahey 2004), such as discriminatory policies and practices.[3] Currently, those individuals affected by historical discriminatory policies related to sexual orientation are either in or approaching older age. Sexual orientation has been identified as an important social determinant of health (Logie 2012), yet, to date, the health of older LGB individuals has been invisible within statistical portraits of Canada. Based on the

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[1] On February 5, 1981, Toronto police raided four private clubs for gay and bisexual men and arrested approximately 300 men.
[2] Same-sex marriage was legally recognized across Canada on July 20, 2005, through the enactment of the Civil Marriage Act.
[3] For example, homosexuality was decriminalized in Canada in 1969.

available literature on the health status of aging LGB communities, we can only speculate about health inequalities among older cohorts of LGB individuals in Canada.

In this study, we investigated the presence of health inequalities among aging lesbian and bisexual females as well as aging gay and bisexual males in Canada. To our knowledge, this analysis is the first to examine the relationship between sex, sexual orientation, and self-reported health status among a national sample of Canadians 45–85 years old. We examined chronic diseases, mental health conditions, health care utilization, and health behaviours among participants in a longitudinal study on health and aging at baseline.

Method

We used baseline data from the Canadian Longitudinal Study on Aging (CLSA), a large, national, long-term study of health and aging. CLSA collects data from adults who were 45–85 years old at the time of recruitment. Within the context of this study, we refer to the sample as *aging* given that, at baseline, some participants are less than 65 years old and cannot be characterized as older adults. This terminology has been used elsewhere in the literature to describe cohorts with similar age ranges (e.g., Gonzales and Henning-Smith 2015). In addition, while these analyses of baseline data are cross-sectional, the CLSA will permit longitudinal analyses following the availability of future waves of data. This analysis included data from participants from both the Tracking and Comprehensive cohorts. CLSA participants were recruited using a complex sampling frame, permitting the estimation of nationally representative health estimates (Kirkland et al. 2015). The CLSA Tracking cohort included 21,241 participants (10,406 males and 10,835 females). Participants completed a 60-min telephone interview that included self-report questions about their health and well-being. Participants in the Comprehensive cohort were eligible to participate if they resided within a 25–50-km radius of the 11 data collection sites (i.e., Victoria, Vancouver, Surrey, Calgary, Winnipeg, Hamilton, Ottawa, Montreal, Sherbrooke, Halifax, and St. John's). They completed a 90-min face-to-face, in-home interview and attended a data collection site where physical assessments were conducted. The CLSA Comprehensive cohort included 30,097 participants (14,777 males and 15,320 females). Exclusion criteria for both cohorts were as follows: individuals residing in First Nations reserves and other First Nations settlements in the provinces, full-time members of the Canadian Armed Forces, residents of long-term care, individuals with cognitive impairment, residents of the territories, and individuals who did not speak English or French. The CLSA was approved by Research Ethics Boards (REBs) in different provinces, and the University of Ottawa REB approved the analyses presented here. Written informed consent was obtained for all participants. Baseline data were collected from 2010 to 2015. Detailed information about the CLSA, including the design and sampling frame, is presented elsewhere (Raina et al. 2009). Demographic characteristics among LGB and heterosexual participants in both samples showed similar patterns of distribution and, in the analyses presented here, baseline data from the Tracking and Comprehensive cohorts were pooled to increase the number of LGB participants.

Data collection

Demographic information (e.g., age, sex, ethnicity, education, household income, urban vs. rural residence, children in household) was collected from each participant.

Sex and sexual orientation

Participants were asked to identify their sex (i.e., female or male). They were also asked whether they consider themselves to be heterosexual (sexual relations with people of the opposite sex); homosexual, that is lesbian or gay (sexual relations with people of your own sex); or bisexual (sexual relations with people of both sexes).

Chronic disease measures

Study participants were asked to self-report whether a doctor had ever told them they had a heart attack or myocardial infarction; angina (or chest pain due to heart disease); stroke or cerebrovascular accident; mini-stroke or transient ischemic attack (TIA); asthma; other respiratory problems (i.e., emphysema, chronic bronchitis, chronic obstructive pulmonary disease, or chronic changes in lungs due to smoking); cancer; arthritis; osteoporosis; and diabetes. To account for all cerebrovascular events, including stroke, which had a prevalence of less than 2%, occurrences of stroke and mini-stroke were combined. Presence of chronic pain was captured by asking participants whether they were usually free of pain or discomfort (response options = yes or no). Participants were classified as obese if their body mass index (BMI) was 30 or above based on their self-reported height and weight (Statistics Canada 2015).

Mental health measures

Participants were asked to self-report whether a doctor had ever told them they had an anxiety disorder such as a phobia, obsessive-compulsive disorder, or a panic disorder (henceforth referred to as *anxiety disorder*) and a mood disorder such as depression (including manic depression), bipolar disorder, mania, or dysthymia (henceforth referred to as *mood disorder*). Participants were asked to rate their mental health

(henceforth referred to as *self-rated mental health*). Response options were excellent, very good, good, fair, or poor; poor and fair responses were amalgamated.

