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# Ethno-racial variations in mental health symptoms among sexually-active gay, bisexual, and other men who have sex with men in Vancouver, Canada: a longitudinal analysis

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## Abstract

**Background** Minority stress from racism and heterosexism may uniquely interact to impact the mental health of racialized sexual minorities. We examined variations in anxiety and depressive symptoms by reported by ethno-racial identity among gay, bisexual, and other men who have sex with men (gbMSM) in Vancouver, Canada.

**Methods** We recruited gbMSM aged  $\geq 16$  years from February 2012 to February 2015 using respondent-driven sampling (RDS). Participants completed computer assisted self-interviews (CASI) at enrollment and every 6 months until February 2017. We examined factors associated with moderate/severe anxiety and depression scores ( $> 10$ ) on the Hospital Anxiety and Depression Scale (HADS) and differences in key explanatory variables including sociodemographic, psychosocial, and substance use factors. We used multivariable mixed effects models to assess whether moderate/severe scores were associated with ethno-racial identity across all visits.

**Results** After RDS-adjustment, of 774 participants, 79.9% of participants identified as gay. 68.6% identified as white, 9.2% as Asian, 9.8% as Indigenous, 7.3% as Latin American, and 5.1% as other ethno-racial identities. Participants contributed a median of 6 follow-up visits (Q1–Q3: 4–7). In the multivariable analysis, Asian participants had decreased odds of moderate/severe anxiety scores compared to white participants (aOR = 0.39; 95% CI: 0.18–0.86), and Latin American participants had decreased odds of moderate/severe depression scores compared to both white (aOR = 0.17; 95% CI: 0.08–0.36) and Asian (aOR = 0.07; 95% CI: 0.02–0.20) participants.

**Conclusion** Asian and Latino gbMSM reported decreased mental health symptoms compared to white participants. Asian and Latino gbMSM in Vancouver appear to manage multiple minority stressors without adversely affecting their mental health.

## Key messages

- What is already known on this topic:

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- Sexual minority groups, including gay, bisexual, and other men who have sex with men (gbMSM), experience higher rates of mental health disorders than their heterosexual counterparts.
- Evidence is mixed on how stigma from intersecting minority identities among gbMSM, such as racism experienced by non-white ethno-racial identities, further affects mental health outcomes.
- What this study adds:
  - Among a sample of urban-residing gbMSM in Vancouver, Canada, ethno-racial minority status was not associated with increased odds of reporting moderate/severe depression or anxiety symptoms.
  - Asian gbMSM had reduced odds of reported anxiety symptoms and Latino men had reduced odds of depression symptoms compared with white men.
- How this study might affect research, practice, or policy:
  - More research is needed with ethno-racialized gbMSM to understand mental health risks and vulnerabilities and to qualify survival and resilience narratives surrounding mental health.
  - Healthcare providers should recognize nuance in how racism and homophobia may uniquely interact to affect the mental health of individual gbMSM.

**Keywords** Men who have sex with men, Race, Ethnicity, Mental health, Depression, Anxiety, Minorities

## Background

Sexual minority groups, including gay, bisexual, and other men who have sex with men (gbMSM), are at greater risk of mental health disorders compared with heterosexual individuals [1–3]. Minority stress theory suggests that these disparities may be explained by the excess stress that individuals from stigmatized groups experience because of their social position [4]. Minority stress may manifest distally (e.g., externalized events such as victimization) or proximally (e.g., internalized social attitudes) [4]. Indeed, research has shown that discrimination, stigma, and internalized homophobia play a role in poor mental health outcomes for gbMSM [5, 6].

However, gbMSM may have multiple marginalized social identities beyond their sexual orientation, including racial or ethnic identity, gender identity, immigration status, socioeconomic status, or HIV serostatus. Indeed, there is extensive literature surrounding the negative impact of racial discrimination on mental health outcomes [7]. Minority identities may be examined through the lens of intersectionality theory, which describes how experiences of oppression from multiple marginalized identities (e.g. racism, heterosexism, classism) interact to produce unique downstream effects [8]. Minority stress theory suggests that sexual minority people of colour experience dual stressors through experiences with both homophobia and racism, also termed the “double jeopardy” hypothesis [9]. However, this diversity of identities can also interact in unique ways, inviting conversations about the contribution of both risk and resilience to mental health [9, 10]. Indeed, many modulating factors, including substance

use [11] immigration status [12], may influence mental health outcomes in gbMSM with multiple marginalized identities.

