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Original mixed methods research

A mixed-methods approach to understanding pharmacists' experiences with the CANRISK diabetes risk questionnaire and user guide

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Abstract

Introduction: The Canadian Diabetes Risk Questionnaire (CANRISK) is a validated tool for diabetes risk screening, but the extent of its uptake and implementation by Canadian pharmacists has not been assessed. We aimed to describe the current use of the CANRISK tool and user guide among pharmacists, identify facilitators and barriers, and provide solutions to improve uptake.

Methods: We used a mixed-methods approach comprising an initial quantitative online survey followed by qualitative interviews with pharmacists to allow for a deeper understanding of their experiences. Descriptive statistics were used to analyze the survey data and thematic analysis was used to analyze the interview data.

Results: We found that 89% of pharmacists surveyed provided diabetes counselling on a daily or weekly basis, but more than half (55%) were not aware of CANRISK and its user guide. Of those who were aware, 60% indicated that they rarely or never used CANRISK. Five overarching themes were identified in the qualitative component. The facilitators to CANRISK uptake included pharmacist's interest, diabetes clinic days/awareness campaigns, and patient-provider relationship. However, there are barriers to its implementation, including time constraints, competing priorities, financial pressures, staff shortages, and limited understanding of the tool's usefulness.

Conclusion: This paper found that CANRISK use was limited, and that support is needed to address the barriers for the successful implementation of CANRISK in pharmacies.

Keywords: *CANRISK, diabetes, pharmacists, CANRISK user guide, mixed-methods study*

Highlights

- The Canadian Diabetes Risk Questionnaire (CANRISK) is a validated tool, but little is known about its implementation by pharmacists.
- This study identified some key facilitators to CANRISK implementation in the pharmacy setting, such as diabetes clinic days and patient-provider relationship. However, the tool is not widely used in pharmacies due to barriers such as competing priorities and limited understanding of its usefulness.
- Increasing awareness and understanding of the CANRISK tool, and providing more support are necessary to enhance the tool's visibility and integration into routine practice.

Introduction

Diabetes is one of the most common chronic conditions in Canada and is increasing at a rate of 3.3% per year.[1] Before diabetes develops, blood glucose levels rise above normal into the prediabetes range, a state that can be diagnosed and reversed if detected early. If left untreated, approximately 25% of people with prediabetes will progress to type 2 diabetes within 3 to 5 years, and up to 70% will develop diabetes within their lifetime.[2] There is also evidence that preventing or delaying the onset of diabetes can reduce the risk of developing macrovascular complications such as cardiovascular disease, and microvascular complications such as retinopathy and nephropathy.[1] Thus, early detection is key for better health outcomes. A valid and easily administered risk assessment tool, the Canadian Diabetes Risk Questionnaire (CANRISK: https://www.healthycanadians.gc.ca/en/canrisk), was developed by the Public Health Agency of Canada (PHAC) in 2011 to identify people at high risk of having prediabetes or diabetes.[3] CANRISK scores are validated against reference standard blood tests and the questionnaire has been demonstrated

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to be a valid tool in Canada's multi-ethnic population.[3] Although developed over a decade ago, CANRISK remains a highly relevant and effective tool for diabetes risk assessment in Canada. Its continued evolution through ongoing validation efforts and targeted updates reinforces its viability. Recent initiatives, such as its adaptation for younger adults aged 18 to 39 and culturally tailored validation among African, Caribbean, and Black populations, reflect sustained investment and a strong commitment to health equity.[4] When compared to similar tools like AUSDRISK and FINRISK, CANRISK performs comparably in identifying individuals at high risk of type 2 diabetes, making it a cost-effective and scalable solution.[3]

A previous evaluation of CANRISK from various regional public health perspectives supported its use as a diabetes risk screening and health promotion tool; however, the perspectives of pharmacists were not captured.[5-7] Pharmacists play an important role in both diabetes prevention and management, and have led community-based diabetes screening programs.[8-17] They are highly accessible in urban and rural areas, which place them in an ideal position to promote public health awareness and prevention of diabetes.[17] CANRISK is a practical tool that can be implemented in pharmacies within primary care settings to enable early detection of individuals at risk for type 2 diabetes. The questionnaire contains simple items, such as age, waist circumference, family history, and physical activity level. It is also easy to administer, and its scoring system allows for quick identification of low-, moderate-, and high-risk individuals. In addition, CANRISK can be used to support both referral and counselling, where high-risk patients can be referred to primary care providers for confirmatory testing, and those with moderate risk can receive counselling from pharmacists on lifestyle interventions (diet, physical activity, and weight management). Similar tools such as AUSDRISK highlight the value of risk assessment screening. For example, the Pharmacy Diabetes Screening Trial (PDST) in Australia screened over 14 000 participants and identified 45% who required a referral.[18] Following referrals, 136 participants were diagnosed with diabetes and 338 with prediabetes.[18] Therefore, its integration in pharmacy workflows can facilitate early detection of at-risk individuals and allow pharmacists to play a key role in preventive care. The Canadian Pharmacists Association (CPhA) has also developed a CANRISK User Guide for Pharmacists, which provides supplementary information to facilitate CANRISK uptake.[19-20] Still, little is known about pharmacists' experience in implementing CANRISK.

The objective of this study was to assess pharmacists' experiences of the CANRISK tool and CPhA's User Guide for Pharmacists, identify facilitators and barriers, and provide solutions to improve its uptake and use.

Methods

Study design

This study used a mixed-methods approach involving an online survey and interviews with pharmacists. The sole inclusion criterion was licensed Canadian pharmacists in any practice setting.

Data collection

Survey

The survey was designed by a pharmacist who was also a Certified Diabetes Educator on the research team, and pretested by the full research team. Questions were also reviewed by Health Canada's Public Opinion Research team. Available in both English and French, the survey contained 10 questions with a mix of binary, Likert scale, and open-ended questions to understand pharmacists' experience and satisfaction with the tool. The survey was hosted on Qualtrics (Seattle, Washington, United States) from October 2022 to February 2023, and recruitment involved contacting organizations to help distribute the survey: CPhA (via their monthly newsletter in October and November 2022), Diabetes Canada (via their communications team), provincial pharmacists associations (only Pharmacists' Association of Newfoundland and Labrador responded and they posted the survey link in their bi-weekly newsletter in November 2022), relevant stakeholders via Health Canada (HC) and PHAC's Consultation and Stakeholder Information Management System, and previous pharmacists contacts. The snowball sampling method was also used to increase recruitment where previous contacts helped distribute the survey further through their professional networks. Snowball sampling was used because our target population comprises pharmacists across Canada in various practice settings, and because there is no exhaustive sampling frame of pharmacists actively performing diabetes risk assessment. This method leverages existing professional networks to increase response rates among busy clinicians, and has been used in prior studies involving pharmacists and diabetes education, and in diabetes risk research more broadly to recruit health care providers.[21-24] We estimated that approximately 20 800 pharmacists received the survey link. The completion of the survey was voluntary. Participants were required to provide consent and were assured that all the information collected would be confidential.

Interviews

At the end of the survey, participants were asked if they would like to share their experience on the CANRISK tool and/or user guide through participation in an interview. If yes, they were directed to provide their email address. They were then contacted by a member of the research team for a semi-structured interview. From December 2022 to February 2023, 20- to 30-minute one-on-one recorded interviews were conducted using Microsoft Teams (Redmond, WA, USA). Interview questions were developed and reviewed by the research team. Questions were also reviewed by Health Canada's Public Opinion Research team. The interview was comprised of four to nine questions depending on the pharmacists' experience and awareness of the CANRISK tool and/or user guide. If they were not aware of the CANRISK tool and/or user guide, the pharmacists would review them and provide their feedback. Interview questions can be found in the supplementary material (available on request from the authors). Interviews were recorded with permission from the participants. Verbal consent related to privacy and confidentiality was provided at the beginning of the interview. All participants accepted audio-recording, and consent was audio-recorded at the start of each interview.