Health behaviours and health care utilization measures

Participants were asked whether they had smoked 100 tobacco cigarettes in their lifetime and, if so, whether they had smoked frequently or occasionally in the last 30 days (i.e., *current smoker*) or not at all (i.e., *former smoker*). Participants were asked about how often they consume alcohol. For females, excessive drinking was defined as having four or more alcoholic drinks on the same occasion at least once a month for the last 12 months; for males, it was defined as having five or more drinks on the same occasion at least once a month for the last 12 months (Statistics Canada 2016). Physical activity was assessed by asking participants how often they completed exercises specifically to increase muscle strength and endurance in the last 7 days; participants were divided into those who responded never and those who responded 1 or more days. Sleep was assessed by asking participants how often their sleep was restless; those who indicated restless sleep on one or more days in the last week were classified as having sleep problems. Health care utilization was evaluated by asking whether participants had seen any of the following health care providers in the last 12 months: (a) general practitioner or family physician, (b) psychologist, (c) medical specialist (such as a cardiologist, gynecologist, and psychiatrist), (d) dentist, (e) ophthalmologist or optometrist, (f) physiotherapist, occupational therapist, or chiropractor, and (g) social worker.

Statistical analysis

Given our interest in examining health inequalities among male and female sexual minorities and in light of prior research in this area (Brennan et al. 2010; Chakraborty et al. 2011; Fredriksen-Goldsen and Muraco 2010), all analyses were conducted separately by sex. Demographic characteristics by sexual orientation were first described by comparing heterosexuals with sexual minorities of the same sex. Next, a subgroup analysis was completed to describe differences in demographic characteristics within sexual minorities where homosexual and bisexual participants were further compared. Categorical demographic variables were examined through the chi-square test, and continuous variables (e.g., age) were compared using an independent samples *t* test.

We estimated the prevalence and confidence intervals for chronic diseases, mental health variables, and other health indicators by sex and sexual orientation. To ensure an adequate number of outcome events per variable for these analyses involving health variables, lesbian and bisexual females were combined, as were gay and bisexual males. To examine health inequalities among aging sexual minorities, we

computed a series of logistic regressions where we controlled for potential confounding variables previously shown to be associated with health among sexual minorities (i.e., income and education) (Fredriksen-Goldsen et al. 2017). To address the wide age range within the CLSA sample (i.e., 45–85) and considering that aging is associated with an increased risk for chronic disease, we controlled for age. Given the complex survey design and provincial differences in health care in Canada, we also controlled for province of residence. Sexual orientation (i.e., heterosexual or non-heterosexual) was our primary explanatory variable and, in most cases, the presence of disease was treated as the outcome in each model. All analyses were completed using Stata 15 (College Station, TX, USA). The complex survey design was accounted for in all analyses by using Stata's svy prefix[4] command to apply the analytic weights for the pooled CLSA sample.

Results

Demographic characteristics

Our pooled analysis sample consisted of 51,208 participants after excluding 130 participants who did not disclose their sexual orientation (i.e., 0.25% of the pooled sample were missing data for sexual orientation). In the Comprehensive cohort, 55 participants (0.18%) were missing data for sexual orientation (i.e., 23 Refused and 32 Don't know/No answer). In the Tracking cohort, 75 participants (0.35%) were missing data for sexual orientation (i.e., 21 Refused and 53 Don't know/No answer).

Of those included in the analysis, 398 females (1.55% of females) and 659 males (2.69% of males) self-identified as sexual minorities. In total, 803 (i.e., 1.57% of the sample) participants identified as lesbian or gay and 254 (i.e., 0.50% of the sample) of participants identified as bisexual. Two percent (95% CI = 1.9–2.3) of participants in this sample identified as a sexual minority; the proportion of sexual minorities was comparable in both the Tracking and Comprehensive cohorts (i.e., 392 participants in the Tracking cohort and 665 participants in the Comprehensive cohort). The mean age for all participants was 59.9 years (SEM = 0.04).

Table 1 presents demographic characteristics of heterosexual and sexual minority females and males. Relative to heterosexual females, sexual minority females were 3.8 years younger (95% CI = 3.0–4.7, *p* < 0.001), had 1.3 fewer children living in their household (95% CI = 1.07–1.36, *p* < 0.001), were more educated (*p* < 0.01), less likely to be retired (*p* < 0.001), and were more likely to be single (*p* < 0.001). A comparison of subgroups showed that bisexual females were

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[4] The svy prefix command in Stata estimates confidence intervals using the logit method.

Table 1 Socio-demographic characteristics among females and males in CLSA baseline by sexual orientation (N = 51,208)

