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Original quantitative research

Pandemic-related impacts and suicidal ideation among adults in Canada: a population-based cross-sectional study

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Abstract

Introduction: Recent evidence has suggested that there has been an increase in suicidal ideation during the COVID-19 pandemic. Our objectives were to estimate the likelihood of suicidal ideation among adults in Canada who experienced pandemic-related impacts and to determine if this likelihood changed during the pandemic.

Methods: We analyzed pooled data for 18 936 adults 18 years or older from two cycles of the Survey on COVID-19 and Mental Health collected from 11 September to 4 December 2020 and from 1 February to 7 May 2021. We estimated the prevalence of suicidal ideation since the pandemic began and conducted logistic regression to evaluate the likelihood of suicidal ideation by adults who experienced pandemic-related impacts, and by factors related to social risk, mental health status, positive mental health indicators and coping strategies.

Results: Adults who had adverse pandemic-related experiences were significantly more likely to experience suicidal ideation; a dose–response relationship was evident. People who increased their alcohol or cannabis use, expressed concerns about violence in their home or who had moderate to severe symptoms of depression, anxiety or posttraumatic stress disorder also had significantly higher risk of suicidal ideation. The risk was significantly lower among people who reported high self-rated mental health, community belonging or life satisfaction, who exercised for their mental and/or physical health or who pursued hobbies.

Conclusion: The COVID-19 pandemic has influenced suicidal ideation in Canada. Our study provides evidence for targeted public health interventions related to suicide prevention.

Keywords: *suicidal ideation, surveillance, COVID-19 pandemic, coronavirus, substance use, violence, mental health, coping*

Highlights

- Adults in Canada who had adverse experiences related to the COVID-19 pandemic were significantly more likely to think about suicide.
- The higher the number of pandemic-related adverse experiences people had, the greater the odds that they thought about suicide (i.e. there was a dose–response relationship).
- Adults who increased their alcohol or cannabis use, who were concerned about violence in their home or who had moderate to severe symptoms of depression, anxiety or posttraumatic stress disorder (PTSD) also had significantly higher risk of suicidal ideation.
- The risk of suicidal ideation was significantly lower among people who self-rated their mental health, community belonging or life satisfaction as high, who exercised for their physical and/or mental health or who pursued hobbies.

Introduction

The COVID-19 pandemic led to widespread concerns about both individual and collective health. Together, concerns about infection and pandemic-related public health interventions appear to have had adverse consequences for population mental health[1-5] as a result of economic insecurity, quarantine and travel restrictions, social isolation, closure of educational institutions and workplaces, along with increased caregiving responsibilities, and grief and loss.

Early in the pandemic, community cohesion and a sense of mutual support may have contributed towards a "pulling together" effect[6] that mediated or delayed impacts on mental illness and suicidality.[7] As the pandemic continued, negative effects on mental health emerged.[2,3] A systematic review of studies from the first year of the pandemic reported elevated rates of distress and symptoms of mental illness.[2] In Canada, job or income loss, death of a family member, friend or colleague, increased alcohol or cannabis use, concerns about violence in people's own homes, and social isolation impacts attributed to the COVID-19 pandemic were independent risk factors for symptoms of

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depression and had a dose–response relationship.[3] Similar effects have been reported for alcohol and substance use;[8-10] evidence on the prevalence of suicidal ideation has varied.[11-13]

The pre-pandemic 12-month prevalence of suicidal ideation was approximately 2.0% globally.[14] An international meta-analysis found that the pooled prevalence of suicidal ideation during the pandemic was 10.8%.[13] In Canada, the prevalence of suicidal ideation since the pandemic began was 2.4% in fall 2020,[11] but nearly doubled, to 4.2%, in spring 2021;[15] this was significantly higher than the prevalence of suicidal ideation in the past 12 months in 2019 of 2.7%.[15]

Pandemic-related stress appears to have disproportionately affected the mental health of young adults, racialized people and those with a mental illness.[8,11,16-20] Frontline and essential workers, including health professionals, also faced unique and increased risks as a result of occupational exposure to COVID-19 and its consequences, including increased exposure to end-of-life care, moral injury and increased risk of infection.[21] Survey data show that 8.4% of the public health workforce in the United States reported suicidal ideation in the prior 2 weeks and that more than 30% reported symptoms of depression, anxiety and posttraumatic stress disorder (PTSD) in 2021.[22]

The primary objective of our study was to estimate the likelihood of suicidal ideation since the start of the pandemic in relation to experiences of pandemic-related impacts, social risks, mental health and coping strategies. The secondary objective was to determine if the patterns of suicidal ideation in these subgroups changed between different periods of the pandemic.

This public health surveillance is necessary to track population-level health changes over time, identify subpopulation differences and assess relationships between suicidality, pandemic-specific experiences and other social and health-related factors.

Methods

This study is reported according to the STROBE guidelines for cross-sectional studies.[23]

Data sources

We analyzed cross-sectional data from the 2020 and 2021 cycles of the nationally representative, population-based Survey on COVID-19 and Mental Health (SCMH).[24,25] The first survey cycle was administered between 11 September and 4 December 2020; the second between 1 February and 7 May 2021. In partnership with the Public Health Agency of Canada (PHAC), Statistics Canada conducted the SCMH to gather data on mental health outcomes and risk and protective factors related to the pandemic. A data-sharing agreement between PHAC and Statistics Canada authorized data access. Respondents were asked for permission to share the information they provided with PHAC. This study is based on data from those shared files. Because this is secondary analysis, research ethics board review is not required.

People aged 18 years or older in the 10 provinces and the 3 territorial capitals (Whitehorse, Yellowknife and Iqaluit) made up the SCMH study population. The SCMH sampling frame was stratified by province, and a simple random sample of dwellings was selected within each province and territorial capital from the Dwelling Universe File; a resident within each selected dwelling was then sampled.

The sampling frame excluded people living in institutions, in collective, unmailable, inactive or vacant dwellings, in First Nations communities designated as federal reserves or in territorial communities outside of the capital cities; together, these groups represented less than 2% of the population of interest.

The SCMH is a voluntary survey completed through an electronic questionnaire or via a computer-assisted telephone interview. Respondents were first contacted via a letter mailed out to the sampled dwellings and given the opportunity to respond using the online questionnaire. Up to two letters were sent reminding residents to respond to the survey before interviewers began phoning to suggest that residents complete the questionnaire over the phone.