Data analysis

Descriptive statistics, including counts and percentages, were used to describe and summarize the survey data. Qualitative data from interviews were transcribed and analyzed thematically.[25] First, a coding manual was developed based on the first two interviews by a research team member (JT). Another team member (SS) then coded these two interviews using the coding manual. Following this, the two team members (JT & SS) met to verify the congruence in code definitions and to refine and finalize the coding manual. They then independently coded the remaining five

transcripts using the final coding manual. After the interviews were coded, the differences in coding were reviewed and discussed until consensus was achieved. Common categories, patterns, and concepts were identified, which led to themes. Data analysis (quantitative and qualitative) was completed on Microsoft Excel (Redmond, WA, USA).

Ethics approval

Based on Article 2.5 of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans, the Health Canada/PHAC Research Ethics Board concluded that ethics approval was not required.[26] The Privacy Management Division at PHAC reviewed the project to ensure confidentiality and privacy guidelines were followed.

Results

Survey results

A total of 44 respondents agreed to participate in the online survey, which demonstrated a low response rate (estimated < 1%) (Table 1). Among them, 89% provided daily to weekly prediabetes or diabetes counselling, but more than half (55%) of pharmacists were unaware of the CANRISK tool (Table 2). Of those who were aware, 60% indicated that they rarely or never used CANRISK. There was only one pharmacist who used another tool. In addition, 60% of the pharmacists who completed the survey were unaware of CPhA's User Guide for Pharmacists. Those who were aware of it rarely or never used it.

TABLE 1
Baseline characteristics of pharmacists (n = 44) in the survey

Characteristics	n	%
Years of experience		
0–5 years	4	9
6–10 years	15	34
11 years or more	25	57
Regions of practice[a]		
British Columbia	5	11
Prairies (AB, SK, MB)	1	2
Ontario	21	47
Quebec	15	33
Atlantic (NS, NB, NL, PEI)	3	7
Areas of primary practice setting[b]		
Medium-large population centre	39	89
Small-rural population centre	5	11

Abbreviations: AB, Alberta; MB, Manitoba; NB, New Brunswick; NL, Newfoundland and Labrador; NS, Nova Scotia; PEI, Prince Edward Island; SK, Saskatchewan.

[a] No responses from the Territories.

[b] Medium-large population centre is defined as population between 30 000 and 100 000 or more. Small-rural population centre is defined as population between < 1000 and 29 999.

Interview findings

Seven pharmacists were interviewed: five from Ontario, one from the Atlantic Region, and one from Quebec. Concepts sorted by themes are found in Table 3. Data saturation was assumed to be achieved as the final three participants did not present any additional themes. Five themes emerged and are described as follows.

Theme 1: Pharmacist's role and interest

Most interviewees highlighted that pharmacists could play a key role in identifying individuals at risk of type 2 diabetes due to their accessibility and expertise. Using CANRISK, pharmacists can screen and educate patients about modifiable risk factors such as diet, physical activity, and weight management. They can also refer high-risk individuals to primary care providers for confirmatory testing, and provide ongoing support and follow-up. Therefore, there is an opportunity to incorporate CANRISK into pharmacy services to facilitate early detection and raise public awareness.

Interviewees noted that, based on their clinical experience and/or observations, some pharmacists who have an interest in diabetes and/or are Certified Diabetes Educators (CDEs) tend to include CANRISK in their discussions with patients and in diabetes clinic days/awareness campaigns. Meanwhile, in terms of uptake, they noted that patients are more likely to complete the questionnaire if there is a good patient-provider relationship, or if the patient does not have a primary care physician, as one pharmacist mentioned: "(When) patients themselves sense something is wrong, they are more likely to come to a pharmacist that they know personally to seek help." (Pharmacist 2)

Theme 2: Positive perception of CANRISK

The pharmacists, who are using CANRISK in their practice, found the tool to be helpful in identifying at-risk patients, and would usually incorporate CANRISK in their diabetes clinic days or awareness campaigns. Most pharmacists (5 out of 7 pharmacists) support its use, as shown by one of their comments: "It's a very good basic tool actually, that is underutilized, very underutilized." (Pharmacist 3)

Theme 3: Limited use of the user guide

Some pharmacists were aware of the CPhA's User Guide for Pharmacists, but only one pharmacist from the interview consulted it in practice. When the user guide was reviewed by the pharmacists who were not aware of it, they found it to be informative and a good complement to the questionnaire. "Yeah, I'm not familiar with the user guide." (After reviewing:) "Oh, this is good! It's good. Yeah, it has a lot of details and everything." (Pharmacist 2)

Theme 4: Barriers to implementation

Challenges included time constraints, competing priorities, financial pressures, staff shortages, and limited understanding of the usefulness of CANRISK. Education about CANRISK was highlighted by several pharmacists as a solution to increase its uptake. "The other part is just awareness. Patients aren't aware that this exists. Lots of health professionals aren't aware that this exists." (Pharmacist 1)

Theme 5: Recommendations

The pharmacists who have used CANRISK provided recommendations based on their experience, and those who have not used it reviewed the questionnaire and the user guide and offered suggestions to improve them. Recommendations regarding how to increase CANRISK awareness and uptake included putting posters in pharmacies to increase patient conversations, developing

TABLE 2
Survey questions and results

Questions	n	%
How many patients do you see in a typical week? Include all patients, including those who visit you for diabetes and non-diabetes related visits.		
Less than 20	2	5
20 to 50	6	14
51 to 80	2	5
81 to 110	11	25
111 to 140	5	11
Over 140	18	41
On average, how often do you provide prediabetes or diabetes advice to your patients?		
Daily	28	64
Weekly	11	25
Monthly	0	0
A few times per year	3	7
Less than a few times a year	2	5
Never	0	0
Are you aware of the CANRISK tool?		
Yes	20	45
No	24	55
i) [If replied "Yes"] How did you find out about CANRISK?		
From pharmacy school	8	40
At a conference	3	15
From work	7	35
From a colleague	0	0
Others (specified email, literature, guidelines)	2	10
ii) [If replied "Yes"] How often do you use the CANRISK questionnaire for prediabetes and diabetes risk assessment?		
Daily	0	0
Weekly	0	0
Monthly	2	10
A few times per year	6	30
Less than a few times a year	6	30
Never	6	30
Are you using other tools for prediabetes and diabetes risk assessment?		
Yes (participant specified CDPP)	1	2
No	43	98
Are you aware of the CPhA's user guide for CANRISK?		
Yes	8	40
No	12	60
i) [If replied "Yes" How frequently do you consult the user guide while implementing the CANRISK tool for risk assessment?		
Daily	0	0
Weekly	0	0
Monthly	1	13
A few times per year	2	25
Less than a few times a year	2	25
Never	3	38
ii) [If replied "Yes"] How would you rate how easy it is to use the user guide?		
Difficult	0	0
Hard	0	0
Average	3	38
Easy	5	63
Very easy	0	0
Do you think a similar guide for the general public or community workers helping others use the CANRISK tool in a community setting would be helpful?		
Yes	18	90
No	2	10

Abbreviations: CANRISK, Canadian Diabetes Risk Questionnaire; CDPP, Canadian Diabetes Prevention Program; CPhA, Canadian Pharmacists Association.

Notes: Percentages are based on the number of respondents for each subquestion. Percentages may not add up to 100 due to rounding.

TABLE 3
Occurrence of concepts in the interviews (n = 7)

Concepts	Occurrence, # of pharmacists
Theme 1: Pharmacist's role and interest	
Pharmacist has a role in identifying at-risk patients	6/7
Pharmacist with personal interest in diabetes or pharmacist who is also a CDE is more likely to use CANRISK	4/7
Good patient-provider relationship	5/7
Pharmacists are first point of contact to health care system	5/7
Theme 2: Positive perception of CANRISK	
Tool is useful	5/7
Used/can be used in diabetes clinic days/awareness campaigns	5/7
Theme 3: Limited use of the user guide	
Awareness of user guide	4/7
Have used the user guide in practice	1/4
Positive feedback after reviewing user guide for those who are not aware of it	3/3
Theme 4: Barriers to implementation	
Time constraints	7/7
Competing priorities	7/7
Financial pressures	6/7
Staff shortages	5/7
Limited understanding of the usefulness of CANRISK	4/7
Theme 5: Recommendations	
Increasing awareness/uptake	
Education to increase CANRISK uptake	5/7
Put posters in pharmacies to increase awareness	3/7
Develop webinars on CANRISK	2/7
Use user guide to create webinar content	3/7
Improving CANRISK tool	
Improve readability	4/7
Avoid potentially offensive language	5/7
Provide explanation on sex vs. gender	4/7
Improve procedure to measure waist circumference in public setting	5/7
Provide information for next steps after patient completes the questionnaire	7/7
Improving CANRISK user guide	
Update the content (outdated)	4/7
Develop webinar with content in user guide	3/7

Abbreviations: CANRISK, Canadian Diabetes Risk Questionnaire; CDE, Certified Diabetes Educator.

webinars on CANRISK for pharmacists, and possibly using the user guide to create the webinar content. This could help increase awareness and help pharmacists feel more confident when administering the questionnaire.