Previous research does not consistently show that people of colour experience more mental health problems compared to their white counterparts, including in sexual minority populations. In the United States (U.S.), the prevalence of mental health disorders is lower in some racial or ethnic minority groups compared with white individuals [13, 14]. Research at the intersection of sexual and ethno-racial minority status is limited, but some U.S. data show that the prevalence of mental health disorders or symptoms is similar or reduced for Black, Latino, and Asian sexual minority individuals compared with white individuals [3, 15–18]. Conversely, some research has shown an increase in suicide attempts for Black [19], Latino [16, 20], and Alaska Native/Pacific Islander [20] sexual minority individuals compared with white individuals. Outside of the U.S., research in the United Kingdom (U.K.) has shown that the impact of minority sexual identity on mental health, as measured by the GHQ-12, is similar along white individuals and people of colour [17]. Conversely, in Australia, non-Anglo-Celtic gay and bisexual men, particularly Indigenous men, were more likely to show symptoms of depression [21].

In Canada, sexual minority individuals experience a higher prevalence of mental health disorders and lower rates of positive mental health than heterosexual individuals [1, 22]. Among all Canadians, Black, South Asian, and Chinese individuals are less likely to have a diagnosed mental health disorder or have suicidal thoughts than their white counterparts [23]. However,

Indigenous individuals experience lower rates of complete mental health (emotional well-being; psychological and social functioning) than non-Indigenous individuals [24]. There is comparatively limited recent research outside the U.S. that has centered ethno-racial identity in examining the mental health outcomes of sexual minority groups, and no studies that have investigated outcomes longitudinally. We developed a study to examine the effect of sexual and ethno-racial minority status on symptoms of anxiety and depression in a sample of sexually-active gbMSM in Metro Vancouver, Canada. In doing so, we compare how multiple marginalized identities may uniquely affect mental health outcomes for gbMSM.

## Methods

### Study design

Data for this study were drawn from the Momentum Health Study, a bio-behavioural prospective cohort study investigating sexual, psychosocial, and substance use patterns among sexually-active gbMSM living in Metropolitan Vancouver, Canada. Participants were recruited from February 2012 to February 2015 using respondent-driven sampling (RDS) [25], a formalized chain-referral sampling methodology that leverages the social networks of participants to recruit from minority or marginalized populations [26]. RDS offers some advantages over more traditional sampling strategies such as facility-based sampling, time-location sampling, snowball sampling or targeted sampling for these populations, but comes with its own limitations [27].

Participant eligibility included: gender identity as a man, regardless of sex assigned at birth; age 16 years or older; reported sex with another man in the past 6-months (P6M); current residence in Metro Vancouver; and ability to complete the questionnaire in English. Initial seeds were recruited via word of mouth through community partners and later through advertisements on gbMSM-targeted websites and mobile phone applications. After enrollment, all participants were provided with up to six vouchers and asked to recruit other eligible gbMSM from their social networks. We obtained written informed consent and participants completed 90-min in-person study visit at enrollment. Participants were also given the option of participating in follow-up visits every 6 months for a maximum of four years. At all study visits, participants completed a computer-assisted, self-administered interview (CASI) which asked about socio-demographic, psychosocial, and behavioural factors, including sexual health and substance use. Participants also met with a study nurse for serologic testing for HIV, syphilis, and hepatitis C. The nurse also asked about history of diagnosed mental health and substance use disorders.

Study participants received \$50 CAD for each study visit and an additional \$10 CAD for each eligible recruit. Data for this analysis were collected until February 2017. More detailed study procedures are published elsewhere [28].

### Patient and public involvement

All study participants were directly recruited into the study as seed participants or were recruited by participants already in the study. The Momentum Study is guided by a Community Advisory Board, made of 4 – 8 members of the GBM community and community-based organizations in Vancouver which met on a quarterly basis. The research questions and analysis plan for this paper were guided by a specific advisory committee, the Momentum Health Study People of Colour Advisory Board, composed of members of the community and the research team who identify as people of colour. All members were offered authorship on the paper so as to understand the results and assist in interpretation. All conference presentations and published manuscripts from the Momentum Study are made available on the study's website (<https://momentumstudy.ca/journal-articles-and-summaries>) for study participants to access. We also provide plain language summaries of all published manuscripts.