Characteristic	Female (n = 26,086)				Male (n = 25,122)			
	Heterosexual (n = 25,688) 95% CI	Lesbian and bisexual — Total (n = 398) Mean or % (95% CI)	Lesbian (n = 275) Mean or % (95% CI)	Bisexual (n = 123) Mean or % (95% CI)	Heterosexual (n = 24,463) Mean or % (95% CI)	Gay and bisexual — Total (n = 659) Mean or % (95% CI)	Gay (n = 528) Mean or % (95% CI)	Bisexual (n = 131) Mean or % (95% CI)
Age, years	60.26 (60.13–60.39) ***	56.42 (55.58–57.25) ***	56.5 (55.4–57.49)	56.3 (54.4–58.2)	59.8 (59.6–59.9) ***	56.9 (56.3–57.6) ***	56.4 (55.6–57.2)	59.2 (57.4–61.1) **
Marital status		***	***	***		***		*
Married/common law	68.6 (68.0–69.2)	64.4 (59.4–69.11)	71.1 (64.7–76.7)	48.6 (38.3–59.1)	82.9 (82.4–83.3)	46.5 (42.3–50.8)	45.7 (40.4–51.0)	50.3 (39.7–60.8)
Single	7.7 (7.4–8.1)	21.8 (18.0–26.3)	20.8 (15.8–26.7)	24.4 (17.0–33.8)	6.6 (6.2–6.9)	40.2 (36.1–44.4)	42.9 (37.8–48.2)	28.5 (20.0–38.8)
Divorced/separated	13.3 (12.9–13.7)	10.2 (7.7–13.4)	6.6 (4.1–10.6)	18.6 (12.4–26.9)	7.6 (7.3–8.0)	9.8 (7.7–12.4)	8.5 (6.2–11.5)	15.4 (9.5–24.2)
Widowed	10.4 (10.0–10.7)	3.6 (2.2–5.6)	1.5 (0.7–3.5)	8.4 (4.6–14.9)	3.0 (2.8–3.1)	3.5 (2.4–5.0)	2.9 (1.8–4.7)	5.8 (2.7–12.0)
Ethnicity								
White	95.2 (94.9–95.5)	94.1 (91.1–96.2)	95.0 (90.9–97.4)	92.1 (84.3–96.2)	93.7 (93.4–94.1)	95.7 (93.6–97.2)	95.7 (92.8–97.5)	95.8 (90.3–98.2)
Education		**				**		**
Less than secondary	6.5 (6.2–6.8)	2.0 (1.0–4.0)	1.8 (0.1–4.6)	2.5 (0.01–8.7)	5.7 (5.4–6.0)	4.0 (2.5–6.4)	2.9 (1.4–6.1)	9.0 (4.5–17.0)
Secondary graduation, no post-secondary	11.8 (11.3–12.2)	9.2 (6.6–12.7)	9.3 (6.0–14.4)	8.9 (4.5–16.8)	9.8 (9.4–10.3)	7.3 (5.5–9.6)	6.0 (4.1–8.7)	13.1 (7.9–10.8)
Some post-secondary	7.3 (6.9–7.6)	7.9 (5.5–11.3)	7.2 (4.4–11.6)	9.6 (4.6–18.8)	7.0 (0.07–7.4)	8.3 (6.2–11.0)	7.2 (4.9–10.4)	12.9 (6.9–22.9)
Post-secondary degree/diploma	74.5 (74.0–75.1)	80.1 (76.4–84.7)	81.7 (75.7–86.4)	79.0 (68.9–86.5)	77.5 (76.9–78.04)	80.4 (76.8–83.6)	84.0 (79.6–87.5)	65.1 (54.5–74.3)
Retirement		***	*			**		*
Completely retired	40.3 (39.8–41.0)	23.6 (19.7–27.9)	27.0 (21.5–33.3)	15.5 (9.7–24.0)	32.0 (31.4–32.6)	27.1 (23.8–30.7)	25.2 (21.3–29.5)	35.3 (26.4–45.4)
Partly retired	8.4 (8.1–8.8)	8.3 (5.2–11.5)	5.5 (3.1–9.5)	14.9 (8.9–23.8)	11.1 (10.7–11.6)	9.7 (7.7–12.2)	8.6 (6.4–11.6)	14.23 (8.5–22.9)
Not retired	51.2 (50.6–51.9)	68.2 (63.3–72.6)	67.5 (60.9–73.6)	69.6 (56.7–78.0)	56.8 (56.2–57.5)	63.2 (59.2–61.0)	66.2 (61.4–70.7)	50.5 (39.8–61.1)
Household income per year		*		***		***		
≥$100,000	31.7 (31.1–32.4)	35.7 (30.7–41.1)	38.9 (32.2–46.1)	28.1 (19.4–38.8)	42.8 (42.1–43.5)	34.9 (30.8–39.3)	37.3 (32.2–42.7)	24.8 (16.5–35.5)
$50,000–$99,999	31.9 (31.3–32.5)	33.3 (28.6–38.5)	33.3 (27.0–40.3)	33.5 (24.4–44.0)	33.5 (32.9–34.2)	33.3 (29.5–37.4)	32.9 (28.2–38.0)	35.0 (25.9–45.3)
$20,000–$49,999	23.3 (22.8–23.9)	18.8 (15.2–23.0)	17.3 (12.8–23.0)	22.2 (15.2–31.3)	16.6 (16.1–17.0)	20.0 (17.4–23.8)	19.7 (16.3–23.8)	23.2 (15.4–33.5)
<$20,000	5.7 (5.5–6.0)	7.8 (5.5–10.8)	5.9 (3.5–9.8)	12.2 (7.0–20.5)	3.3 (3.0–3.5)	8.2 (6.1–10.8)	7.0 (4.7–10.1)	13.3 (7.6–22.1)
Refused/Don't know	7.3 (7.0–7.7)	4.4 (2.7–7.2)	4.6 (2.4–8.7)	4.1 (1.4–11.0)	3.9 (3.6–4.1)	3.2 (2.1–4.9)	3.1 (1.8–5.3)	3.8 (1.5–9.1)
Residence (urban)	85.0 (84.6–85.5)	87.8 (83.6–91.0) ***	86.9 (81.3.5–91.0)	89.9 (80.695.0) ***	85.95 (85.5–86.4)	90.27 (87.6–92.4) ***	91.8 (88.8–94.0)	83.9 (75.1–89.9) *
Children in household	2.3 (2.2–2.3)	1.0 (0.9–1.2) ***	0.8 (0.7–1.0)	1.5 (1.2–1.8) ***	2.2 (2.2–2.2)	0.6 (0.5–0.7) ***	0.4 (0.3–0.5)	1.5 (1.2–1.9) *