Recommendations to improve the questionnaire included improving readability (larger font size, simpler words), avoiding potentially offensive language (avoid the word "large" when referring to weight, using a preamble to provide a rationale regarding sex vs. gender), improving procedures for measuring waist circumference in a public setting, and providing options on next steps once an individual has received a high-risk score. For example, next steps could include asking the patient to speak to a health care provider for bloodwork to assess risk, and providing a pamphlet/information sheet to the patient after they complete the questionnaire to put the risk into context.

Some recommendations for the user guide include updating the content as some of the information and links are outdated and using the content of the user guide to develop a webinar or continuing education material for pharmacists.

Discussion

This is the first study that examined pharmacists' experiences with the CANRISK tool and user guide. The survey results revealed that most pharmacists were unaware of CANRISK and its use in pharmacies was limited. The themes identified in the interviews helped to explain the barriers to CANRISK implementation, but also highlighted that there is potential to improve CANRISK uptake in pharmacy settings.

Our findings illustrated that the uptake of CANRISK by pharmacists is limited, which is consistent with the systematic review that examines health care professionals' uptake of diabetes risk assessment tools.[27] Yet, the findings from Bird and colleagues, which examined the use of CANRISK from the perspectives of regional public health organizations, found that the tool was widely used for risk screening and health promotion.[5] However, they sampled mostly administrators of health organizations as compared to the front-line health care professionals targeted in our study.[5]

The interviews identified barriers to implementing CANRISK, such as time constraints, competing priorities, financial limitations, staff shortages, lack of awareness, and limited understanding of its utility. These barriers align with findings from a systematic review and existing literature, which include attitudes toward diabetes assessment tools, impracticality of the tools, and lack of reimbursement and regulatory support.[27,28] The lack of CANRISK awareness may stem from minimal promotion since CANRISK's launch over a decade ago. When CANRISK was first launched, CPhA developed the CANRISK User Guide for Pharmacists, which provides supplementary information, key messages, and clarification that pharmacists can provide to patients. As with many programs, uptake often peaks early and then declines, which may explain the current limited use. Our results found that although more than half of the surveyed pharmacists were unaware

of CANRISK, those who used it incorporated it into their diabetes awareness efforts. This suggests that there are opportunities to engage pharmacists more effectively to assist in early identification of individuals at risk of developing type 2 diabetes and to refer them to primary care providers promptly. Pharmacists are increasingly playing a key role in the prevention and management of chronic diseases, such as diabetes, as seen in several pharmacist-led interventions in the literature.[27,29-34] In particular, community pharmacists are in a unique position to support CANRISK implementation due to their accessibility, regular interactions with patients, and expertise in chronic disease prevention and management. While staffing shortages and competing priorities are some of the challenges, CANRISK could be integrated into existing activities, such as patient counselling or medication reviews, as an opportunistic risk screening. By way of illustration—pending feasibility testing—while patients wait for their prescriptions or flu shots, a pharmacy assistant or technician could introduce the CANRISK questionnaire to them. Patients could complete it on paper or a tablet, after which the pharmacist would review the results, provide counselling, and, if needed, refer patients to a physician. Results could then be documented in the pharmacy system for follow-up.

The pharmacists in the interview also provided recommendations on the CANRISK tool, which are consistent with the systematic review and Bird et al's study.[5,27] Recommendations include improving readability, addressing potentially offensive language, improving procedures for measuring waist circumference in public settings, and providing clear next steps for individuals with high-risk scores.[5,27] The similarity in recommendations on CANRISK by pharmacists and other audiences indicates that the CANRISK tool may need to be revised to enhance its usability and relevance.

Strengths and limitations

This study provides valuable insights from pharmacists on their use of CANRISK and the user guide. As pharmacists are highly accessible with an expanded scope of practice (which varies across jurisdictions), a better understanding of what will support their use is important. Limitations of this study include small sample sizes, certain provinces not being represented and others overrepresented (e.g. Ontario and Quebec), and the non-random method of obtaining respondents (i.e. snowball sampling), which limit its generalizability. Although various organizations and previous pharmacist contacts helped to distribute the survey, a low response rate was found. Some factors that may contribute to the low response include time constraints, lack of incentives for participating in the survey, and survey fatigue (if they are invited to participate in multiple surveys), which are consistent with the literature.[35] Low participation may also suggest limited interest, awareness, or time for CANRISK. Meanwhile, the pharmacists who participated might already have an interest in diabetes prevention, which may impact our findings through selection bias. Despite the limitations, this study informs current use and future evaluation of CANRISK.

Conclusion

CANRISK remains a relevant and valuable tool for early identification of type 2 diabetes risk, with recent updates expanding its use to younger and more diverse populations. It serves not only as a no/low-cost screening instrument but also as an effective referral and counselling aid in pharmacy settings, supporting timely intervention and health education. Our findings suggest that more support is needed to address the barriers of CANRISK implementation in pharmacy settings and a revision of the tool is recommended, specifically improving readability, avoiding potentially offensive language, and providing information on next steps after patients complete the questionnaire. Further studies are needed to evaluate the impact of CANRISK implementation in pharmacy settings and potential cost savings to the health care system due to pharmacists' intervention, such as referral to primary care providers, drug therapy recommendations, and lifestyle interventions.

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Conflicts of interest

Margaret de Groh is the journal's former Associate Editor-in-Chief and Howard Morrison is an Acting Editor-in-Chief and one of the journal's Editorial Board Members. Both have recused themselves from the review process for this article. The authors declare that they have no competing interests.

Authors' contributions and statement

JT: conceptualization, formal analysis, writing—original draft, writing—review and editing.

YJ: conceptualization, writing—review and editing, supervision.

SS: formal analysis, writing—review and editing.

HM: writing—review and editing.

MdG: conceptualization, writing—review and editing, supervision.

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References

1. Public Health Agency of Canada. Framework for diabetes in Canada [Internet]. Ottawa (ON): Government of Canada; 2022. Available from: https://www.canada.ca/en/public-health/services/publications/diseases-conditions/framework-diabetes-canada.html

2. Hostalek U. Global epidemiology of prediabetes - present and future perspectives. Clin Diabetes Endocrinol. 2019;5:5. https://doi.org/10.1186/s40842-019-0080-0

3. Robinson CA, Agarwal G, Nerenberg K. Validating the CANRISK prognostic model for assessing diabetes risk in Canada's multi-ethnic population. Chronic Dis Inj Can. 2011;32(1):19-31. https://doi.org/10.24095/hpcdp.32.1.04

4. Alamgir A, Raghunauth R, Momoh O, Ledwos C. Assessing the risks and cultural relativity of diabetes in Black individuals of African Caribbean ancestry (ACB) aged 18-39 years in Toronto. Int J Environ Res Public Health. 2025;22(1):85. https://doi.org/10.3390/ijerph22010085

5. Bird M, Cerutti S, Jiang Y, Srugo SA, de Groh M. Implementation of the CANRISK tool: a qualitative exploration among allied health professionals in Canada. Can J Diabetes. 2022; 46(2):118-125. https://doi.org/10.1016/j.jcjd.2021.06.006

6. Lemieux CL, deGroh M, Gibbons L, Morrison H, Jiang Y. A tool to assess risk of type 2 diabetes in Canadian adults. Can J Diabetes. 2020;44(5):445-7. https://doi.org/10.1016/j.jcjd.2020.03.002