As part of the error detection/edit process, incoming data were verified to ensure that the data file contained only one questionnaire per dwelling.

The response rate was 53.3% (n = 14 689 respondents) for the 2020 cycle and 49.3% (n = 8032 respondents) for the 2021 cycle. We analyzed data for a total of 18 936 respondents who agreed to share their information with PHAC (n = 12 344 in 2020; n = 6592 in 2021).

Measures

The dependent variable was recent suicidal ideation. Survey respondents were asked: "Have you seriously contemplated suicide since the COVID-19 pandemic began?" We assessed the following potential correlates (as independent variables): COVID-19-related impacts; increased alcohol and cannabis consumption; concerns about violence in people's own homes; symptoms of mental illness; stressful/traumatic events; work status; positive mental health outcomes; and coping strategies. Details about these variables are provided in Table 1.

Analysis

We conducted the analyses using SAS Enterprise Guide version 7.1 (SAS Institute, Cary, NC, USA). To account for the complex survey design and to ensure that the results were population representative, all estimates were adjusted with sampling weights generated by Statistics Canada. The weighting procedures involved several steps to reduce bias,[24] and accounted for both non-responses and respondents who did not agree to share their responses with PHAC. We estimated 95% modified Clopper–Pearson confidence intervals (CI)[26] using the bootstrap technique.

The analysis for the primary objective, to estimate the likelihood of suicidal ideation since the start of the pandemic in relation to experiences of pandemic-related impacts, social risks, mental health and coping strategies, was based on pooled data from the 2020 and 2021 SCMH. Because the two SCMH cycles had nearly identical methodologies and independent samples and their respective collection periods were close in time, we combined the datasets for analysis based on the user guideline provided by Statistics Canada. We estimated the prevalence of recent suicidal ideation across COVID-19-related impacts and used both univariate and adjusted logistic regression models to determine the likelihood of suicidal ideation associated with COVID-19-related impacts within the general population. We included

TABLE 1
Factors potentially associated with suicidal ideation during the COVID-19 pandemic

Factor	Questions posed	Response options plus variable coding
COVID-19- related impact	Respondents were asked: "Have you experienced any of the following impacts due to the COVID-19 pandemic?" • Loss of job or income • Difficulty meeting financial obligations or essential needs • Death of a family member, friend or colleague • Feelings of loneliness or isolation • Emotional distress • Physical health problems • Challenges in personal relationships with members of your household We also investigated the cumulative exposure effect of these 7 impacts by summing the number of impacts that people reported experiencing.	"Yes" and "no."
Increased alcohol consumption	Respondents were asked: "On average, over the course of the COVID-19 pandemic, how has your alcohol consumption changed when comparing to before the pandemic?"	"Increased," "decreased" or "no change." We coded the variable as "Increased" vs. "decreased/no change."
Ever used cannabis	Respondents were asked: "In the past 30 days, how often did you use cannabis?"	"Never used cannabis," "used previously, but not in past 30 days," "1 day in past 30 days," "2 or 3 days in past 30 days," "1 or 2 days per week," "3 or 4 days per week," "5 or 6 days per week" or "daily." We coded "never used cannabis" as "no" and the remainder as "yes."
Increased cannabis use	Respondents who did not respond "never used cannabis" were asked: "On average, over the course of the COVID-19 pandemic, how has your use of cannabis changed when compared to before the pandemic?"	"Increased," "decreased" or "no change." We coded the variable as "increased" vs. "decreased/no change."
Concerns about violence in people's own homes	Respondents were asked: "How concerned are you about violence in your home?"	"Not at all," "somewhat" and "very/extremely." We coded "not at all" as "no," and "somewhat" and "very/extremely" as "yes."
Moderate to severe symptoms of major depressive disorder	Respondents who scored ≥10 on the Patient Health Questionnaire (PHQ-9). The scale assessed symptoms over the past 2 weeks.	N/A
Moderate to severe symptoms of generalized anxiety disorder	Respondents who scored ≥10 on the Generalized Anxiety Disorder scale (GAD-7). The scale assessed symptoms over the past 2 weeks.	N/A
Moderate to severe symptoms of PTSD	Respondents who scored ≥33 on the PTSD Checklist for DSM-5 (PCL-5). The PTSD questions asked about the past month.	N/A
Experienced traumatic/stressful event	Respondents were asked: "Have you ever experienced a highly stressful or traumatic event during your life?"	"Yes" and "no."
Work status: essential worker/frontline worker	Respondents were asked if during the past 7 days they were considered an "essential worker." This was defined as "an individual who works in a service, facility or in an activity that is necessary to preserve life, health, public safety and basic societal functions of Canadians, for example, by working in transportation (public transit, gas stations, etc.), financial institutions, health care or as first responders (police, firefighters, paramedics, etc.), pharmacies, childcare, food supply (grocery stores, truck drivers, etc.)." Respondents were also asked if during the past 7 days they were considered a "frontline worker." This was defined as "an individual who has the potential to come in direct contact with COVID-19 by assisting those who have been diagnosed with the virus, for example, police officers, firefighters, paramedics, nurses or doctors."	We coded respondents as frontline workers if they answered "yes." to being considered a frontline worker. We coded respondents as essential workers if they answered "yes" to being considered an essential worker and "no" to being considered a frontline worker. We coded the remaining respondents as having "other" worker status.
Self-rated mental health	Respondents were asked: "In general, how is your mental health?"	"Excellent," "very good," "good," "fair" and "poor." We coded "excellent" and "very good" as "high" and the rest as "low."
Life satisfaction	Respondents were asked: "Using a scale of 0 to 10, where 0 means 'very dissatisfied' and 10 means 'very satisfied,' how do you feel about your life as a whole right now?"	We coded scores of ≥8 as "high" and the rest as "low."

Continued on the following page

TABLE 1 (continued)
Factors potentially associated with suicidal ideation during the COVID-19 pandemic

Factor	Questions posed	Response options plus variable coding
Community belonging	Respondents were asked: "How would you describe your sense of belong to your local community?"	"Very strong," "somewhat strong," "somewhat weak" and "very weak." We coded "very strong" and "somewhat strong" as "high" and the remaining two as "low."
Coping strategies	Respondents were asked: "Are you currently doing any of the following activities for your health?" • Communicating with friends and family • Meditating • Praying or seeking spiritual guidance • Exercising (outdoors and/or indoors) • Changing food choice • Pursuing hobbies • Changing sleep patterns	"Yes, for my mental health," "Yes, for my physical health," "Yes, for both my mental and physical health" and "No." We coded "yes" and "no" for the responses.