Table 1 (continued)

Characteristic	Female (n = 26,086)				Male (n = 25,122)			
	Heterosexual (n = 25,688) 95% CI	Lesbian and bisexual			Heterosexual (n = 24,463) Mean or % (95% CI)	Gay and bisexual		
		Total (n = 398) Mean or % (95% CI)	Lesbian (n = 275) Mean or % (95% CI)	Bisexual (n = 123) Mean or % (95% CI)		Total (n = 659) Mean or % (95% CI)	Gay (n = 528) Mean or % (95% CI)	Bisexual (n = 131) Mean or % (95% CI)
Living alone	21.0 (20.6–21.5)	24.3 (20.4–28.7) **	17.6 (13.4–22.9)	40.1 (30.7–50.3) ***	11.3 (11.0–11.7)	38.8 (34.9–42.9) ***	39.2 (34.3–44.3)	37.4 (28.1–47.8) **
Province		**		***		***	***	
Alberta	9.3 (9.1–9.5)	6.6 (4.3–9.8)	6.4 (4.2–9.5)	7.0 (3.7–12.7)	10.6 (10.4–10.9)	6.5 (4.5–9.2)	6.1 (4.6–8.0)	8.3 (3.8–17.2)
British Columbia	17.1 (16.9–17.4)	24.1 (20.0–28.7)	23.0 (19.5–27.0)	26.6 (19.7–34.8)	17.3 (17.0–17.5)	18.8 (15.7–22.3)	18.4 (16.2–20.8)	20.6 (13.1–30.7)
Manitoba	8.7 (8.6–8.9)	12.4 (9.4–16.2)	13.3 (10.8–16.1)	10.4 (6.0–17.3)	9.2 (9.0–9.4)	5.8 (4.1–8.2)	6.5 (5.3–8.0)	2.8 (1.0–7.3)
New Brunswick	2.7 (2.6–2.7)	1.7 (8.0–3.6)	1.4 (0.8–2.5)	2.4 (1.0–5.8)	2.6 (2.5–2.7)	3.7 (2.5–5.5)	4.0 (3.2–5.1)	2.3 (0.8–6.7)
Newfoundland and Labrador	7.0 (6.9–7.2)	6.9 (4.7–10.1)	7.6 (5.6–10.1)	5.4 (2.3–12.1)	6.5 (6.4–6.7)	3.9 (2.6–5.7)	3.4 (2.3–4.9)	5.9 (3.5–9.7)
Nova Scotia	9.6 (9.4–9.7)	9.5 (6.7–13.4)	9.4 (6.8–12.8)	9.8 (5.3–17.7)	8.5 (8.3–8.7)	7.6 (5.7–10.2)	7.6 (6.2–9.3)	7.7 (4.0–14.5)
Ontario	21.6 (21.4–21.8)	17.3 (14.0–22.3)	17.1 (13.8–20.9)	19.3 (12.8–28.0)	21.7 (21.5–22.0)	26.3 (22.8–30.2)	26.8 (24.2–26.5)	25.4 (17.2–33.5)
Prince Edward Island	2.2 (2.2–2.3)	1.7 (0.8–3.5)	2.4 (1.9–2.9)	0 (0.0–0.0)	2.2 (2.1–2.3)	2.7 (1.7–4.3)	2.2 (1.6–3.2)	4.9 (2.3–10.2)
Quebec	19.0 (18.8–19.2)	17.3 (13.7–21.6)	17.7 (14.6–21.4)	16.3 (10.8–23.9)	18.7 (18.4–18.9)	22.1 (18.8–25.9)	23.8 (21.1–26.8)	15.0 (9.9–22.2)
Saskatchewan	2.7 (2.7–2.8)	2.1 (1.1–4.0)	1.8 (0.9–3.7)	2.8 (1.1–6.7)	2.7 (2.6–2.8)	2.5 (1.5–4.2)	1.2 (0.7–2.3)	8.0 (4.4–14.3)

Tests first compared demographic characteristics between heterosexual and non-heterosexual participants of the same sex. Next, demographic characteristics were contrasted between homosexual (i.e., lesbian or gay) and bisexual participants of the same sex. All analyses accounted for complex survey by applying the analytic weights for the pooled CLSA sample

CI confidence interval

*p < 0.05; **p < 0.01; ***p < 0.001

more likely to be widowed or divorced/separated compared to lesbian participants ($p < 0.001$).