### Variables of interest

Participants were asked to identify the ethnic or racial group they most identified with from a list of 14 possibilities: Indigenous, White, Chinese or Taiwanese, Japanese, Korean, Filipino, South Asian, Southeast Asian, West Asian, Arab, Latino, Black, Pacific Islander, or Other. If “Other” was selected, participants could enter their preferred identity in free text. Participants could also select other ethno-racial groups they identified with in addition to the group they most identified with. These categories were then grouped into five larger ethno-racial groups: white, Indigenous, Latino, Asian and Other for analysis. The Hospital Anxiety and Depression Scale (HADS) [29] was used to ascertain current symptoms of anxiety and depression. Participants provided responses using 4-point scales to statements designed to assess anxiety and depression (e.g. “I get a sort of frightened feeling as if something awful is about to happen”) [29]. Scores for each subscale (anxiety and depression independently) range from 0 to 21 and are categorized as: normal (0–7), mild [8–10], and moderate/severe (> 10) [29]. The HADS scale has been widely used in both research and clinical settings to measure clinically significant symptoms of anxiety and depression and appears to perform as well as other measures such as the Beck's Depression

Index and the Personal Health questionnaire [30]. The Cronbach's  $\alpha$  for anxiety (0.84) and depression (0.79) scores measured at enrollment indicating good internal consistency.

Sociodemographic variables included age, income, and education, sexual identity, immigration status, self-reported HIV serostatus, and being "out" with their sexual orientation. In addition to the HADS, other psychological factors were measured with the Gay/Bisexual Self-Esteem Scale [31], Lubben Social Network Scale [32], and Loneliness Scale for Emotional and Social Loneliness [33]. As substance use has been shown to be associated with mood and anxiety symptoms [34, 35], participants also completed the Alcohol Use Disorder Identification Test (AUDIT) [36] and were asked about their substance use patterns over the P6M including their use of tobacco, cannabis, crystal methamphetamine, stimulants, depressants, opiates, and hallucinogens.

### Statistical analysis

We calculated RDS-I adjusted descriptive statistics for data collected at enrollment and bivariate analyses comparing variables across the five ethno-racial identities. We used Chi square or Fisher's exact tests to compare categorical variables and Kruskal–Wallis tests for continuous variables.

We used three-level generalized linear mixed models (GLMM) to examine associations with moderate/severe scores (defined as scores  $> 10$ ) on the HADS anxiety and depression subscales, at each study visit including enrollment and all available follow-up visits. These models used the RDS chain as the first level cluster to account for biases associated with recruitment chains and participant as the second level cluster to account for within-participant correlations. Odds ratios were calculated. White ethno-racial identity was used as the initial reference group, as most participants identified as white and given the social privilege ascribed to this group. We completed additional analyses using Asian identity (the second most common identity before RDS adjustment) as the reference group. Variables included for consideration in the multivariable model were selected based on  $p$ -value  $< 0.2$  in the univariable model and/or previous research. The final models were selected using a backward stepwise selection technique based on two criteria (Akaike Information Criterion (AIC) and Type III  $p$ -values), whereby the least significant (i.e., highest Type III  $p$ -value) variable was dropped until the final models reached the optimal (minimum) AIC [37]. All analyses were performed using SAS® Version 9.4 (SAS Corporation Cary, North Carolina, United States). All statistical tests were two-sided and considered significant at  $p < 0.05$ .

### Results

A total of 774 individuals were enrolled between February 2012 and February 2015 including 134 (17.3%) recruited as initial seeds. All 774 contributed at least one observation to the study and 583 (75.3%) completed at least one follow-up visit by February 2017. The median follow-up time was 3.4 years (Q1–Q3: 2.5–3.5), and the median number of follow-up visits was 6 (Q1–Q3: 4–7). Of the 774 participants with at least one study visit, the median number of follow-up visits did not differ across ethno-racial categories groups, ( $p = 0.241$ ). After RDS adjustment, 34.4% of the sample were aged  $< 30$  years, 79.9% identified as gay, and 20.1% identified as bisexual or other. The majority of respondents (67.4%) reported some post-secondary education, while 72.9% reported an annual income less than \$30,000. Over one in four participants (26.6%) reported not being born in Canada. Almost a quarter (21.4%) self-reported as living with HIV, and 70.2% reported being "out" about their sexual orientation. In terms of ethno-racial identity groups, 68.6% identified as white, 9.2% as Asian, 9.8% as Indigenous (Indigenous), 7.3% as Latino, and 5.1% as other racial or ethnic identities. At enrollment, 27.7% (95% CI: 22.5–32.7%) had moderate/severe HADS anxiety scores and 5.9% (95% CI: 3.2–9.4%) had moderate/severe depression scores.

RDS-adjusted descriptive statistics by ethno-racial identity group are shown in Table 1. We found statistically significant differences ( $p < 0.001$ ) for at least one group for all sociodemographic factors and substance use measures. However, we did not find differences between groups for measures of loneliness ( $p = 0.994$ ), overall self-esteem ( $p = 0.376$ ), or collective self-esteem ( $p = 0.541$ ). We found differences in the distribution of normal, borderline, and moderate/severe depression scores at enrollment across ethno-racial groups ( $p = 0.003$ ), but the differences in anxiety scores did not reach statistical significance ( $p = 0.067$ ).