Abbreviations: N/A, not applicable; PTSD, posttraumatic stress disorder.

gender, age group and survey cycle in the adjusted models.

For the secondary objective, to determine if the patterns of suicidal ideation changed between different periods of the pandemic, we analyzed data from the 2020 and 2021 SCMH separately to evaluate changes in the likelihood of suicidal ideation across pandemic-related experiences, social risks, mental health and coping strategies during the pandemic. We used overlapping confidence intervals to determine statistically significant change in odds ratios in the 2020 and 2021 SCMH.

We also conducted gender-stratified analyses for males and females. We did not further analyze respondents who reported gender diversity because of the small number of self-reports (< 1% of sample), but included gender-diverse respondents in the overall analyses.

We excluded missing data (maximum 4.5% for all the estimates) from the analysis. We used a *p* value of less than 0.05 to identify statistically significant results in all the analyses.

Results

Of the 18936 respondents in 2020 and 2021 SCMH combined data, 579 reported suicidal ideation since the pandemic began (78 respondents did not respond to the suicidal ideation question and were excluded from the analysis). In the 2020 SCMH, 2.4% (95% CI: 2.0–2.9) of adults (2.7%, 95% CI: 2.2–3.3 for females; 2.1%, 95% CI: 1.5–2.8 for males) reported suicidal ideation. In the 2021 SCMH, the overall prevalence was 4.2% (95% CI: 3.4–5.0), with 4.0% (95% CI: 3.0–5.2) for females and 4.1% (95% CI: 3.0–5.5) for males.

Table 2 shows that the sociodemographic characteristics for the 2020 and 2021 SCMH samples were similar, except for slightly fewer young adults (18–34 years) and more middle-aged adults (35–64 years) in the 2021 SCMH.

People who experienced any COVID-19-related impacts were significantly more likely to experience suicidal ideation than people who did not experience these impacts; this was evident across most factors for both males and females (see Table 3). Overall, 43.3% of adults in Canada reported feeling lonely or isolated during the pandemic. Feelings of loneliness or isolation had the largest impact on suicidal ideation (adjusted odds ratio [aOR] = 8.1; 95% CI: 5.8–11.2), followed by emotional distress (aOR = 6.8; 95% CI: 4.7–9.7) and physical health problems (aOR = 3.7; 95% CI: 2.7–5.1).

Nearly half of adults in Canada (48.8%) experienced two or more pandemic-related impacts; their odds of suicidal ideation were 8.7 times higher than the odds for those who experienced one or no impact, after adjusting for gender, age group and survey cycle.

A positive dose–response relationship between pandemic-related impacts and suicidal ideation was apparent. The odds of suicidal ideation among people who experienced six or more impacts were 25.4 times higher than the odds for those who experienced one or no impact in the adjusted model.

Adults in Canada who increased alcohol or cannabis consumption, who had ever used cannabis or who had concerns about violence in their own home were significantly more likely to experience suicidal ideation, with the odds ratios higher among males than among women (see Table 4). People who had moderate to severe symptoms of any mental illness during the pandemic had a significantly higher prevalence of suicidal ideation, with odds ratios of 7.6 (95% CI: 5.4–10.6) for anxiety, 13.7 (95% CI: 9.6–19.5) for depression and 10.2 (95% CI: 7.2–14.5) for PTSD.

In contrast, people with high self-rated mental health, a strong sense of community belonging or high life satisfaction or who exercised for their mental and/or physical health were significantly less likely to report recent suicidal ideation (see Table 5). People who pursued their hobbies were also significantly less likely to report recent suicidal ideation, but in gender-stratified analyses, this association was statistically significant in males only. Moreover, frontline workers and essential non-frontline workers were no more or less likely than others to consider suicide (see Table 4).

For the second objective of this study, when we analyzed the data from the 2020 and 2021 SCMH separately (results available on request from the authors), odds ratios were decreased for female frontline

TABLE 2
Sociodemographic characteristics of the 2020 and 2021 SCMH survey samples

Sociodemographic characteristics	n (%)[b]		
	2020 SCMH n = 12 344	2021 SCMH n = 6592	Total n = 18 936
Gender			
Female	7063 (50.7)	3755 (50.6)	10 818 (50.6)
Male	5255 (49.1)	2827 (49.2)	8082 (49.2)
Gender diverse	20 (0.2)	8 (0.2)	28 (0.2)
Age, years			
18–34	2104 (28.2)	1161 (24.8)	3265 (26.5)
35–64	6747 (49.6)	3592 (53.0)	10 339 (51.3)
65+	3493 (22.2)	1839 (22.2)	5332 (22.2)
Racialized group member[a]			
Yes	2119 (26.6)	1125 (25.8)	3244 (26.2)
No	10 104 (73.4)	5403 (74.2)	15 507 (73.8)
Immigrant status			
Yes	2173 (27.0)	1172 (27.6)	3345 (27.3)
No	10 117 (73.0)	5391 (72.4)	15 508 (72.7)
Place of residence			
Population centre	9249 (82.3)	4956 (82.1)	14 205 (82.2)
Rural area	2998 (17.7)	1578 (17.9)	4576 (17.8)
Educational attainment			
High school or lower	3641 (31.2)	1857 (29.3)	5498 (30.2)
Post-secondary	8678 (68.8)	4716 (70.7)	13 394 (69.8)
Median household income, thousand CAD (95% CI)	83.5 (80.5, 86.5)	83.6 (80.6, 86.6)	83.6 (79.5, 87.7)

Source: 2020 and 2021 cycles of the Survey on COVID-19 and Mental Health, Canada.

Abbreviations: CI, confidence interval; SCMH, Survey on COVID-19 and Mental Health.

[a] We coded individuals who were classified as visible minorities or Indigenous as racialized group members and those who identified only as White as non-racialized.

[b] Percentages were weighted to represent the population. Missing data were not included in the number of samples and percentage by each sociodemographic characteristics, but included in total numbers for the 2020 and 2021 SCMH and combined data.

workers versus other females in the 2021 SCMH (OR = 0.4, 95% CI: 0.1–1.0; aOR = 0.3, 95% CI: 0.1–0.8) compared to those in the 2020 SCMH (OR = 2.3, 95% CI: 1.2–4.4; aOR = 1.7, 95% CI: 0.9–3.3). We did not observe significant changes in odds ratios between the 2020 and 2021 SCMH for other variables.