7. Public Health Agency of Canada. CANRISK consultation meeting – summary report. Internal report. Unpublished 2019.

8. Orabone AW, Do V, Cohen E. Pharmacist-managed diabetes programs: improving treatment adherence and patient outcomes. Diabetes Metab Syndr Obes. 2022;15:1911-23. https://doi.org/10.2147/DMSO.S342936

9. Nabulsi NA, Yan CH, Tilton JJ, Gerber BS, Sharp LK. Clinical pharmacists in diabetes management: what do minority patients with uncontrolled diabetes have to say? J Am Pharm Assoc. 2020;60(5):708-15. https://doi.org/10.1016/j.japh.2020.01.024

10. Halalau A, Sonmez M, Uddin A, Karabon P, Scherzer Z, Keeney S. Efficacy of a pharmacist-managed diabetes clinic in high-risk diabetes patients, a randomized controlled trial - "Pharm-MD": impact of clinical pharmacists in diabetes care. BMC Endocr Disord. 2022;22(1):69. https://doi.org/10.1186/s12902-022-00983-y

11. Pontefract BA, King BS, Gothard DM, King CA. Impact of pharmacist-led diabetes management in primary care clinics. Innov Pharm. 2018;9(2):1-8. https://doi.org/10.24926/iip.v9i2.985

12. Jamshed SQ, Siddiqui MJ, Rana B, Bhagavathula AS. Evaluation of the involvement of pharmacists in diabetes self-care: a review from the economic perspective. Front Public Health. 2018;6:244. https://doi.org/10.3389/fpubh.2018.00244

13. Iqbal MZ, Khan AH, Iqbal MS, Syed Sulaiman SA. A review of pharmacist-led interventions on diabetes outcomes: an observational analysis to explore diabetes care opportunities for pharmacists. J Pharm Bioallied Sci. 2019;11(4):299-309. https://doi.org/10.4103/jpbs.JPBS_138_19

14. Benedict AW, Spence MM, Sie JL, Chin HA, Ngo CD, Salmingo JF, et al. Evaluation of a pharmacist-managed diabetes program in a primary care setting within an integrated health care system. J Manag Care Spec Pharm. 2018;24(2):114-22. https://doi.org/10.18553/jmcp.2018.24.2.114

15. Khan YH, Alzarea AI, Alotaibi NH, Alatawi AD, Khokhar A, Alanazi AS, et al. Evaluation of impact of a pharmacist-led educational campaign on disease knowledge, practices and medication adherence for type-2 diabetic patients: a prospective pre- and post-analysis. Int J Environ Res Public Health. 2022;19(16):10060. https://doi.org/10.3390/ijerph191610060

16. McSweeney B, Campbell RB, Grewal EK, Campbell DJT. Pharmacists' role in diabetes management for persons with lived experience of homelessness in Canada: a qualitative study. Front Clin Diabetes Healthc. 2022;3:1087751. https://doi.org/10.3389/fcdhc.2022.1087751

17. El-Den S, Lee YLE, Gide DN, O'Reilly CL. Stakeholders' acceptability of pharmacist-led screening in community pharmacies: a systematic review. Am J Prev Med. 2022;63(4):636-46. https://doi.org/10.1016/j.amepre.2022.04.023

18. Krass I, Carter R, Mitchell B, Versace VL, Wilson F, Mc Namara KP, et al. Pharmacy diabetes screening trial (PDST): outcomes of a national clustered RCT comparing three screening methods for undiagnosed type 2 diabetes (T2DM) in community pharmacy. Diabetes Res Clin Pract. 2023;197:110566. https://doi.org/10.1016/j.diabres.2023.110566

19. Emberley P, Leblanc C. Diabetes updates and patient tools. Can Pharm J. 2014;147(1):66-7. https://doi.org/10.1177/1715163513515836

20. Canadian Pharmacists Association. CANRISK user guide for pharmacists [Internet]. Ottawa (ON): Canadian Pharmacists Association; [cited 2022 Aug 1]. Available from: https://www.pharmacists.ca/cpha-ca/assets/File/education-practice-resources/CanriskuserguideforpharmacistsEN.pdf

21. Ayadurai S, Sunderland B, Tee LB, Hattingh HL. A training program incorporating a diabetes tool to facilitate delivery of quality diabetes care by community pharmacists in Malaysia and Australia. Pharm Pract. 2019; 17(2):1457. https://doi.org/10.18549/PharmPract.2019.2.1457

22. Gargya D, Mirkazemi C, Curtain C. Qualitative exploration of the experiences of community pharmacists delivering the Diabetes MedsCheck service. J Clin Pharm Ther. 2022; 47(8):1194-200. https://doi.org/10.1111/jcpt.13654

23. Bamogaddam RF, Mohzari Y, Aldosari FM, Alrashed AA, Almulhim AS, Kurdi S, et al. Prevalence and associations of type 2 diabetes risk and sociodemographic factors in Saudi Arabia: a web-based cross-sectional survey study. Int J Environ Res Public Health. 2023;20(3):2269. https://doi.org/10.3390/ijerph20032269

24. Shaghaghi A, Bhopal RS, Sheikh A. Approaches to recruiting 'hard-to-reach' populations into research: a review of the literature. Health Promot Perspect. 2011;1(2):86-94. https://doi.org/10.5681/hpp.2011.009

25. Coates WC, Jordan J, Clarke SO. A practical guide for conducting qualitative research in medical education: part 2-coding and thematic analysis. AEM Educ Train. 2021;5(4):e10645. https://doi.org/10.1002/aet2.10645

26. Government of Canada. Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans – TCPS 2 [Internet]. Ottawa (ON): Government of Canada; 2018 [modified 2020 Feb 19; cited 2022 Aug 30]. Available from: https://ethics.gc.ca/eng/policy-politique_tcps2-eptc2_2018.html

27. Dhippayom T, Chaiyakunapruk N, Krass I. How diabetes risk assessment tools are implemented in practice: a systematic review. Diabetes Res Clin Pract. 2014;104(3):329-42. https://doi.org/10.1016/j.diabres.2014.01.008

28. Cooney E, O'Riordan D, McSharry J. Pharmacists' perceived role in supporting diabetes education and self-management in Ireland: a qualitative study. HRB Open Res. 2022;4:20. https://doi.org/10.12688/hrbopenres.13192.2

29. Fathima M, Saini B, Foster JM, Armour CL. A mixed methods analysis of community pharmacists' perspectives on delivering COPD screening service to guide future implementation. Res Social Adm Pharm. 2019; 15(6):662-72. https://doi.org/10.1016/j.sapharm.2018.08.007

30. Rondeaux S, Braekman T, Beckwé M, Biset N, Maesschalck J, Duquet N, et al. Diabetes and cardiovascular diseases risk assessment in community pharmacies: an implementation study. Int J Environ Res Public Health. 2022;19(14):8699. https://doi.org/10.3390/ijerph19148699

31. Daly CJ, Quinn B, Mak A, Jacobs DM. Community pharmacists' perceptions of patient care services within an enhanced service network. Pharmacy. 2020;8(3):172. https://doi.org/10.3390/pharmacy8030172

32. Nik J, Lai PS, Ng CJ, Emmerton L. A qualitative study of community pharmacists' opinions on the provision of osteoporosis disease state management services in Malaysia. BMC Health Serv Res. 2016;16(1):448. https://doi.org/10.1186/s12913-016-1686-x

33. Laliberté MC, Perreault S, Damestoy N, Lalonde L. The role of community pharmacists in the prevention and management of osteoporosis and the risk of falls: results of a cross-sectional study and qualitative interviews. Osteoporos Int. 2013;24(6):1803-15. https://doi.org/10.1007/s00198-012-2171-y

34. Jalkanen K, Aarnio E, Lavikainen P, Lindström J, Peltonen M, Laatikainen T, et al. Pharmacy-based screening to detect persons at elevated risk of type 2 diabetes: a cost-utility analysis. BMC Health Serv Res. 2021;21(1):916. https://doi.org/10.1186/s12913-021-06948-6

35. Guirguis LM, Hughes CA, Makowsky MJ, Sadowski CA, Schindel TJ, Yukesel N, et al. Development and validation of a survey instrument to measure factors that influence pharmacist adoption of prescribing in Alberta, Canada. Pharm Pract. 2018;16(1):1068. https://doi.org/10.18549/PharmPract.2018.01.1068

https://doi.org/10.24095/hpcdp.46.4.02

Original qualitative research

Evolving influence of mental health stigma in Ontario public safety organizations: a qualitative study

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Abstract

Introduction: Mental health stigma has been a long-standing issue in public safety professions and can deter public safety personnel (PSP) from accessing mental health support. This is concerning as PSP experience higher rates of post-traumatic stress injuries (PTSI) than the general population. Public safety employers play an important role in stigma reduction. However, there is little research on Ontario public safety employers' perspectives on mental health stigma in their organization and the accompanying organizational challenges they face in addressing stigma and supporting PSPs' mental health.