In the univariable analysis of factors associated with moderate/severe HADS anxiety scores, participants who identified as Asian (OR = 0.31; 95% CI: 0.13–0.77) and Latino (OR = 0.23; 95% CI: 0.05–0.97) had decreased odds of moderate/severe anxiety scores compared with white participants (Table 2). This association remained in the multivariable model for Asian participants (aOR = 0.39; 95% CI: 0.18–0.86) but was not retained for Latino participants (aOR = 0.39; 95% CI: 0.09–1.73). We found no other significant differences between ethno-racial groups when changing the reference group to from white to Asian (data not shown). Other factors associated with increased odds of moderate/severe anxiety score in the multivariable model included AUDIT Score (aOR = 1.06; 95% CI: 1.02–1.09), total self-esteem score

**Table 1** RDS adjusted descriptive statistics of gbMSM living in Metro Vancouver, Canada at enrollment (n = 774)

	White (n = 585; RDS% = 68.6%)			Asian (n = 74; RDS % = 9.2%)			Indigenous (n = 50; RDS % = 9.8%)			Latino (n = 35; RDS % = 7.3%)			Other (n = 30; RDS % = 5.1%)			P-Value
	n	RDS %	RDS 95% CI	n	RDS %	RDS 95% CI	n	RDS %	RDS 95% CI	n	RDS %	RDS 95% CI	n	RDS %	RDS 95% CI	
Demographics																
Income Group																
Less than \$30,000	356	67.4	62.2, 72.6	39	61.5	48.1, 74.9	46	95.0	89.0, 100.0	27	86.9	74.5, 99.2	17	55.9	29.2, 82.6	<0.001
\$30,000—\$59,999	161	22.6	18.0, 27.1	21	21.4	10.9, 31.8	4	5.0	0.0, 11.0	4	6.4	0.0, 14.8	10	35.3	9.6, 61.0	
\$60,000 and over	68	10.0	6.8, 13.2	14	17.1	7.6, 26.7	0	0.0	0.0, 0.0	4	6.7	0.0, 15.8	3	8.8	0.0, 21.2	
Education completed																
High school or less	137	29.7	24.0, 35.4	3	7.4	0.0, 16.1	26	54.4	33.6, 75.1	7	18.0	0.2, 35.8	6	26.3	0.6, 52.1	<0.001
Greater than high school	448	70.3	64.6, 76.0	71	92.6	83.9, 100.0	24	45.6	24.9, 66.4	28	82.0	64.2, 99.8	24	73.7	47.9, 99.4	
Born in Canada																
No	82	14.3	10.2, 18.4	52	76.7	65.9, 87.5	0	0.0	0.0, 10.0	31	95.4	90.1, 100.0	12	51.9	24.9, 78.8	<0.001
Yes	503	85.7	81.6, 89.8	22	23.3	12.5, 34.1	50	100.0	0.0, 10.0	4	4.6	0.0, 9.9	18	48.1	21.2, 75.1	
Being Out																
Partially/no	37	8.2	4.8, 11.6	24	39.0	23.8, 54.2	5	5.3	0.0, 10.9	5	20.7	1.6, 39.8	1	6.4	0.0, 19.3	<0.001
Yes	479	77.2	72.1, 82.2	47	55.0	39.9, 70.1	37	70.1	50.9, 89.4	26	64.6	41.7, 87.4	22	57.7	29.5, 85.9	
Not gay-identified	69	14.6	10.4, 18.8	3	6.0	0.0, 13.8	8	24.5	5.6, 43.5	4	14.7	0.0, 31.9	7	35.9	7.3, 64.5	
Substance Use, P6M																
P6M Crystal Methamphetamine																
No	469	81.8	77.2, 86.4	70	95.6	90.2, 100.0	27	58.8	38.9, 78.8	30	86.9	70.1, 100.0	24	90.5	79.8, 100.0	<0.001
Yes	116	18.2	13.6, 22.8	4	4.4	0.0, 9.8	23	41.2	21.2, 61.1	5	13.1	0.0, 29.9	6	9.5	0.0, 20.2	
P6M Crack																
No	536	89.6	85.3, 93.9	71	95.5	89.9, 100.0	34	58.7	37.6, 79.8	33	91.8	75.9, 100.0	26	80.0	55.7, 100.0	<0.001
Yes	49	10.4	6.1, 14.7	3	4.5	0.0, 10.1	16	41.3	20.2, 62.4	2	8.2	0.0, 24.1	4	20.0	0.0, 44.3	
AUDIT Zone																
Low Risk	351	63.5	58.1, 69.0	55	82.7	73.6, 91.7	17	28.7	9.3, 48.0	21	63.6	40.9, 86.3	17	67.1	41.5, 92.8	<0.001
Medium Risk	162	25.8	20.9, 30.7	14	11.8	4.4, 19.3	9	20.7	4.2, 37.2	10	24.4	5.0, 43.8	9	26.4	1.4, 51.3	
Harmful	37	5.1	3.1, 7.0	2	2.8	0.0, 6.7	13	22.3	6.0, 38.7	3	3.8	0.0, 9.9	1	0.9	0.0, 2.7	
Possible Dependence	33	5.6	2.9, 8.3	3	2.7	0.0, 6.3	9	28.3	7.4, 49.2	1	8.2	0.0, 24.1	2	5.6	0.0, 15.0	
Mental Health																
HADS-Anxiety Scores																
Normal (0–7)	268	42.1	36.4, 47.7	45	57.1	43.2, 71.1	24	53.6	32.4, 74.7	19	49.1	25.2, 72.9	17	44.4	17.5, 71.3	0.067
Mild (8–10)	156	27.7	22.4, 33.1	17	27.9	14.6, 41.3	11	20.4	4.2, 36.5	9	33.8	9.9, 57.8	7	31.5	5.1, 57.8	
Moderate/severe (> 10)	157	30.2	24.7, 35.7	10	14.9	5.2, 24.6	13	26.1	6.9, 45.3	7	17.1	0.0, 34.8	5	24.1	0.0, 49.3	