Discussion

We used nationally representative, population-based survey data to examine suicidal ideation among adults who experienced pandemic-related impacts in Canada. Nearly half the population aged 18 years or older reported two or more such adverse impacts, and they were significantly more likely to report that they had seriously considered suicide. As with a 2021 study of depression in Canada,[3] a clear dose–response relationship was evident; the risk of suicidal ideation rose with the number of impacts experienced.

The risk of suicidal ideation was also significantly higher among people who reported increased alcohol or cannabis consumption, who expressed concerns about violence in their own home or who had moderate to severe symptoms of depression, anxiety or PTSD. Those who reported high self-rated mental health, community belonging and life satisfaction or who exercised for their mental and/or physical health had significantly lower risk.

The pandemic resulted in numerous interrelated stresses and magnified existing vulnerabilities. A US survey conducted in March and April 2020 found that suicidal ideation was associated with markers of economic insecurity (e.g. difficulty paying rent) and social isolation.[4] Canadian survey data from 2020 show that major sources of stress were fear of becoming ill or infecting a family member, financial concerns, social isolation and the potential for illness or death of a family member.[5] With successive waves of COVID-19, these concerns became realities for many. At a population level, the accumulation of negative experiences may have amplified risks for adverse mental health outcomes and contributed to the strong dose–response relationship observed with suicidal ideation.

Our results align with evidence that the prevalence of suicidal ideation increased in 2021 compared with 2019[11] in Canada and elsewhere.[13] This suggests that pandemic-related impacts may be directly associated with suicidal ideation, although the effects were not immediate and varied

TABLE 3
Suicidal ideation during the pandemic, by experiences of COVID-19-related impacts, ≥18 years, Canada

Count and prevalence of COVID-19-related impacts, n (%)		Prevalence and odds ratio of suicidal ideation								
		Overall (n = 18 936)			Female (n = 10 818)			Male (n = 8 082)		
		Prevalence, % (95% CI)	OR (95% CI)	aOR[a] (95% CI)	Prevalence, % (95% CI)	OR (95% CI)	aOR[b] (95% CI)	Prevalence, % (95% CI)	OR (95% CI)	aOR[b] (95% CI)
Loss of job/income										
No	14 930 (75.0)	2.5 (2.1, 3.0)	(Ref.)	(Ref.)	2.4 (1.9, 3.1)	(Ref.)	(Ref.)	2.4 (1.8, 3.1)	(Ref.)	(Ref.)
Yes	3808 (25.0)	5.7 (4.5, 7.1)	2.4 (1.8, 3.2)***	1.9 (1.4, 2.6)***	6.3 (4.8, 8.2)	2.7 (1.9, 4.0)***	2.0 (1.4, 3.0)***	5.2 (3.5, 7.3)	2.2 (1.4, 3.6)***	1.8 (1.1, 2.9)*
Difficulty meeting financial obligations/essential needs										
No	16 378 (84.4)	2.4 (2.0, 2.9)	(Ref.)	(Ref.)	2.6 (2.1, 3.3)	(Ref.)	(Ref.)	2.0 (1.5, 2.8)	(Ref.)	(Ref.)
Yes	2558 (15.6)	8.0 (6.4, 9.9)	3.5 (2.6, 4.7)***	2.9 (2.2, 4.0)***	7.4 (5.5, 9.8)	3.0 (2.0, 4.4)***	2.3 (1.5, 3.5)***	8.5 (6.1, 11.5)	4.5 (2.8, 7.1)***	3.8 (2.4, 6.1)***
Death of family/friend/colleague										
No	17 276 (91.3)	3.1 (2.7, 3.6)	(Ref.)	(Ref.)	3.0 (2.5, 3.7)	(Ref.)	(Ref.)	3.1 (2.4, 3.9)	(Ref.)	(Ref.)
Yes	1462 (8.7)	5.1 (3.5, 7.3)	1.7 (1.1, 2.5)*	1.5 (1.0, 2.3)	6.1 (3.7, 9.4)	2.1 (1.2, 3.6)**	2.0 (1.1, 3.4)*	3.7 (1.8, 6.5)	1.2 (0.6, 2.4)	1.0 (0.5, 2.1)
Loneliness/sense of isolation										
No	10 871 (56.7)	0.7 (0.5, 1.0)	(Ref.)	(Ref.)	0.7 (0.4, 1.0)	(Ref.)	(Ref.)	0.8 (0.5, 1.2)	(Ref.)	(Ref.)
Yes	7867 (43.3)	6.7 (5.8, 7.7)	9.7 (7.0, 13.5)***	8.1 (5.8, 11.2)***	6.2 (5.1, 7.4)	10.0 (6.2, 16.1)***	8.5 (5.3, 13.5)***	6.9 (5.4, 8.8)	9.3 (5.7, 15.3)***	7.7 (4.8, 12.5)***
Emotional distress										
No	11 460 (59.7)	0.9 (0.6, 1.2)	(Ref.)	(Ref.)	1.0 (0.6, 1.5)	(Ref.)	(Ref.)	0.8 (0.5, 1.2)	(Ref.)	(Ref.)
Yes	7278 (40.3)	6.9 (5.9, 8.0)	8.4 (5.9, 11.7)***	6.8 (4.7, 9.7)***	6.0 (4.9, 7.3)	6.4 (3.8, 10.8)***	5.0 (2.9, 8.6)***	7.6 (5.9, 9.7)	10.4 (6.5, 16.7)***	8.8 (5.5, 14.3)***
Physical health problem										
No	13 860 (72.2)	1.7 (1.4, 2.2)	(Ref.)	(Ref.)	1.8 (1.2, 2.5)	(Ref.)	(Ref.)	1.7 (1.2, 2.4)	(Ref.)	(Ref.)
Yes	4878 (27.8)	7.4 (6.2, 8.7)	4.5 (3.3, 6.1)***	3.7 (2.7, 5.1)***	6.6 (5.4, 8.1)	3.9 (2.6, 6.0)***	3.3 (2.1, 5.1)***	7.8 (5.8, 10.3)	5.0 (3.2, 7.9)***	4.2 (2.6, 6.6)***