Methods: A thematic analysis of 28 semi-structured interviews with 33 public safety employer representatives from fire services, paramedics, police, and provincial corrections within Ontario was conducted.

Results: Employer representatives recognized mental health stigma existed historically. They described that stigma is reducing due to sociopolitical changes that restructured PTSI as a common occupational injury. Participants shared ways they are adjusting organizational practices and policies to further reduce stigma and support PSP. They also highlighted accompanying organizational challenges, including ongoing historic stigma, uncertainty in how to support PSP with PTSI, and difficulty finding meaningful accommodations.

Conclusion: Participants perceived mental health stigma to be decreasing in their public safety organizations. However, ongoing stigma, organizational factors and uncertainty around how to support those experiencing PTSI can pose challenges to return-to-work and accommodation. While in various stages of implementing initiatives to support mental health, organizations need to continue to build PTSI awareness, take accountability for their role in reducing mental health stigma, and build trauma-informed practices and policies.

Keywords: *emergency responders, mental health, Ontario, social stigma, workplace*

Highlights

- The presumptive legislation and broader societal shifts in discussing mental health aided in reducing mental health stigma in public safety organizations.
- Employer organizations are in different stages of adjusting organizational practices and policies to further reduce stigma and support PSP.
- Organizational challenges, including ongoing historic stigma, uncertainty in how to support PSP with PTSI, and difficulty finding meaningful accommodations, are barriers to decreasing stigma.
- Organizations need to continue to build PTSI awareness, take accountability for their role in reducing mental health stigma, and build trauma-informed practices and policies.

Introduction

Public safety personnel (PSP) are regularly exposed to potentially psychologically traumatic events in their work that can result in post-traumatic stress injuries (PTSI), such as post-traumatic stress disorder (PTSD), depression and anxiety.[1-4] PSP generally includes any worker trained to protect public safety and security.[5] In this paper, the term PSP includes individuals in firefighting, police, paramedic, and correctional services. A growing body of literature over the past two decades has integrated evidence for work-related exposure to traumatic events to develop prevalence estimates for PTSD among PSP. A survey of 5813 PSP in Canada reported that 44.5% of PSP screened positive for at least one mental disorder. In this sample, roughly 19.5% of municipal and provincial police, 29.1% of correctional workers, 13.5% of firefighters, and 24.5% of paramedics screened positive for PTSD.[6] Another sample of 5267 PSP across Canada reported 22.1% experienced PTSD.[7] For comparison, 8% of the general population

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in Canada experience mild to moderate symptoms of PTSD, with 5% reporting a formal diagnosis.[8]

Public safety organizations face multiple challenges in recognizing and accommodating PTSI among PSP. One challenge is the well-documented influence of stigma. Stigma is a social phenomenon that involves labelling a difference in identities or characteristics as important or relevant, holding negative beliefs or attitudes about this difference (i.e. stereotyping), and linguistically separating people with these differences from those without. There are often pre-existing power imbalances between the stigmatizer and those stigmatized, with the stigmatizer usually having more power due to some aspect of their identity.[9,10] Stigma often leads to people (un) consciously treating others with the stigmatized identity differently, often negatively, which reinforces power imbalances.[9,10] Hence, stigma is an active process of negatively defining and devaluing an identity or characteristic through actions and beliefs.[10] It is multidimensional in that it occurs on an individual, organizational, and societal level.[10] As a process, stigma can emerge, be maintained and can be removed.[10,11]

In the context of public safety organizations, there can be a predominant belief that individuals with mental health challenges are unable to cope with the stresses of their role and pose a safety risk.[12] A meta-analysis of studies that explored PSPs' experience of mental health stigma and related barriers to seeking support reported that roughly a third of PSP experience mental health stigma.[13] Fear of judgment, unequal power dynamics and internalized beliefs of being incapable or flawed can lead to shame.[14] This shame is exacerbated by fears of discrimination (i.e. being treated differently for having PTSI), disbelief (i.e. peers questioning the legitimacy of the PTSI), and loss of identity and professional status.[11,13,15,16] In a survey of 133 police officers in Ontario, over half believed that in general, police officers perceive seeking mental health support as a personal failure and believed most officers would not work with a peer experiencing PTSI.[17] These beliefs, if held by individual PSP, are documented barriers to seeking mental health support.[16,18,19]

Currently, PSP employer organizations use a variety of tools aimed to lower stigma and prevent mental health challenges, including peer support, critical incident stress management programs and psychoeducation on trauma and resilience through programs like Road to Mental Readiness and Before Occupational Stress. While these supports may lower the prevalence of some mental health conditions, these resources minimally change PSP willingness to access supports, such as a community mental health professional or their employee (and family) assistance program, which provides employees and their families with a range of free and confidential resources (such as counselling) offered by a third-party.[20] In one study, 44.4% of police officers reported that they would not seek mental health supports if needed.[17] Stigma-related barriers to seeking support primarily concerned service confidentiality, potential negative impact on their career, and fear of judgment from peers and leadership.[13] Organizational culture is a contributing factor to the use of organizational supports, like the employee assistance program.[21] Public safety employer organizations play an important role in addressing the causes and consequences of stigma related to mental health needs in their organization.[22-24] Organizations may reinforce stigma structurally through practices and policies that disadvantage those with mental health conditions.[12,25] Leadership within organizations may also hold negative beliefs about individuals with PTSI, which can result in discriminating actions and influence the general organizational culture and attitude towards mental health.[12,25]

Ontario context

In 2016, the Ontario Legislature amended legislation to designate PTSD experienced by PSP as an occupational injury. The legislative amendment, applying to the operational policies of the provincial workers' compensation authority, presumes that a diagnosis of PTSD by a psychologist or psychiatrist for an active-duty PSP was caused by workplace exposures.[25] This legislation covers 12 categories of workers, including police officers, paramedics, and workers in correctional institutions. One consequence of the presumptive legislation was a dramatic increase in the incidence of accepted workers' compensation claims for PTSD diagnoses among the 70 000 PSP in Ontario, from fewer than 100 per year prior to 2016 to an average of 700 to 800 annual claims following the presumptive designation.[21] In the case of work-related illness or injury compensated by the provincial workers' compensation authority, employers have a legislated duty to accommodate workers with disabilities and provide meaningful opportunities to return to employment. In parallel with the legislative amendments, public safety organizations were required to provide the Ontario Ministry of Labour, Immigration, Training and Skills Development with a PTSD prevention plan that outlined what measures they were going to take to prevent the development of PTSD and support PSPs' mental health.[25]

Public safety employers in Ontario also have the duty to accommodate members recovering from PTSI. If a PSP's claim for a mental stress injury is approved, the Workplace Safety and Insurance Board (WSIB) supports the PSP while they are out of work and acts as a liaison between the employer, PSP, and the health care practitioner(s). PSP who experience PTSI tend to have longer claim durations and more difficulty returning to work for many reasons. Workers often struggle with a lack of communication from WSIB, financial ambiguity, and difficulty navigating the claim process.[26] PSP can be reluctant to return-to-work (RTW) given their knowledge of the work demands and environment, which can activate trauma responses.[27] Organizational factors such as staffing shortages, leadership's lack of knowledge on PTSI, and lack of organizational support can leave PSP feeling unsupported by their employer, result in poorer mental health, and be a barrier to RTW.[28,29] Stigma may also negatively impact the RTW journey of PSP who experienced PTSI.[30] Despite the large influence public safety organizations have on PSP, little is known about employers' perspectives on mental health stigma within their organizations.