Table 1 (continued)

	White (n = 585; RDS % = 68.6%)			Asian (n = 74; RDS % = 9.2%)			Indigenous (n = 50; RDS % = 9.8%)			Latino (n = 35; RDS % = 7.3%)			Other (n = 30; RDS % = 5.1%)			P-Value
	n	RDS %	RDS 95% CI	n	RDS %	RDS 95% CI	n	RDS %	RDS 95% CI	n	RDS %	RDS 95% CI	n	RDS %	RDS 95% CI	
HADS Depression Scores																
Normal (0–7)	486	82.5	77.9, 87.1	66	91.7	83.9, 99.6	40	85.5	70.4, 100.0	31	86.1	68.8, 100.0	26	72.3	42.4, 100.0	0.003
Mild (8–10)	59	12.1	7.9, 16.3	5	7.5	0.0, 15.2	4	2.6	0.0, 6.1	4	13.9	0.0, 31.2	2	14.8	0.0, 39.1	
Moderate/severe (> 10)	36	5.4	3.1, 7.6	1	0.8	0.0, 2.4	4	11.9	0.0, 26.8	0	0.0	0.0, 0.0	1	12.9	0.0, 37.3	
	MD	RDS MD	RDS Q1, Q3	MD	RDS MD	RDS Q1, Q3	MD	RDS MD	RDS Q1, Q3	MD	RDS MD	RDS Q1, Q3	MD	RDS MD	RDS Q1, Q3	
Age	34	34	25, 49	30	29	23, 38	37	37	30, 44	31	30	24, 38	33	36	29	0.003
Self Esteem Total Score	7	7	4, 10	7	7	5, 9	7	7	4, 10	5	7	3, 7	6	7	4, 9	0.376
Collective Self Esteem Score	8	7	6, 9	8	8	6, 9	8	8	7, 9	7	7	6, 8	8	7	6, 10	0.541
Loneliness Score	2	3	1, 5	2	3	1, 5	2	3	1, 4	2	3	1, 4	2	4	1, 5	0.994

RDS Respondent Driven Sampling, 95% CI 95% confidence interval, P6M Past 6 months, AUDIT Alcohol Use Disorders Identification Test, HAD Hospital Anxiety & Depression Scale, MD Median, Q1/Q3 First quartile, third quartile values

**Table 2** Univariable and multivariable generalized linear mixed models of factors associated with HADS **anxiety** score > 10 among gbMSM living in Metro Vancouver, Canada