Compared to heterosexual males, sexual minority males were 2.8 years younger (95% CI = 2.2–3.5, $p < 0.001$), had 1.6 fewer children living in their household (95% CI = 1.5–1.7, $p < 0.001$), were more likely to be single ($p < 0.001$), and were more likely to be living alone ($p < 0.001$). While sexual minority males were less likely to be retired ($p < 0.05$), they also reported lower household income ($p < 0.001$) relative to heterosexual peers. Compared to gay males, bisexual males were 2.9 years older (95% CI = 0.8–4.9, $p < 0.001$), had 1.13 more children living in their household (95% CI = 0.8–1.5, $p < 0.001$), and were more likely to be married ($p < 0.05$).

Chronic conditions

Table 2 shows the prevalence of chronic conditions by sexual orientation for males and females as well as crude and adjusted odds ratios.

Results indicated that sexual minority females had a higher prevalence of reporting asthma (prevalence of 19.0%; AOR = 1.43, 95% CI = 1.0–1.7, $p = 0.047$) compared to heterosexual peers, after controlling for demographic characteristics. The prevalence of hypertension was lower among sexual minority females relative to heterosexual females (prevalence of 21.1%; AOR = 0.7, 95% CI = 0.6–0.9, $p = 0.011$). Gay and bisexual males had higher odds of reporting asthma (prevalence of 15%; AOR = 1.4, 95% CI = 1.0–1.8, $p = 0.010$), respiratory problems (prevalence of 9%; AOR = 1.4, 95% CI = 1.0–1.9, $p = 0.042$), cancer (prevalence of 12.5%, AOR = 1.5, 95% CI = 1.0–1.9, $p = 0.008$), and osteoporosis (prevalence of 3.9%, AOR = 2.0, 95% CI = 1.3–3.1, $p = 0.003$), relative to heterosexual males, after controlling for demographic characteristics.

Mental health

Mental health-related variables are presented in Table 3. Female sexual minorities exhibited a higher lifetime prevalence of anxiety disorders (prevalence of 18.5%, AOR = 1.8, 95% CI = 1.4–2.4, $p < 0.001$), mood disorders (prevalence of 30.5%, AOR = 1.6, 95% CI = 1.2–2.0, $p < 0.001$), and poor/fair current self-rated mental health (prevalence of 10.1%, AOR = 1.6, 95% CI = 1.1–2.4, $p = 0.009$) relative to heterosexual peers, after controlling for demographic characteristics.

Among males, prevalence estimates showed greater odds for gay and bisexual individuals of being previously diagnosed with an anxiety disorder (prevalence of 11%, AOR = 1.5, 95% CI = 1.1–2.0, $p = 0.005$) and a mood disorder (prevalence of 24.5%, AOR = 1.9, 95% CI = 1.6–2.4, $p < 0.001$), after controlling for demographic characteristics. Gay and bisexual males reported a higher prevalence of poor/fair self-rated mental health (prevalence of 7.7%, crude OR = 1.5,

95% CI = 1.1–2.1, $p = 0.01$), a difference that no longer reached statistical significance after controlling for demographic characteristics.

Health behaviours and health care utilization

Prevalence of health behaviours and indicators of health care utilization is presented in Table 4. Among female participants, sexual minorities were more likely to be former smokers (prevalence of 52.5%, AOR = 1.5, 95% CI = 1.2–1.9, $p = 0.001$)[5] and engage in heavy drinking (prevalence of 27.2%, AOR = 1.8, 95% CI = 1.3–2.4, $p < 0.001$). Sexual minority female participants were more likely to report having seen a psychologist in the last 12 months in comparison to heterosexual peers (prevalence of 9.1%, crude OR = 1.7, $p = 0.007$), a difference that no longer reached significance after controlling for demographic characteristics. After controlling for demographic characteristics, female sexual minorities had higher odds of seeing a physiotherapist, occupational therapist, or chiropractor (prevalence of 46.1%, AOR = 1.3, 95% CI = 1.1–1.7, $p = 0.010$).

Gay and bisexual male participants were more likely to be current smokers (prevalence of 28.6%, AOR = 1.5, 95% CI = 1.2–2.0, $p = 0.003$), after controlling for demographic variables. They were also more likely to report having seen a psychologist (prevalence of 9.3%, AOR = 1.8, 95% CI = 1.3–2.5, $p = 0.001$), family physician (prevalence of 89.8%, AOR = 1.6, 95% CI = 1.1–2.1, $p = 0.002$), medical specialist (prevalence of 50.5 AOR = 1.3, 95% CI = 1.1–1.6, $p = 0.005$), and social worker (prevalence of 6.2%, AOR = 2.1, 95% CI = 1.4–3.1, $p < 0.001$) in the last 12 months compared to heterosexual males, after controlling for demographic variables.

Discussion

Canada's population of LGB adults is aging and, to date, the health status of older sexual minorities has been invisible within our statistical portraits. To our knowledge, this is the first study to examine differences in health status between aging heterosexual and sexual minority adults in Canada. The results indicate that sexual minority adults aged 45 and older in Canada demonstrate the presence of health inequalities in chronic diseases, mental health conditions, and health risk behaviours. Sexual minority females were more likely than heterosexual female participants to report having asthma. In terms of health risk behaviours, sexual minority females were more likely to report excessive drinking and being former smokers. Sexual minority males were likely to report being current smokers, having had a cancer diagnosis, and having asthma and other respiratory problems. Given the

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[5] Reference category for former and current smoker was non-smoker.