Continued on the following page

TABLE 3 (continued)
Suicidal ideation during the pandemic, by experiences of COVID-19-related impacts, ≥18 years, Canada

Count and prevalence of COVID-19-related impacts, n (%)		Prevalence and odds ratio of suicidal ideation								
		Overall (n = 18 936)			Female (n = 10 818)			Male (n = 8 082)		
		Prevalence, % (95% CI)	OR (95% CI)	aOR[a] (95% CI)	Prevalence, % (95% CI)	OR (95% CI)	aOR[b] (95% CI)	Prevalence, % (95% CI)	OR (95% CI)	aOR[b] (95% CI)
Challenges in personal relationship										
No	15 403 (79.4)	2.3 (1.9, 2.8)	(Ref.)	(Ref.)	2.3 (1.7, 2.9)	(Ref.)	(Ref.)	2.2 (1.5, 3.0)	(Ref.)	(Ref.)
Yes	3335 (20.6)	7.2 (5.9, 8.7)	3.3 (2.5, 4.5)***	2.7 (2.0, 3.7)***	7.0 (5.4, 9.0)	3.3 (2.2, 4.8)***	2.5 (1.7, 3.9)***	7.1 (5.1, 9.7)	3.5 (2.2, 5.5)***	2.9 (1.8, 4.7)***
Number of COVID-19-related impacts experienced										
0 or 1	10 160 (51.2)	0.6 (0.4, 0.9)	(Ref.)	(Ref.)	0.7 (0.3, 1.3)	(Ref.)	(Ref.)	0.5 (0.3, 0.9)	(Ref.)	(Ref.)
2	3265 (17.3)	3.0 (2.0, 4.4)	5.3 (3.0, 9.5)***	4.7 (2.6, 8.4)***	2.9 (1.6, 4.8)	4.5 (1.8, 11.1)**	3.8 (1.5, 9.6)**	3.1 (1.7, 5.4)	6.2 (2.9, 13.6)***	5.5 (2.5, 11.9)***
3	2459 (13.3)	5.1 (3.5, 7.1)	9.1 (5.2, 16.1)***	7.1 (4.0, 12.9)***	3.9 (2.5, 5.8)	6.1 (2.7, 14.1)***	4.9 (2.1, 11.7)***	5.6 (2.9, 9.6)	11.5 (5.1, 25.9)***	10.0 (4.4, 22.4)***
4	1645 (9.9)	7.2 (5.4, 9.3)	13.2 (7.9, 22.0)***	10.1 (5.9, 17.5)***	7.8 (5.4, 11.0)	12.8 (5.6, 29.3)***	9.9 (4.2, 23.7)***	5.8 (3.4, 9.1)	11.9 (5.8, 24.3)***	9.3 (4.5, 19.3)***
5	765 (5.0)	11.1 (7.7, 15.3)	21.3 (12.2, 37.1)***	16.1 (9.0, 28.7)***	8.0 (4.9, 12.1)	13.1 (5.5, 31.0)***	9.1 (3.6, 23.0)***	15.1 (8.9, 23.4)	34.3 (16.1, 73.1)***	26.2 (12.5, 54.8)***
≥6	444 (3.3)	17.1 (12.2, 22.9)	35.2 (20.1, 61.6)***	25.4 (13.8, 47.0)***	15.9 (10.1, 23.5)	28.7 (12.3, 66.9)***	19.1 (7.4, 49.3)***	18.6 (10.7, 29.1)	44.1 (19.6, 99.2)***	33.6 (14.6, 77.2)***
≥2	8578 (48.8)	6.2 (5.3, 7.1)	11.3 (7.2, 17.7)***	8.7 (5.5, 14.0)***	5.7 (4.7, 6.8)	9.1 (4.3, 19.2)***	6.9 (3.2, 15.1)***	6.4 (5.0, 8.1)	13.2 (7.4, 23.6)***	10.7 (6.0, 19.1)***

Source: 2020 and 2021 Survey on COVID-19 and Mental Health, Canada, combined data.

Abbreviations: CI, Clopper–Pearson confidence interval; OR, crude odds ratio; aOR, adjusted odds ratio; Ref, reference group.

Note: For prevalence and odds ratio estimates, number of missing samples was 275 for gender combined, 141 for females and 34 for males. Missing samples for each estimate were less than 1.5%.

[a] Odds ratio adjusted by gender, age group and survey cycle.

[b] Odds ratio adjusted by age group and survey cycle.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

TABLE 4
Suicidal ideation during COVID-19 pandemic, by social risks and mental illness conditions, ≥18 years, Canada