	Univariable		Multivariable	
	OR	95% CI	aOR	95% CI
<b>Age</b>	<b>0.98</b>	<b>0.96, 1.00</b>	<b>0.98</b>	<b>0.96, 1.00</b>
<b>AUDIT Score</b>	<b>1.10</b>	<b>1.05, 1.14</b>	<b>1.06</b>	<b>1.02, 1.09</b>
<b>Self Esteem scale total score</b>	<b>1.64</b>	<b>1.53, 1.75</b>	<b>1.43</b>	<b>1.33, 1.53</b>
<b>Collective Self Esteem Score</b>	<b>0.92</b>	<b>0.85, 1.00</b>	Not Selected	
<b>Loneliness score</b>	<b>2.23</b>	<b>2.00, 2.49</b>	<b>1.67</b>	<b>1.50, 1.86</b>
<b>Ethno-racial identity</b>				
White	Ref			
Asian	<b>0.31</b>	<b>0.13, 0.77</b>	<b>0.39</b>	<b>0.18, 0.86</b>
Indigenous	1.13	0.32, 3.97	0.79	0.29, 2.10
Latino	<b>0.23</b>	<b>0.05, 0.97</b>	0.39	0.09, 1.73
Other	0.38	0.10, 1.53	0.59	0.15, 2.36
<b>Income group</b>				
Less than \$30,000	Ref			
\$30,000—\$59,999	0.76	0.50, 1.16	Not Selected	
\$60,000 and over	<b>0.52</b>	<b>0.30, 0.92</b>		
<b>Education</b>				
High school or less	Ref			
Greater than high school	<b>0.52</b>	<b>0.29, 0.94</b>	Not Selected	
<b>Born in Canada</b>				
No	Ref			
Yes	<b>2.51</b>	<b>1.28, 4.92</b>	Not Selected	
<b>Immigration status</b>				
Born in Canada	Ref			
Canadian Citizen/Permanent Resident	<b>0.46</b>	<b>0.23, 0.94</b>	Not Selected	
Temporary Status/Refugee/Other	<b>0.23</b>	<b>0.08, 0.72</b>		
<b>Current Housing</b>				
Stable	Ref			
Unstable	1.41	0.86, 2.31	Not Selected	
<b>Being Out</b>				
Partially/no	Ref			
Yes	0.96	0.46, 2.02	Not Selected	
Not gay-identified	1.29	0.52, 3.23		
<b>Sexual Identity</b>				
Gay	Ref			
Bisexual/Other	1.48	0.85, 2.58	Not Selected	
<b>Self-Reported HIV Status</b>				
HIV Negative/Unknown	Ref			
HIV Positive	1.08	0.58, 2.01	Not Selected	
<b>P6M Crystal</b>				
No	Ref			
Yes	<b>2.28</b>	<b>1.43, 3.65</b>	Not Selected	
<b>P6M Crack</b>				
No	Ref			
Yes	<b>3.87</b>	<b>1.74, 8.61</b>	1.71	0.77, 3.77

Data with bold emphasis indicates statistical significance at  $p < .05$

HAD Hospital Anxiety & Depression Scale, OR Odds ratio, 95% CI 95% confidence interval, AUDIT Alcohol Use Disorders Identification Test, P6M Past 6 months

(aOR=1.43; 95% CI: 1.33–1.53), and loneliness score (aOR=1.67; 95% CI: 1.50–1.86). Increasing age was associated with a lower odd of moderate/severe scores (aOR=0.98 per year; 95% CI: 0.96–1.00).

In univariable analyses of factors associated with moderate/severe HADS depression scores, Latino identity was significantly associated with decreased odds of having moderate/severe HADS depression scores compared to both white (OR=0.01; 95% CI: 0.01–0.03) (Table 3) and Asian (OR=0.03; 95% CI: 0.01–0.06) identity (data not shown). This association was retained in the multivariable model for Latino individuals in comparison with both white (aOR=0.17; 95% CI: 0.08–0.36) and Asian (aOR=0.07; 95% CI: 0.02–0.20) individuals. No other significant differences were found between ethno-racial groups when we changed the reference category as above (data not shown). Other factors associated with increased odds of moderate/severe depression scores in our multivariable analysis included age (aOR=1.06; 95% CI: 1.03–1.08), self-esteem score (aOR=1.55; 95% CI: 1.44–1.67), loneliness score (aOR=1.78; 95% CI: 1.51–2.11) and unstable housing (aOR=2.16; 95% CI: 1.19–3.95).

## Discussion

In a longitudinal analysis of 774 sexually-active gbMSM in Vancouver, Canada, we did not find evidence of increased odds of moderate/severe anxiety or depression scores amongst ethno-racial minority men compared to white men. In fact, we found reduced odds of anxiety symptoms for Asian men and depressive symptoms for Latino men when compared to their white counterparts.