Table 2 Chronic health conditions among females and males in CLSA baseline by sexual orientation

Chronic conditions	Female	Lesbian and bisexual			Male	Gay and bisexual		
	Heterosexual (ref) % (95% CI)	Total % (95% CI)	OR (95% CI)	AOR (95% CI)	Heterosexual (ref) % (95% CI)	Total % (95% CI)	OR (95% CI)	AOR (95% CI)
Myocardial infarction	2.3 (2.2–2.5)	2.7 (1.6–4.6)	1.2 (0.7–2.0)	1.7 (1.0–2.9)	6.4 (6.1–6.7)	5.6 (4.1–7.7)	0.9 (0.6–1.2)	1.1 (0.7–1.5)
Angina	2.9 (2.7–3.1)	3.2 (1.9–5.3)	1.1 (0.6–1.9)	1.7 (1.0–2.9)	4.9 (4.6–5.2)	3.4 (2.3–5.0)	0.7 (0.5–1.0)	0.8 (0.6–1.2)
Hypertension	32.3 (31.7–32.8)	21.1 (17.3–25.4)	0.6*** (0.4–0.7)	0.7* (0.6–0.9)	35.0 (34.3–35.6)	33.5 (29.7–37.5)	0.9 (0.8–1.1)	1.1 (0.9–1.3)
Stroke or TIA	3.4 (3.2–3.6)	3.6 (2.2–5.9)	1.1 (0.6–1.8)	1.6 (0.9–2.7)	3.9 (3.7–4.1)	4.8 (3.3–6.9)	1.2 (0.8–1.8)	1.5 (1.0–2.3)
Respiratory problems	8.2 (7.8–8.5)	8.5 (6.1–11.8)	1.0 (0.7–1.5)	1.2 (0.8–1.7)	6.6 (6.3–7.0)	9.0 (6.7–11.9)	1.4* (1.0–1.9)	1.4* (1.0–1.9)
Asthma	14.4 (13.9–14.8)	19.0 (15.2–23.5)	1.4* (1.1–1.8)	1.3* (1.0–1.7)	10.5 (10.1–11.0)	15.0 (12.1–18.5)	1.5** (1.2–1.9)	1.4* (1.0–1.8)
Cancer	14.0 (13.6–14.5)	9.8 (7.1–13.4)	0.7* (0.5–0.9)	0.8 (0.6–1.1)	12.1 (11.7–12.5)	12.5 (10.1–15.5)	1.0 (0.8–1.3)	1.5** (1.1–1.9)
Chronic pain	41.5 (40.8–42.2)	39.9 (34.7–45.3)	0.9 (0.7–1.2)	1.0 (0.8–1.3)	33.3 (32.6–34.0)	34.2 (30.1–38.6)	1.1 (0.8–1.5)	1.0 (0.8–1.2)
Back problems	25.3 (24.7–25.9)	28.5 (24.0–33.5)	1.2 (0.9–1.5)	1.2 (1.0–1.6)	26.8 (26.1–27.4)	27.2 (23.5–31.3)	1.0 (0.8–1.2)	1.0 (0.9–1.2)
Arthritis	58.9 (58.1–59.7)	57.4 (50.3–64.2)	0.9 (0.7–1.3)	1.0 (0.9–1.5)	45.7 (44.8–46.6)	38.9 (33.2–44.8)	0.8* (0.6–1.0)	0.9 (0.7–1.1)
Osteoporosis	13.1 (12.7–13.5)	9.9 (7.3–13.2)	0.7 (0.5–1.0)	1.1 (0.7–1.5)	2.1 (1.9–2.3)	3.9 (2.5–5.9)	1.8** (1.2–2.9)	2.0** (1.3–3.1)
Diabetes	13.9 (13.3–14.6)	10.4 (6.4–16.6)	0.7 (0.4–1.2)	0.8 (0.4–1.6)	17.1 (16.3–17.9)	20.7 (15.9–26.4)	1.3 (0.9–1.8)	1.4 (1.0–1.9)
Obesity	26.7 (26.2–25.2)	27.6 (23.2–32.5)	1.0 (0.8–1.3)	1.0 (0.8–1.3)	27.9 (27.2–28.5)	25.3 (21.7–29.2)	0.9 (0.7–1.1)	0.8 (0.7–1.0)

All analyses accounted for complex survey by applying the analytic weights for the pooled CLSA sample

AOR: adjusted for age (in years), education, income, and province

CI confidence interval; TIA transient ischemic attack

*p < 0.05; **p < 0.01; ***p < 0.001

Table 3 Mental health conditions among females and males in CLSA baseline by sexual orientation

	Females				Males			
	Heterosexual (ref) % (95% CI)	Lesbian and bisexual			Heterosexual (ref) % (95% CI)	Gay and bisexual		
		Total % (95% CI)	OR (95% CI)	AOR (95% CI)		Total % (95% CI)	OR (95% CI)	AOR (95% CI)
Mood disorder	19.9 (19.4–20.4)	30.5 (25.9–35.5)	1.8*** (1.4–2.2)	1.6*** (1.2–2.0)	12.2 (11.8–12.7)	24.5 (20.9–28.5)	2.3*** (1.9–2.9)	1.9*** (1.6–2.4)
Anxiety disorders	10.1 (9.7–10.5)	18.5 (14.7–23.0)	2.0*** (1.5–2.7)	1.8*** (1.4–2.4)	6.2 (5.8–6.5)	11.0 (8.6–14.0)	1.9*** (1.4–2.5)	1.5*** (1.1–2.0)
Perceived mental health (poor-fair)	5.6 (5.3–5.9)	10.1 (7.3–13.7)	1.9*** (1.3–2.7)	1.6* (1.1–2.4)	5.3 (4.9–5.6)	7.7 (5.7–10.3)	1.5* (1.1–2.1)	1.1 (0.8–1.6)