This paper describes the perspectives of representatives of public safety employers in Ontario concerning the historical influence of stigma, and the contemporary challenges arising from employer obligations to provide employment accommodations for PSP recovering from mental health injury attributed to PTSI. The study uses reflexive thematic analysis to explore how public safety employer representatives understand the historic and contemporary influence of mental health stigma within their organization.

Methods

The findings come from data collected as part of a larger qualitative study that examined employer perspectives on RTW for PSP who experience PTSI. These findings are reflective of the rich discussions of mental health stigma that arose during these interviews. The broader study was reviewed and approved by the University of Toronto REB (RIS #3770).

Recruitment

Employer participants were recruited through informal and formal referrals. For formal referrals, the senior representative with decision-making authority agreed to the participation of their organization; they were asked to nominate one or more members of the organization's human resource or disability management staff as candidates to participate in the study. Informal referrals involved asking contacts known to the research team to circulate study information, identifying and contacting potential participants via their organization's webpage or LinkedIn account, and a snowball sampling approach. Potential participants recruited from formal and informal referrals were told that participation is voluntary and confidential.

Participants

Individuals who were employed by public safety organizations in Ontario, including police, correctional, paramedic, and fire services, were interviewed. Eligible participants had to have knowledge and experience with disability management and accommodation policies and practices, specifically relating to PTSI. Federally administered services were excluded.

Twenty-eight semi-structured interviews were conducted between July 2023 and January 2024 with 33 representatives (27 female, 6 male) from 28 public safety organizations spanning 16 municipalities, with five organizations servicing all of Ontario (Table 1). Public safety employer organizations included individual correctional institutions, and police, fire, and paramedic services that supported specific geographical areas. Participants were in various organizational departments including human resources, disability management and wellness, and leadership. Interviews were done either one-on-one with the interviewer or with pairs of participants, at the participants' request.

TABLE 1
Number of participants per sector

	Fire	Paramedic	Police	Corrections	Total
Employer organizations	4	9	11	4	28
Individual employer representatives	5[a]	10[b]	14	4	33

[a] Two participants were involved in the return-to-work process for fire and paramedic.

[b] One participant was involved in the return-to-work process for paramedic and police.

Purposive sampling was used to obtain a similar ratio of police, fire, corrections, and paramedic employers proportionate to their psychological injury claims reported to WSIB between 2018 and 2020. However, difficulty in recruiting eligible fire and corrections services led to less recruitment in these professions.

Most municipality-specific organizations were located Southern Ontario, with a minority in Northern Ontario. Municipalities sampled covered large, medium and small communities ranging from populations of over 1 million people to under 100 000 people. Nine organizations had over 1000 employees, five had between 500 to 1000 employees, and 14 organizations had under 500 employees.

Interviews lasted 45 to 65 minutes (mean = 53.39, SD = 4.90) over Zoom (Version 5.13.5, Zoom Communications, Inc., San Jose, CA, USA) or phone and were recorded via a handheld recorder or through the Zoom platform. Verbal consent for participation and recordings was obtained at the beginning of interviews. Recordings were transcribed by a professional transcription service. LV de-identified and reviewed all interview transcripts for accuracy prior to analysis. The first two interviews were conducted by BY and LV to assess quality and flow of interview questions. The interview guide was adjusted accordingly. The remaining interviews were conducted by LV. BY, the co-principal investigator in this study, is a qualitative researcher with expertise in organizational behaviour and human resource management. LV, the research associate in the study, has qualitative research experience with a background in social anthropology and mental health treatment.

Analysis

Reflexive thematic analysis was used to engage in a rich and detailed analysis of the data by using the subjective knowledge and experience of the research team to co-create meaning within the data.[31] Data were analyzed concurrently with interviews, which helped identify gaps in knowledge, inform subsequent interview questions, and identify themes early on. The research team stopped conducting interviews when there were enough data to address the research question.[32]

LV and BY familiarized themselves with the data and met regularly to discuss interpretations of the data, which resulted in them inductively creating codes to label key reflections.[33] The first few interviews were coded individually in NVivo10 for Windows (QSR International Pty Ltd. 1999–2014, Burlington, MA, USA) by LV and BY to help with data familiarization and interpretation. Afterwards, LV and BY discussed their interpretations and co-created codes that were applied to all transcripts. LV did the initial interview coding and highlighted her additional or changing interpretations. BY reviewed the coding and reflections and included her own thoughts. These curiosities were discussed in team meetings, and codes were adjusted accordingly to highlight these new meanings. Codes were synthesized to create larger descriptive patterns of meaning in the data shared by the research team (i.e. themes). Themes were continuously refined throughout analysis until they were succinct and distinct from each other. CM participated in co-creating meaning by providing his interpretations on the broader themes. Coding and theme creation occurred between November 2023 and May 2024.

Weekly team meetings were held between all team members throughout the study, which allowed for ongoing discussions about recruitment, methods, and interpretations. Reflexivity was maintained throughout by discussing in team meetings their curiosities as situated in their interests and the connections they were making between their area of expertise

and the data.[34] They also engaged in reflexivity by reflecting on and discussing the underlying assumptions they were drawing from when analyzing data, how these assumptions influenced the analysis and how the interpretations would impact PSP, WSIB, and employer organizations. This was particularly helpful for moments when participants shared strong opinions that had the potential to overshadow the nuances of the situation described by other participants. Furthermore, BY and LV's academic backgrounds and interests helped attune them to the nuances in participants' conversations about stigma in their workplace and profession and situate it within a larger cultural and political context. An audit trail also supported reflexivity by tracking team members' questions, evolving interpretations of the data, and changes to the research process. A summary of the research findings from the broader component this study was based on was provided to select participants from all PSP professions for feedback to further enrich the data by involving them in the research process and data interpretation. The Standards for Reporting Qualitative Research were used to guide the reporting of this study.[35]

Results

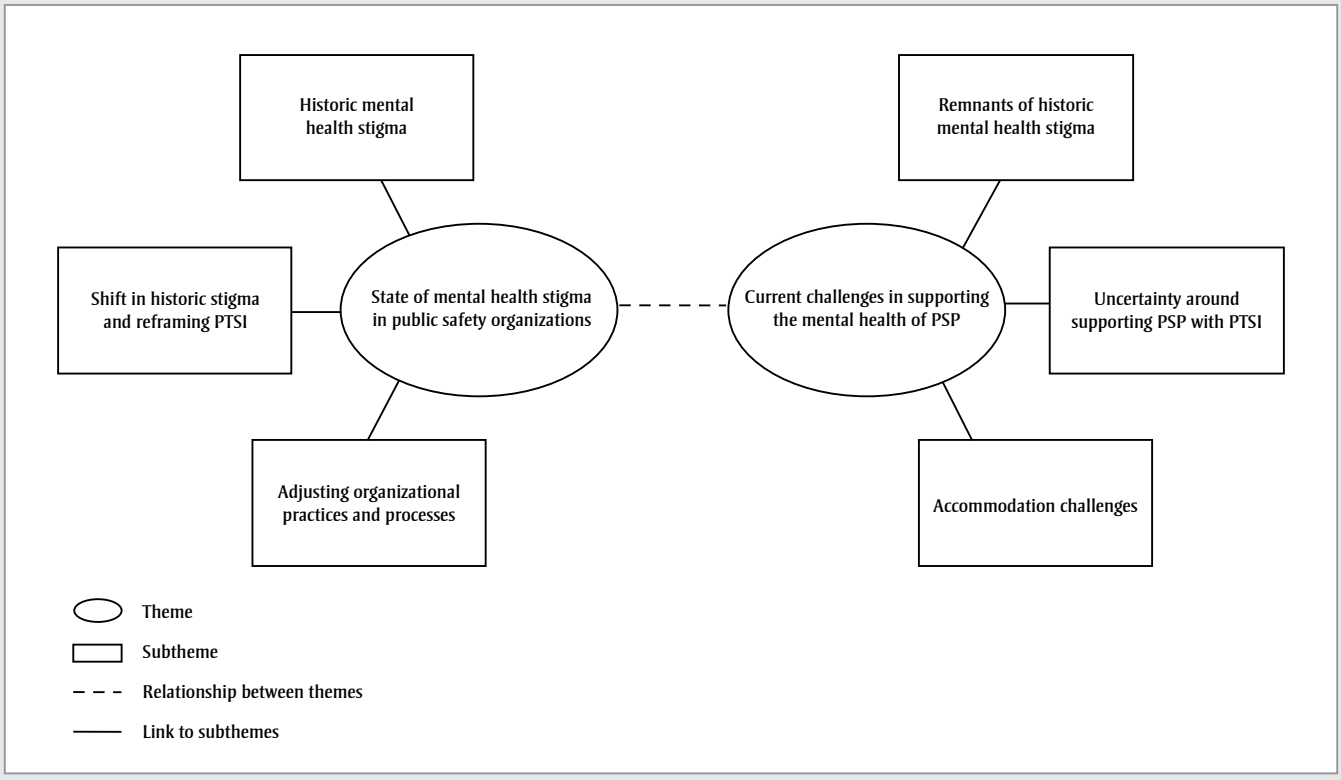
Participants explained that historic mental health stigma, which positioned PTSI as an inherent shortcoming and a sign that a PSP is unfit for the role, is slowly diminishing throughout public safety organizations. They attributed this shift to broader societal changes that embrace mental health and legislative reforms that defined PTSI as an occupational injury and require employers to provide employment accommodations. This reframing encouraged public safety organizations to re-evaluate their practices and create and strengthen mental health initiatives and supports to reduce mental health stigma and improve the prevention of PTSI. Participants also discussed challenges related to supporting the mental health of PSP, which may impact the effectiveness of the efforts to reduce stigma (Figure 1). These challenges will be addressed in the next sections.