Count and prevalence of social risks and mental illness, n (%)		Prevalence and odds ratio of suicidal ideation								
		Overall (n = 18 936)			Female (n = 10 818)			Male (n = 8082)		
		Prevalence, % (95% CI)	OR (95% CI)	aOR[a] (95% CI)	Prevalence, % (95% CI)	OR (95% CI)	aOR[b] (95% CI)	Prevalence, % (95% CI)	OR (95% CI)	aOR[b] (95% CI)
Substance use										
Increased alcohol consumption										
No	15 920 (83.9)	2.9 (2.4, 3.4)	(Ref.)	(Ref.)	3.2 (2.6, 3.9)	(Ref.)	(Ref.)	2.4 (1.7, 3.2)	(Ref.)	(Ref.)
Yes	2961 (16.1)	5.7 (4.5, 7.1)	2.1 (1.5, 2.8)***	1.8 (1.4, 2.5)***	4.3 (3.1, 5.8)	1.4 (0.9, 2.0)	1.2 (0.8, 1.8)	6.8 (4.9, 9.2)	3.0 (1.9, 4.7)***	2.8 (1.8, 4.5)***
Used cannabis in past 30 days										
No	13 526 (72.1)	2.1 (1.7, 2.6)	(Ref.)	(Ref.)	2.3 (1.7, 3.1)	(Ref.)	(Ref.)	1.8 (1.2, 2.6)	(Ref.)	(Ref.)
Yes	5390 (27.9)	6.4 (5.3, 7.6)	3.1 (2.4, 4.2)***	2.4 (1.8, 3.3)***	6.4 (5.0, 7.9)	2.9 (2.0, 4.1)***	2.1 (1.4, 3.2)***	6.0 (4.5, 7.9)	3.5 (2.2, 5.5)***	2.8 (1.8, 4.5)***
Increased cannabis use										
No	4367 (78.3)	5.2 (4.1, 6.5)	(Ref.)	(Ref.)	5.8 (4.3, 7.5)	(Ref.)	(Ref.)	4.7 (3.1, 6.7)	(Ref.)	(Ref.)
Yes	1033 (21.7)	10.7 (8.0, 13.9)	2.2 (1.5, 3.2)***	1.8 (1.2, 2.7)**	8.5 (5.6, 12.2)	1.5 (0.9, 2.5)	1.4 (0.8, 2.4)	11.0 (6.8, 16.7)	2.5 (1.4, 4.7)**	2.3 (1.2, 4.3)*
Concerns about violence in people's own homes										
No	18 237 (95.4)	3.2 (2.7, 3.7)	(Ref.)	(Ref.)	3.3 (2.7, 4.0)	(Ref.)	(Ref.)	2.9 (2.2, 3.6)	(Ref.)	(Ref.)
Yes	657 (4.6)	6.0 (3.3, 9.9)	1.9 (1.1, 3.5)*	1.8 (1.0, 3.3)	4.4 (2.5, 7.0)	1.3 (0.8, 2.3)	1.2 (0.7, 2.1)	7.4 (2.8, 15.3)	2.7 (1.0, 7.2)*	2.6 (1.0, 6.7)
Mental illness										
Moderate to severe symptoms of generalized anxiety disorder										
No	16 141 (85.8)	1.7 (1.3, 2.1)	(Ref.)	(Ref.)	1.4 (1.0, 1.9)	(Ref.)	(Ref.)	1.9 (1.3, 2.5)	(Ref.)	(Ref.)
Yes	2454 (14.2)	13.4 (11.3, 15.8)	9.2 (6.8, 12.5)***	7.6 (5.4, 10.6)***	12.7 (10.2, 15.5)	10.1 (6.8, 15.0)***	8.3 (5.4, 12.8)***	13.4 (9.4, 18.1)	8.2 (5.0, 13.4)***	6.8 (4.1, 11.6)***
Moderate to severe symptoms of depressive disorder										
No	15 580 (83.0)	1.1 (0.8, 1.4)	(Ref.)	(Ref.)	1.0 (0.7, 1.5)	(Ref.)	(Ref.)	1.0 (0.6, 1.5)	(Ref.)	(Ref.)
Yes	2876 (17.0)	14.4 (12.2, 16.8)	15.8 (11.4, 21.9)***	13.7 (9.6, 19.5)***	12.4 (10.0, 15.2)	13.5 (8.7, 20.8)***	10.9 (6.8, 17.3)***	16.6 (12.8, 21.1)	20.2 (12.0, 34.2)***	17.2 (10.0, 29.8)***

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TABLE 4 (continued)
Suicidal ideation during COVID-19 pandemic, by social risks and mental illness conditions, ≥18 years, Canada

Count and prevalence of social risks and mental illness, n (%)		Prevalence and odds ratio of suicidal ideation								
		Overall (n = 18 936)			Female (n = 10 818)			Male (n = 8082)		
		Prevalence, % (95% CI)	OR (95% CI)	aOR[a] (95% CI)	Prevalence, % (95% CI)	OR (95% CI)	aOR[b] (95% CI)	Prevalence, % (95% CI)	OR (95% CI)	aOR[b] (95% CI)
Moderate to severe symptoms of PTSD										
No	16 909 (93.1)	2.0 (1.6, 2.5)	(Ref.)	(Ref.)	1.9 (1.4, 2.5)	(Ref.)	(Ref.)	2.1 (1.5, 2.8)	(Ref.)	(Ref.)
Yes	1220 (6.9)	20.2 (16.8, 24.0)	12.2 (8.9, 16.7)***	10.2 (7.2, 14.5)***	18.1 (14.1, 22.6)	11.2 (7.5, 16.7)***	9.0 (5.8, 14.0)***	21.9 (15.2, 30.0)	13.3 (7.9, 22.4)***	12.1 (7.0, 20.8)***
Experienced stressful/traumatic event										
No	6132 (37.2)	1.6 (1.1, 2.3)	(Ref.)	(Ref.)	1.7 (0.9, 2.9)	(Ref.)	(Ref.)	1.6 (0.9, 2.5)	(Ref.)	(Ref.)
Yes	12 763 (62.8)	4.3 (3.7, 5.0)	2.7 (1.8, 4.1)***	3.0 (2.0, 4.5)***	4.2 (3.5, 5.0)	2.6 (1.4, 4.9)**	3.0 (1.6, 5.5)***	4.1 (3.2, 5.3)	2.7 (1.6, 4.7)***	3.1 (1.8, 5.3)***
Work status										
Frontline worker	1381 (6.2)	3.5 (2.3, 5.1)	1.1 (0.7, 1.6)	0.8 (0.5, 1.2)	3.6 (2.1, 5.6)	1.1 (0.6, 1.8)	0.8 (0.5, 1.4)	3.0 (1.3, 5.9)	0.9 (0.4, 2.2)	0.8 (0.3, 1.8)
Essential non-front-line worker	3844 (22.9)	3.1 (2.2, 4.1)	0.9 (0.6, 1.3)	0.7 (0.5, 1.0)*	3.3 (2.0, 5.1)	1.0 (0.6, 1.7)	0.8 (0.4, 1.3)	2.6 (1.7, 4.0)	0.8 (0.5, 1.3)	0.6 (0.4, 1.0)
Others	13 670 (70.9)	3.4 (2.8, 3.9)	(Ref.)	(Ref.)	3.3 (2.7, 4.1)	(Ref.)	(Ref.)	3.2 (2.4, 4.2)	(Ref.)	(Ref.)

Source: 2020 and 2021 Survey on COVID-19 and Mental Health, Canada, combined data.

Abbreviations: CI, Clopper–Pearson confidence interval; OR, odds ratio; aOR, adjusted odds ratio; PTSD, posttraumatic stress disorder; Ref, reference group.

Note: For prevalence and odds ratio estimates, number of missing samples was 26–877 for gender combined, 65–512 for females and 42–365 for males. Estimates for moderate to severe symptoms of PTSD, moderate to severe symptoms of depressive disorder and moderate to severe symptoms of anxiety disorder had the highest number of missing samples, at 847, 547 and 416 for gender combined, respectively. Missing samples for each estimate were less than 4.5%.