All analyses accounted for complex survey by applying the analytic weights for the pooled CLSA sample

AOR: adjusted for age (in years), education, income, and province

CI confidence interval

$*p < 0.05$; $**p < 0.01$; $***p < 0.001$

strong link between health behaviours (e.g., smoking, excessive alcohol consumption) and chronic disease risk, our results suggest the need for targeted health interventions that consider both the social determinants of health and the unique histories of marginalized groups, such as aging sexual minorities, to reduce health risk behaviours.

In terms of mental health, compared to heterosexual participants, sexual minority males and females were more likely to report having had a diagnosis of an anxiety or a mood disorder in their lifetime, even after controlling for relevant demographic variables. Gay and bisexual men had higher odds of seeing a health professional, including social workers and psychologists. These findings suggest that aging sexual minorities may be at-risk of poor mental health outcomes and that health care and helping professionals should be competent in screening for mental health conditions and providing culturally competent care to aging members of this population.

The findings presented here align with minority stress models in that members of marginalized groups may experience poor health outcomes stemming from negative social conditions and the experience of adverse or stressful events. Until 1969, homosexual acts in Canada were criminal, a prime example of the historical social conditions experienced by many participants in this study (United Way of Ottawa 2017; Chambers 2010). Yet, it has been argued that by navigating adversity and transitions throughout the life course, sexual minorities may be better equipped to accept aging relative to their heterosexual peers, through a process of "crisis competence" (Friend 1980). This resiliency in aging exhibited by sexual minorities and the associated historical and contemporary lived experiences may explain the higher prevalence of health help-seeking behaviour observed here, such as higher odds of seeing a health/mental health professional. While this analysis focused on health inequalities, existing literature on LGB aging also highlights the strengths (e.g., sense of community, social support) exhibited by individuals in these communities (Graham et al. 2011); future research should examine these strengths in relation to the risks observed here.

The findings presented here bear a remarkable resemblance to other estimates from outside of Canada (Fredriksen-Goldsen et al. 2017; Fredriksen-Goldsen et al. 2013) showing health inequalities among older LGB communities within population health datasets. Our findings are consistent with other works that show inequalities in the prevalence of anxiety and depression among sexual minorities of both sexes (Gonzales and Henning-Smith 2015; Wallace et al. 2011) as well as an increased risk of cancer among sexual minority males (Boehmer et al. 2011; Ward et al. 2015). Within our sample, the prevalence of disability was too low (< 1%) among both heterosexual and sexual minority participants to warrant multivariable analysis. The sample of Canadian LGB individuals presented here was still relatively young for a

Table 4 Health behaviours and health care utilization among females and males in CLSA baseline by sexual orientation

	Females				Males			
	Heterosexual % (ref)	Lesbian and bisexual			Heterosexual % (ref)	Gay and bisexual		
		Total (%)	OR (95% CI)	AOR (95% CI)		Total (%)	OR (95% CI)	AOR (95% CI)
Health behaviours								
Former smoker	43.3 (42.6–44.0)	52.5 (46.8–58.1)	1.4** (1.2–1.8)	1.5*** (1.2–1.9)	49.8 (49.1–50.5)	50.1 (45.5–54.7)	1.0 (0.8–1.2)	1.1 (0.9–1.4)
Current smoker	16.2 (15.6–16.8)	23.1 (17.6–29.8)	1.6* (1.1–2.2)	1.4 (0.9–2.0)	17.5 (16.8–18.3)	28.6 (23.7–34.1)	1.9*** (1.5–2.4)	1.5** (1.2–2.0)
Heavy drinking	16.0 (15.4–16.6)	27.2 (22.1–32.9)	2.0*** (1.5–2.6)	1.8*** (1.3–2.4)	25.3 (24.6–26.0)	25.9 (21.9–30.3)	1.0 (0.8–1.3)	1.0 (0.8–1.2)
No exercise (per week)	71.5 (70.8–72.1)	70.4 (65.1–75.2)	0.9 (0.7–1.2)	1.0 (0.8–1.3)	70.5 (69.8–71.1)	69.5 (65.2–73.4)	1.0 (0.8–1.2)	0.9 (0.8–1.2)
Sleep problems	67.6 (67.0–68.3)	64.0 (58.8–69.0)	0.9 (0.7–1.1)	0.8 (0.7–1.0)	60.7 (60.0–61.4)	61.9 (57.7–66.0)	1.1 (0.9–1.3)	1.0 (0.8–1.2)
Health care utilization								
Family doctor	91.0 (90.6–91.4)	90.7 (87.1–93.4)	1.0 (0.7–1.4)	1.1 (0.7–1.6)	86.9 (86.4–87.4)	89.8 (86.7–92.2)	1.3 (1.0–1.8)	1.6** (1.1–2.1)
Psychologist	5.4 (5.1–5.8)	9.1 (6.3–12.8)	1.7** (1.2–2.6)	1.5 (1.0–2.2)	4.5 (4.2–4.9)	9.3 (7.0–12.3)	2.2*** (1.6–3.0)	1.8** (1.3–2.5)
Medical specialist	47.6 (47.0–48.3)	46.0 (40.6–51.5)	0.9 (0.7–1.2)	1.0 (0.8–1.2)	45.9 (45.2–46.6)	50.5 (46.0–54.9)	1.2* (1.0–1.4)	1.3** (1.1–1.6)
Dentist	82.5 (82.0–83.0)	85.4 (81.2–88.8)	1.2 (0.9–1.7)	1.1 (0.8–1.2)	79.7 (79.1–80.2)	81.2 (77.3–84.6)	1.1 (0.9–1.4)	1.2 (1.0–1.6)
Ophthalmologist or optometrist	61.9 (61.2–62.6)	57.2 (51.6–62.5)	0.8 (0.7–1.0)	0.9 (0.7–1.2)	52.4 (51.6–53.1)	54.5 (50.0–58.9)	1.1 (0.9–1.3)	1.3* (1.0–1.5)
Physiotherapist, occupational therapist, or chiropractor	37.0 (36.4–37.7)	46.1 (40.7–51.6)	1.5** (1.2–1.8)	1.3* (1.1–1.7)	31.5 (30.9–32.2)	32.0 (28.0–36.3)	1.0 (0.8–1.2)	1.0 (0.8–1.3)
Social worker	3.4 (3.1–3.6)	5.5 (3.4–8.8)	1.7* (1.0–2.8)	1.6 (1.0–2.8)	2.5 (2.3–2.7)	6.2 (4.4–8.7)	2.6*** (1.8–3.8)	2.1*** (1.4–3.1)