The state of mental health stigma in public safety organizations

Historic mental health stigma

Employer representatives explained that historically there were substantial stigmatizing beliefs in their organization surrounding mental health. PSP were expected to remain in control of their emotions during highly stressful events and not express vulnerable feelings, such as fear and sadness. There was a belief that "Yeah, this is your job, this is what you signed up for." (paramedic, interview 19) PSP who expressed struggling with their mental health were morally stigmatized as it was assumed that they were inherently emotionally weak and were not capable of being in the profession. There was also the all-or-nothing assumption that PSP are either fully capable of doing their job or completely incapable. A corrections employer representative shared how when they were discussing exposure therapy, there was a lot of resistance from supervisors due to their lack of knowledge in this approach and their belief that "you either come back to work, or you don't" (interview 29). These negative attitudes

FIGURE 1
Thematic map with themes, subthemes and relationships between themes



Abbreviations: PSP, public safety personnel; PTSI, post-traumatic stress injuries.

concerning mental health also fed into PSPs' concern of discrimination by their employer. Specifically, participants described that PSP feared that their career would be jeopardized as they may not be considered for promotions or may be forced to stop practising in their current professional capacity. A police employer representative highlighted, "I remember officers sitting in my office afraid to speak up because they think their gun will be taken away" (interview 33). Another police employer explained that concerns of being stigmatized were "reinforced by experiences," which influenced "why people choose to do things in a certain way" (interview 6).

PSP often found it difficult to accept the impact of the job on their mental health as they were often fearful of stigma and discrimination or felt ashamed of their condition. A paramedic employer representative explained, "Nobody would admit a mental health injury before. They'd go off on anything except mental health. A back injury, or a shoulder strain, or whatever" (interview 21). Difficulty accepting their mental health challenges and needs also deterred PSP from seeking support from mental health professionals, as another paramedic employer shared:

> It was very much the suck it up attitude and move on, and nobody talked about going and talking to a psychologist. Like, what was a psychologist. That was never a conversation. (interview 22)

Participants shared that denying feelings that arose from the job often led to increasing mental distress or using harmful methods to manage the emotions themselves, which could involve numbing practices such as substance use. A police employer described how drinking was encouraged in their policing culture as a coping mechanism:

> When [police officers] went to Police College, they were taught if you had a bad day, you had a stressful day, you take your guys out, you go to the bar, and you get drunk. You get up the next morning and you just deal with it. (interview 11)

Alternatively, a few participants described approaches to avoid stigma by seeking support from trusted colleagues and informally debriefing with them after a potentially traumatic event.

Shift in historic stigma and reframing PTSI

While participants recognized historic stigma continues to exist, they also recognized that it is diminishing in their organization. They attributed this change to two main factors—broader social shifts in understanding mental health and the introduction of legislative reforms in 2016. These social and policy shifts helped to normalize discussions of mental health and reframed PTSI as an occupational injury, which encouraged organizations to bolster preventative mental health supports for their members and improve accommodation and RTW practices.

Employer representatives discussed how the public's relationship with mental health changed over the years. They noted that society is more open to discussing mental health, which is evident from content shown in mainstream media. A paramedic representative described the shift towards mental health awareness in the media: "Twenty years ago, you wouldn't have seen the ads that you see now talking about mental health and the programs, and if you are feeling overwhelmed, you need to talk about it" (interview 7). Participants suggested that society's focus on mental health helps reduce stigma among PSP, specifically among the more recent generation of PSP who have been more exposed to messages normalizing mental health. Participants shared that this generational shift is evident in how newer PSP tend to be more vocal about their mental health status and needs and take a more active role in advocating for their mental health. A police representative observed how media has changed generational beliefs:

> There is more social media and campaigns publicly on the whole mental health aspect, you can definitely see it in the younger recruits. They're more willing to come forward and more willing to talk about themselves and just advocate for themselves and for more wellness supports. So, that's the shift where the older generation may not necessarily be there, but definitely all our new recruits coming in are just more knowledgeable and more in tune as to what they're willing or wanting to do. (interview 3)

Given this normalization of mental health on a societal level, some participants described that the newer generation of PSP tend to be more self-aware of their emotional state and engaged with mental health supports. Some participants described that the influx of PSP who do not hold mental health stigma is changing the broader organizational and professional culture as older PSP who hold stigma are retiring. As one police employer representative described, "there is a bit of an old guard that is passing through our service." (interview 6)

However, this openness to discussing mental health challenges and seeking help is generally spreading across different generations of PSP across all services. A corrections representative noticed PSP are more "transparent" about mental health challenges and "are speaking up about [having a] mental illness and [how] they've been handling it" (interview 16). In addition to discussing the resources PSP use to manage PTSI, PSP can also be eager to make use of professional supports available. At a fire services employer organization, a staff psychologist who initially worked with peer supporters expanded their services to the whole organization after receiving an overwhelming interest from PSP. Now, over three quarters of the organization see the psychologist. Similarly, a police employer recalled a moment where a PSP openly acknowledged accessing the employee assistance program during a training session and praised those services, which the participant noted would not have been discussed before.

Additionally, presumptive legislation and the requirement to create a prevention plan actively placed responsibility for PSP wellness onto the public safety organization and encouraged the leaders, managers and coordinators of the organization to reflect and act on how to adequately support their employees' mental health. This refocusing was highlighted by a fire services employer representative who acknowledged that the presumptive legislation "definitely put the focus on mental health in the workplace. It made us focus on 'we've got to ensure that everything we do is to prevent these claims from even happening', so a lot of prevention" (interview 1). Since the presumptive legislation, participants have also noted an increase in PTSI claims, and more PSP reporting and documenting stressful events with their employer. For some, the increase in claims resulted in creating or expanding abilities management teams who support claims and RTW. For one police employer,

the increase in claims resulted in contracting a third-party disability management service provider until they could expand their internal team.