Our results are consistent with research in general populations in the United States and United Kingdom, which found similar or lower levels of mental health symptoms, suicidal ideation, or doctor-diagnosed mental health conditions among Black, Hispanic, and Asian individuals compared with white individuals [13, 14, 23]. This has similarly been demonstrated in some large-scale national studies in sexual minority populations in the U.S. and U.K. [3, 15, 17, 18]. Notably, in the U.S. National Latino and Asian American Survey conducted in 2002–2003, Latino and Asian sexual minority individuals had lower levels of depressive, anxiety, substance use, and eating disorders, identified through diagnostic interview, than comparable studies of sexual minorities in general [15]. However, some findings in the extant literature varied with differing mental health indicators (i.e., suicidality) or when evaluating non-white identities individually rather than a composite group. For example, although it was found that non-white lesbian and gay adolescents overall had similar or decreased levels of depressive symptoms, this differed between Black and Asian as compared to Latino, multiracial, and American Native/Pacific

Islander youth, the latter ethno-racial groups experiencing increased depressive symptoms [17, 20]. Additionally, some U.S. research has found increased levels of suicidality or suicide attempts among sexual minority people of colour [16, 19, 20]. Indeed, research in the U.S. and Canada has shown that members of ethnic minorities with mental health symptoms or disorders are more likely to have persistent disorders [13], more likely to have unmet mental health care needs [23, 38], and less likely to visit mental health resources [23].

Several hypotheses exist to explain the similar or reduced rates of mental health symptoms among gbMSM of colour, including immigration status, family cohesion, and resilience or stress-related growth. In our study, Latino and Asian men were significantly less likely to be born in Canada. In North America, and specifically in Canada, some research has shown evidence of a “healthy immigrant” effect, at least initially, resulting in better mental health outcomes for immigrants [12]. Family cohesion and support, which may be higher in Latino and Asian communities [39], may also serve as a protective factor against poor mental health outcomes [40]. Finally, the previous experiences of gbMSM of colour may contribute to their resilience against sexual minority-related stigma and discrimination. For example, members of racial and ethnic minority groups can learn mechanisms for coping with minority stress in childhood through family members and close adult figures [31]. GbMSM of color may also acquire coping skills earlier in life through minority stress-related experiences associated with an ethno-racial minority identity [9, 41]. Taken together, these factors may explain the reduced levels of anxiety or depression symptoms among Asian and Latino men in our study.

Some differences in mental health symptoms may also be explained through other factors in the multivariable analysis. We selected variables in our multivariable analysis based on factors found in the literature that may confound mental health outcomes. For example, differences were found in alcohol use (AUDIT score) between ethno-racial groups, with a significant association between AUDIT score and anxiety symptoms. Alcohol use is often comorbid with anxiety [42] or depression [43] symptoms, with a potential causal relationship between alcohol use disorder and major depression [43]. Additionally, significant associations were found between loneliness and self-esteem scores and anxiety and depression symptoms, although differences were not found between groups. Finally, significant differences between ethno-racial groups were found in income and education level, which are important social determinants of mental health that have been found to be associated with poor mental health

**Table 3** Univariable and multivariable generalized linear mixed models of factors associated with HADS depression score > 10 among gbMSM living in Metro Vancouver, Canada

	Univariable		Multivariable	
	OR	95% CI	aOR	95% CI
<b>Age</b>	<b>1.04</b>	<b>1.02, 1.06</b>	<b>1.06</b>	<b>1.03, 1.08</b>
<b>AUDIT Score</b>	1.05	0.99, 1.10	Not selected	
<b>Self Esteem scale total score</b>	<b>1.74</b>	<b>1.58, 1.91</b>	<b>1.55</b>	<b>1.44, 1.67</b>
<b>Collective Self Esteem Score</b>	0.89	0.79, 1.02	Not selected	
<b>Loneliness score</b>	<b>2.62</b>	<b>2.21, 3.11</b>	<b>1.78</b>	<b>1.51, 2.11</b>
<b>Ethno-racial identity</b>				
White	Ref			
Asian	0.64	0.29, 1.41	2.23	0.76, 6.54
Indigenous	1.86	0.72, 4.84	1.18	0.30, 4.66
Latino	<b>0.01</b>	<b>0.01, 0.03</b>	<b>0.17</b>	<b>0.08, 0.36</b>
Other	0.74	0.18, 3.00	2.19	0.27, 17.65
<b>Income group</b>				
Less than \$30,000	Ref			
\$30,000—\$59,999	0.84	0.43, 1.61	Not Selected	
\$60,000 and over	0.40	0.12, 1.34	Not Selected	
<b>Education</b>				
High school or less	Ref			
Greater than high school	<b>0.26</b>	<b>0.16, 0.42</b>	0.54	0.27, 1.08
<b>Born in Canada</b>				
No	Ref			
Yes	1.45	0.79, 2.67	Not Selected	
<b>Immigration status</b>				
Born in Canada	Ref			
Canadian Citizen/ Permanent Resident	<b>0.93</b>	<b>0.48, 1.78</b>	Not Selected	
Temporary Status/Refugee/Other	0.17	0.03, 1.15		
<b>Current Housing</b>				
Stable	Ref			
Unstable	<b>3.17</b>	<b>1.71, 5.87</b>	<b>2.16</b>	<b>1.19, 3.95</b>
<b>Being Out</b>				
Partially/no	Ref			
Yes	1.11	0.30, 4.12	Not Selected	
Not gay-identified	2.42	0.61, 9.56	Not Selected	
<b>Sexual Identity</b>				
Gay	Ref			
Bisexual/Other	1.45	0.65, 3.26	Not Selected	
<b>Self-Reported HIV Status</b>				
HIV Negative / Unknown	Ref			
HIV Positive	<b>2.50</b>	<b>1.40, 4.45</b>	Not Selected	
<b>P6M Crystal</b>				
No	Ref			
Yes	<b>2.25</b>	<b>1.01, 4.99</b>	Not Selected	
<b>P6M Heroin</b>				
No	Ref			
Yes	<b>6.16</b>	<b>1.30, 29.28</b>	Not Selected	