[a] Odds ratio adjusted by gender, age group and survey cycle.

[b] Odds ratio adjusted by age group and survey cycle.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

TABLE 5
Suicidal ideation during COVID-19 pandemic, by positive mental health indicators and coping strategies, ≥18 years, Canada

Count and prevalence of positive mental health and coping, n (%)		Prevalence and odds ratio of suicidal ideation								
		Overall (n = 18 936)			Female (n = 10 818)			Male (n = 8082)		
		Prevalence, % (95% CI)	OR (95% CI)	aOR[a] (95% CI)	Prevalence,% (95% CI)	OR (95% CI)	aOR[b] (95% CI)	Prevalence, % (95% CI)	OR (95% CI)	aOR[b] (95% CI)
Positive mental health indicators										
Self-rated mental health										
High	10 768 (55.7)	0.5 (0.3, 0.9)	0.07 (0.04, 0.13)***	0.09 (0.05, 0.16)***	0.6 (0.3, 1.2)	0.09 (0.04, 0.20)***	0.11 (0.05, 0.24)***	0.4 (0.1, 1.0)	0.05 (0.02, 0.16)***	0.06 (0.02, 0.29)***
Low	8157 (44.3)	6.8 (5.9, 7.8)	(Ref.)	(Ref.)	6.4 (5.3, 7.6)	(Ref.)	(Ref.)	7.0 (5.5, 8.7)	(Ref.)	(Ref.)
Community belonging										
High	12 454 (60.5)	1.4 (1.1, 1.8)	0.22 (0.16, 0.31)***	0.28 (0.20, 0.38)***	1.6 (1.1, 2.2)	0.25 (0.16, 0.39)***	0.31 (0.20, 0.48)***	1.2 (0.8, 1.8)	0.20 (0.12, 0.33)***	0.24 (0.15, 0.40)***
Low	6427 (39.5)	6.1 (5.2, 7.2)	(Ref.)	(Ref.)	6.0 (4.7, 7.4)	(Ref.)	(Ref.)	5.9 (4.5, 7.7)	(Ref.)	(Ref.)
Life satisfaction										
High	9705 (47.6)	0.5 (0.3, 0.9)	0.09 (0.05, 0.15)***	0.10 (0.06, 0.17)***	0.6 (0.3, 1.1)	0.10 (0.05, 0.20)***	0.12 (0.06, 0.26)***	0.4 (0.2, 0.8)	0.07 (0.03, 0.16)***	0.08 (0.03, 0.19)***
Low	9201 (52.4)	5.8 (5.1, 6.7)	(Ref.)	(Ref.)	5.7 (4.7, 6.8)	(Ref.)	(Ref.)	5.7 (4.5, 7.2)	(Ref.)	(Ref.)
Coping strategies										
Communication with friends and family										
No	2223 (12.8)	3.9 (2.8, 5.3)	(Ref.)	(Ref.)	4.8 (2.8, 7.7)	(Ref.)	(Ref.)	3.4 (2.2, 5.1)	(Ref.)	(Ref.)
Yes	16 578 (87.2)	3.2 (2.8, 3.8)	0.8 (0.6, 1.2)	0.7 (0.5, 1.0)	3.2 (2.6, 3.9)	0.7 (0.4, 1.1)	0.6 (0.3, 1.0)	3.0 (2.3, 3.9)	0.9 (0.5, 1.5)	0.8 (0.5, 1.4)
Meditating										
No	14 633 (77.5)	3.1 (2.7, 3.7)	(Ref.)	(Ref.)	3.5 (2.8, 4.3)	(Ref.)	(Ref.)	2.7 (2.1, 3.4)	(Ref.)	(Ref.)
Yes	3995 (22.5)	4.1 (3.1, 5.3)	1.3 (1.0, 1.8)	1.2 (0.8, 1.7)	3.1 (2.2, 4.2)	0.9 (0.6, 1.3)	0.8 (0.5, 1.2)	5.0 (3.0, 7.8)	1.9 (1.1, 3.3)*	1.8 (1.0, 3.1)*
Praying or seeking spiritual guidance										
No	12 776 (68.5)	3.3 (2.8, 3.9)	(Ref.)	(Ref.)	3.5 (2.8, 4.4)	(Ref.)	(Ref.)	3.0 (2.3, 3.8)	(Ref.)	(Ref.)
Yes	5877 (31.5)	3.4 (2.6, 4.4)	1.0 (0.7, 1.4)	1.1 (0.8, 1.6)	3.2 (2.3, 4.3)	0.9 (0.6, 1.3)	1.1 (0.7, 1.6)	3.5 (2.1, 5.4)	1.2 (0.7, 2.0)	1.2 (0.7, 2.1)

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TABLE 5 (continued)
Suicidal ideation during COVID-19 pandemic, by positive mental health indicators and coping strategies, ≥18 years, Canada