All analyses accounted for complex survey by applying the analytic weights for the pooled CLSA sample. Reference group for former and current smoker is non-smoker

AOR: adjusted for age (in years), education, income, and province

CI confidence interval

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

study on aging (mean age for females = 56.42; mean age for males = 56.9); the CLSA sample may have yet to experience the functional impacts of multiple chronic diseases.

The results of this study have important implications for health research, practice, and policy to support a diverse aging population. However, this study is not without its limitations. These findings are based on self-reported data, and the addition of objective measures of health would enhance the estimates presented. While the sampling frame allows us to generate estimates that are representative of the 10 Canadian provinces, the health of individuals in Canada's territories, those residing in long-term care, and residents of First Nations reserves and other First Nations settlements was not captured within this dataset. Similarly, recent Census data indicate that approximately 2% of Canadian adults 45 years and older do not speak English or French (Statistics Canada, 2006), excluding them from participation in the CLSA. Thus, linguistic minorities in Canada who also identify as LGB may have unique health needs, which are not represented within the CLSA dataset. Sexual and gender minorities have been identified as a *hard-to-reach* population who often exhibit higher nonresponse rates than majority populations (Bonevski et al. 2014); the sampling weights used to estimate the broader Canadian population may not account for this sampling bias and thus impact generalizability. Due to our sample size, we grouped bisexual and homosexual participants of the same sex; future research should examine differences in health outcomes among such subpopulations. Finally, the CLSA baseline data did not include questions about gender expression or gender identity, precluding any analysis of the health of aging gender minorities in Canada, a population about which very little is known.

In our study, we conducted multiple statistical tests, increasing the probability of a type 1 error (i.e., rejecting the null hypothesis when it is true). This study was exploratory insofar as, to our knowledge, it is the first to examine health inequalities among aging sexual minorities in Canada, and the data were collected as part of a national data collection initiative broadly focused on health and aging. Given our objectives and the available data, we opted not to perform adjustments for multiple tests, an appropriate approach for exploratory analyses (Bender and Lange 2001). Future hypothesis-driven data collection initiatives focused on health and aging among sexual minority communities are warranted to confirm the descriptive results presented here.

This study represents an important step towards understanding and addressing the health needs of aging sexual minorities in Canada. These findings highlight the importance of considering both sex and sexual orientation when developing approaches to support a diverse aging population. Male and female sexual minorities exhibit different patterns of health inequalities that should be considered by health policy makers and health care providers seeking to promote health equity.

These findings support the need to simultaneously consider sexual orientation and age, including the historical and contemporary lived experiences, within the delivery of programs and health services to aging adults. For example, addressing gaps in the cultural competence of health and social care may reduce perceived stigma and alleviate fears of discrimination among LGB older adults, thereby minimizing inequalities (Cannon et al. 2017).

These data suggest clear mental health inequalities between aging sexual minorities and heterosexual Canadians; strategies to promote mental health among older Canadians should also consider the needs of at-risk populations, such as sexual minorities. Further study is needed to understand and address the mechanisms underlying health and well-being of older sexual and gender minority communities, data that are not available in population health datasets.

Compliance with ethical standards

The CLSA was approved by Research Ethics Boards (REBs) in different provinces, and the University of Ottawa REB approved the analyses presented here. Written informed consent was obtained for all participants.

Conflict of interest   The authors declare that they have no competing interests.

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