Data with bold emphasis indicates statistical significance at  $p < .05$

HAD Hospital Anxiety & Depression Scale, OR Odds ratio, 95% CI 95% confidence interval, AUDIT Alcohol Use Disorders Identification Test, P6M Past 6 months

outcomes or mental health disorders [44]. These variables were largely associated with symptom scores in the univariable analyses but were not retained in our multivariable model. Thus, given that the decreased odds of moderate/severe anxiety scores for Latino men was not retained in the multivariable model, other variables may be involved that may serve as the topic of further research.

A key strength of our study was the use of respondent-driven sampling (RDS), with the inclusion of ethno-racial minority seeds, as our sampling and analysis methodology. RDS has the potential to overcome previous sampling shortfalls and more accurately represent population parameters for the Metro Vancouver gbMSM population. Additionally, it allows for the inclusion of subgroups and communities that may be missed through other recruiting methods and enables the study team to adjust for some known biases that arise through the recruitment process. Our longitudinal analysis also increases our statistical power to examine associations between smaller ethno-racial groups while accounting for non-independence of repeated measures and recruitment chains. This allowed our study to address the limitation of relatively small numbers of participants who identified as racial or ethnic minorities. Additionally, our sample was drawn from gbMSM residing in Metro Vancouver, Canada, and thus may not reflect either rural or other urban contexts elsewhere. Greater Vancouver contains a greater proportion of visible minority individuals than Canada as a whole [45], and research has shown a protective effect of higher immigrant concentration neighborhoods on mental health disorder prevalence for immigrants in Canada [12]. Finally, we used the HADS, which utilizes previously established and validated cut-offs, to measure depression and anxiety symptoms [46]. However, given the limited sample of individuals with moderate/severe depression, scores, this may potentially reduce our power to detect significant effects. Additionally, more research is needed to determine the validity of the HADS scale within ethno-racial minority populations in Canada and the United States.

Further research is needed to understand the distinct social, cultural, and structural mechanisms that modulate mental health for gbMSM of various ethno-racial identities. Moving forward, an important research objective remains in understanding survival and resilience narratives that promote mental health among gbMSM of colour. Healthcare providers should nevertheless be aware of the unique mechanisms of racism and heterosexism interact when working with gbMSM.

## Conclusion

Among a sample of urban-residing gbMSM in Vancouver, Canada, ethno-racial minority status was not associated with increased odds of moderate/severe depression or anxiety symptoms. Asian and Latino gbMSM in Metro Vancouver manage multiple minority stressors without higher self-reported burden of mental health symptoms. Of note, gbMSM still experience a higher burden of mental health disorders than the general population in Canada. As such, more research is needed with ethno-racialized minority gbMSM to understand mental health risks and vulnerabilities and to qualify survival and resilience narratives surrounding mental health. Healthcare providers should be aware of the complexity in how racism and heterosexism interact when working with gbMSM.

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## Authors' contributions

GO, AL, AA, DH, FB, LV, SL, JD produced the initial study design, which was then modified with input from SB, JS and DMM. AL supervised study implementation and data collection. JZ created the analytic dataset and LW conducted the analysis. SB wrote the first draft and all co-authors provided input and approved the final submitted version.

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## Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to our ethics approvals and privacy policies. However, the British Columbia Centre for Excellence in HIV/AIDS (BC-CFE) may, upon meeting all legislative and policy obligations, provide de-identified data used in the manuscript for external research use. Requests for access to the research dataset must be directed to the Privacy Officer at [privacy@bccfe.ca](mailto:privacy@bccfe.ca). If approved, the de-identified research dataset will be provided via Secure File Transfer Protocol to the requesting researcher.

## Declarations

### Ethics approval and consent to participate

All study participants provided written informed consent to participate. Research ethics approval was granted from the Research Ethics Boards of Simon Fraser University, the University of British Columbia (reference number H11-00691), and the University of Victoria.

### Consent to publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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