Count and prevalence of positive mental health and coping, n (%)		Prevalence and odds ratio of suicidal ideation								
		Overall (n = 18 936)			Female (n = 10 818)			Male (n = 8082)		
		Prevalence, % (95% CI)	OR (95% CI)	aOR[a] (95% CI)	Prevalence,% (95% CI)	OR (95% CI)	aOR[b] (95% CI)	Prevalence, % (95% CI)	OR (95% CI)	aOR[b] (95% CI)
Exercising for their mental and/or physical health										
No	3591 (18.8)	5.0 (3.7, 6.6)	(Ref.)	(Ref.)	4.8 (3.2, 7.0)	(Ref.)	(Ref.)	5.2 (3.3, 7.7)	(Ref.)	(Ref.)
Yes	15 253 (81.2)	2.9 (2.5, 3.4)	0.6 (0.4, 0.8)**	0.5 (0.4, 0.8)***	3.0 (2.5, 3.7)	0.6 (0.4, 1.0)*	0.6 (0.4, 1.0)*	2.6 (2.0, 3.4)	0.5 (0.3, 0.8)**	0.5 (0.3, 0.8)**
Changing food choices										
No	7047 (39.2)	2.9 (2.3, 3.5)	(Ref.)	(Ref.)	2.9 (2.1, 3.8)	(Ref.)	(Ref.)	2.7 (2.0, 3.6)	(Ref.)	(Ref.)
Yes	11 638 (60.8)	4.0 (3.3, 4.9)	1.4 (1.1, 1.9)*	1.2 (0.9, 1.7)	4.1 (3.3, 5.1)	1.5 (1.0, 2.1)*	1.2 (0.8, 1.8)	3.8 (2.6, 5.4)	1.4 (0.9, 2.3)	1.2 (0.7, 2.0)
Pursuing hobbies										
No	7134 (40.6)	3.8 (3.0, 4.7)	(Ref.)	(Ref.)	3.8 (2.8, 4.9)	(Ref.)	(Ref.)	3.9 (2.7, 5.4)	(Ref.)	(Ref.)
Yes	11 630 (59.4)	3.0 (2.4, 3.6)	0.8 (0.6, 1.0)	0.7 (0.5, 1.0)*	3.1 (2.4, 4.0)	0.8 (0.6, 1.2)	0.9 (0.6, 1.3)	2.4 (1.7, 3.3)	0.6 (0.4, 1.0)	0.6 (0.4, 1.0)*
Changing sleep patterns										
No	3515 (20.4)	2.9 (2.4, 3.4)	(Ref.)	(Ref.)	2.9 (2.3, 3.6)	(Ref.)	(Ref.)	2.7 (2.0, 3.5)	(Ref.)	(Ref.)
Yes	15 167 (79.6)	5.3 (4.1, 6.7)	1.9 (1.4, 2.6)***	1.5 (1.1, 2.1)**	5.3 (3.7, 7.2)	1.9 (1.2, 2.8)**	1.5 (1.0, 2.3)	4.9 (3.2, 7.1)	1.8 (1.1, 3.0)*	1.6 (1.0, 2.6)

Source: 2020 and 2021 Survey on COVID-19 and Mental Health, Canada, combined data.

Abbreviations: CI, Clopper–Pearson confidence interval; OR, odds ratio; aOR, adjusted odds ratio; Ref., reference group.

Note: For prevalence and odds ratio estimates, number of missing samples was 89–382 for gender combined, 52–200 for females and 37–160 for males. Missing samples for each estimate were no more than 2.0%.

[a] Odds ratio adjusted by gender, age group and survey cycle for overall.

[b] Odds ratio adjusted by age group and survey cycle for females and males.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

across populations. As in previous cross-sectional studies,[5,8] we found that people with a mental illness had a significantly higher prevalence of suicidal ideation during the pandemic than those who did not have a mental illness. The consistency of these results across studies underscores the need to overcome existing and new barriers to accessing mental health care and support timely deployment of evidence-based treatments.

Our analysis also shows higher odds of suicidal ideation with increased alcohol and cannabis use and concerns about violence in their home. These factors may serve as indirect pathways through which the pandemic has influenced suicidality. For example, pandemic-related stresses may have increased risks for family violence, particularly in periods of lockdown.[27,28] While rates of child maltreatment and intimate partner violence have varied during the pandemic,[29-31] they are both forms of violence that often occur at home and are strongly associated with suicidal ideation and attempts.[32,33] To the extent that "concerns" might be a proxy for actual experiences of violence, interventions that reduce risks by providing social support, improving clinical follow-up care and supporting victims of violence to attain financial security[28] may have the secondary benefit of reducing ideating suicide.

Frontline and essential workers faced occupational stresses during the pandemic that may have affected mental health and suicidal behaviors.[21,34-36] Our analyses of the data from the 2020 SCMH show that female frontline workers were significantly more likely to report suicidal ideation than other females, but the opposite was the case for the 2021 SCMH, when female frontline workers were significantly less likely to report suicidal ideation. A possible explanation is that those who experienced the worst outcomes in the early stages of the pandemic were on stress leave and may not have worked during the second survey period. Overall, data on the mental health of health care workers are lacking,[34] and further studies are needed to understand experiences of moral injury, burnout and pandemic stress on suicidality in these groups. The negative associations between suicidal ideation, indicators of positive mental health and exercise that we observed align with other evidence.[3,37-39]

Strengths and limitations

Our study was based on two iterations of a nationally representative, population-based survey, and examined suicidal ideation across a broad range of factors related to COVID-19 and health and social risks with standardized measures. These strengths align with those reported in previous studies using the SCMH.[3,11] Nonetheless, several limitations should be considered when interpreting our results.

Prevalence and odds ratio estimates were based on combined data from two survey cycles, so they do not reflect a single time point during the pandemic. Another limitation is that the recall periods for suicidal ideation were not the same for the two cycles.

Further, the effects of the modest response rate and of respondents who did not agree to share their data with PHAC on suicidal ideation were not clear, though Statistics Canada adjusted the sample weights through a comprehensive weight redistribution process that controlled demographic factors and other survey variables and used a quality control step to reduce bias. Moreover, this is a cross-sectional study where it is difficult to determine the temporal relationship between suicidal ideation and experiences of pandemic-related impacts with other independent factors. Suicidal ideation and mental illness were self-reported or based on screening questions, not clinical diagnostic assessments, and coping strategies were not measured through specific validated tools; as a result, report biases might exist.

Lastly, the outcome variable suicidal ideation and several other variables included in this study (e.g. concerns about violence in people's own homes) had relatively low prevalence. To account for this and attain maximum statistical power, we used a lenient alpha level of 0.05 to determine statistical significance. This approach may result in false positives because of the numerous comparisons made in this work.

Conclusion

The COVID-19 pandemic was strongly associated with suicidal ideation among adults in Canada. Our study has contributed, in a timely manner, to understanding the influence of the pandemic on population mental health, and the results can help inform interventions that address factors related to suicidality. This work can also inform future public health programs and policies that target specific population groups with elevated risks for suicidal ideation, such as people with mental illness as well as those who experienced multiple pandemic impacts and recently increased their alcohol and drug consumption.

The results are generalizable to the adult population in Canada, but some subpopulations with an elevated pre-pandemic prevalence of suicidal ideation were not part of the sample frame of the SCMH (e.g. youth) or were not identifiable in the data (e.g. LGTBQ2+). Future studies should investigate suicidal ideation in these subpopulations.

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Conflicts of interest

The authors have no conflicts of interest to declare.

Authors' contributions and statement

All authors advised on the conception and design of the analysis.

LL conducted the statistical analysis.

All authors interpreted the results.

NJP and LL drafted and revised the manuscript.

All authors critically reviewed every draft of the article and approved the final submission.

The content and conclusions in this article are those of the authors and do not necessarily reflect the official position of the Government of Canada.

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