The shifts in understanding mental health and the legislative change were reflected in participants' discussion of PTSI. Whereas historic stigma represented PTSI as a personal failing, participants explicitly spoke of PTSI as an occupational hazard. This shift in language was evident to one paramedic employer:

> I don't think it would have been strange even 10 years ago to say, [a PSP] has gone off sick, he's loopy, or crazy, or anything like that. There might still be that stigma, but I think at least the language has started to change. They're off with a mental health injury, or a stress injury, or something like that, or even PTSD or whatever. I think people are more inclined to at least use the vernacular that we've become accustomed to. And I think if you [ask] when did we probably start seeing that change, I think it was probably shortly after the presumptive legislation for PTSD came into play for paramedics. (interview 21)

This reconstruction of PTSI as an unavoidable consequence of work exposures also came through subtle nuances in the way employer representatives described mental health in the public safety profession. They defined PTSI as a complex injury whose impact fluctuates over time and can present differently in each person, which requires organizational initiatives that focus on supporting PSP who experience PTSI:

> [PTSI is] not the same thing as you break a wrist, I break a wrist, and we're suffering the same thing. It is not the same as a mental health thing. If you're suffering from PTSI and I'm suffering from PTSI, we're such unique individuals in our brains. Something that might trigger me won't trigger you, as an example. This leads to why we need to invest more resources in supporting those employees because you just don't know what you're going to get. (paramedic employer, interview 17)

Adjusting organizational practices and processes

Participants described that the broader social shifts and the presumptive legislation encouraged public safety organizations to create and strengthen mental health initiatives and supports to reduce mental health stigma and improve PTSI prevention. Given PTSI was positioned as a common occupational injury, organizations needed to educate PSP, supervisors, and leadership on PTSI and mental health in their organization. There was also a need for more proactive supports that prevented the onset and development of PTSI. Hence, organizational practices and processes needed to change to suit the new understanding of PTSI.

The supports described by participants involved training for PSP and supervisors to create a baseline understanding of mental health and build awareness of PTSI symptoms in themselves and others. Participants listed using online training courses, such as Road to Mental Readiness and Before Operational Stress, and a few noted contracting a local mental health professional to provide training. Some supervisors were given specialized training primarily by internal wellness or claims management teams on how to support PSP with PTSI, understanding cognitive limitations and restrictions, their duty to accommodate, and how to identify appropriate accommodations. A police employer described a yearly discussion they have with leadership:

> [On the education day] every year, and we have had time with every single one of them that has come through to talk about abilities management, return to work, our role, their role. So, sometimes it is a 10-minute conversation, there are no questions. We're like, okay, well, you got the information, you know who we are. And other times I have had these wonderful hour, hour-and-a-half long conversations with people about how we can do better, and their pain points. So, just really rich ideas, and open, honest conversations about, why do we do it like this, and we need to do this, and why don't we do that? (interview 32)

Some employer representatives described the role of leadership in normalizing mental health discussions in their organizations. A few shared ways that their leadership team is challenging stigma through creating an organizational strategic mission to support PSPs' wellness and implementing more organizational mental health supports. A police employer representative shared how leadership's verbal encouragement of accessing mental health supports helped lower stigma:

> Our command staff, they very much have the attitude of no, I want you to be accessing these supports. It's not a sign of weakness, it's a sign of strength so it's that we're trying to shift the culture from the top down, but as you know, sometimes it's not as quick, but I think we're getting there. It will take a lot of time to undo the years of that behaviour, right? (interview 11)

Other initiatives included having an onsite psychologist, implementing peer support teams, critical event debriefs, and establishing wellness teams with individuals specializing in mental health and disability management. A few participants described having committees where employer representatives and union representatives meet to discuss how to support PSP mental health. Participants who had these committees in their organizations shared that they were useful for sharing knowledge about PSPs' experience and keeping each other accountable:

> We do have a program in place [for] whenever there's an accommodation that needs to be implemented. So, the union has buy-in, the manager, the union member, the employer and another [program] representative which is usually another union member, sit together collaboratively and they figure out what accommodations are going to work best. I think the union is very helpful when it comes to that aspect, only because by nature if management might suggest something, there may be some pushback, but if the employee sees the union and management are in agreement with the accommodation plan, then there's not as much resistance to it. (corrections employer, interview 37)

While public safety organizations have taken steps to strengthen their policies and practices to align with the understanding of PTSI as an occupational injury, participants also discussed challenges related to supporting the mental health of PSP. These challenges may impact the effectiveness of their efforts to reduce stigma.

Current challenges in supporting the mental health of PSP

Remnants of historic mental health stigma

Employer representatives acknowledged that the experiences that arose from historic stigma continue to shape organizations' relationship with PSP. While the staff, beliefs, and structure of the organization may have changed to one that is more supportive of mental health, many PSP struggle to trust in this change:

> Even though we are different people, and our approach may be different than in the past, if somebody had a terrible experience in the past and has a bad taste in their mouth from 15 or 20 years ago, we have to overcome that first, and then deal with the issue of the day. So, some of the resistance or challenge we get might not actually be about us, it's about what happened a decade or more ago. (police employer, interview 32)

For some, this mistrust was warranted as there continues to be suspicion towards PSP experiencing PTSI, wondering if the person is being dishonest about their injury to receive paid time off. A police employer described how this suspicion can be born from inaccurate beliefs of what a mental health occupational injury looks like:

> So, I think what we need to recognize in policing is that it's a suspicious group who are trained investigators, so they fill in the blanks. And I think sometimes that can be to our detriment from a cultural perspective in terms of oh well, I saw this person in the gym, or I saw them on Instagram, and I don't know why they're not here because they look really good and they're travelling or doing whatever. The rumour mill is brutal. (interview 32)

Employer representatives described that having management educated on mental health and on board with mental health advocacy is critical to fostering a supportive workplace culture and challenging stigma, which helps (re)build trust with employees. Participants shared their efforts in educating and offering guidance to management on PTSI claims, and mental health awareness and advocacy:

> So, we're trying to provide more mental health training. The psychologist I said we work with; we're arranging for her to come back. She was in a couple of years ago, but [this time] she's going to have sessions with everybody to talk about stigma, recognizing signs and symptoms, and just different things, and also, specific training for supervisors on how to handle when someone has had a traumatic call, but also, how to handle the people that are left afterwards. Explaining to them where this [affected] person is, or if they are saying things they shouldn't say, so how to just handle that in the workplace. Hopefully, that will help. (police and paramedic employer, interview 16)

Uncertainty around supporting PSP with PTSI

Participants shared that while there was more acceptance and acknowledgement of mental challenges within their organizations, supervisors and colleagues who were adapting to the changing understanding of PTSI as a complex and individualized injury expressed uncertainty with how to communicate and support these workers. Most colleagues and supervisors generally accepted the legitimacy of PTSI, however, they were "afraid to talk to [PSP experiencing PTSI] because [the colleague] might set them off" (police employer, interview 28). As described by a paramedic and fire employer, this can leave supervisors and colleagues hyper-focused on the condition and how their interactions with the PSP can impact the person:

> Everyone is so scared of this topic [of PTSI]. They're scared of certain things they say. Everything is toned down and everything is monotone. Let's just say you and I are dealing with someone and you are the WSIB rep, and we're having this conversation with an employee. We end the meeting and you're a little harsh. And the employee ends up doing something to themselves, inflicting harm on themselves. Now there's that sense of ownership that I caused [the harm]. That's what I mean by scared because we don't see [the PTSI], we don't feel it, we don't know hardly anything about it, because that's owned within somebody's system. I think it's just people are afraid and they don't really understand it. (interview 8)

For some, there was a shift from believing PTSI is an inherent sign of one's weakness to a belief that mental health is influenced by many factors, such as what is said to them, and those struggling with their mental health are extra sensitive to these factors. This shift in stigma can have similar impacts to historic stigma as it isolates the PSP by othering them. It frames PTSI as central to the PSP's identity, forgetting the other aspects that make them a PSP and an individual, thereby reducing the PSP's personhood to their experience of PTSI.

Organizational uncertainty in understanding PSPs' needs and possible accommodation placements also made it difficult for organizations to create policies and procedures that provided guidance on how to relate with PSP who experience PTSI. For some supervisors, this uncertainty came from vague limitations and restrictions from WSIB and health care providers, which created challenges around supporting the RTW and accommodation of the PSP:

> Sometimes we get a lot of, can't be exposed to traumatic content. So, I need that fleshed out a little bit. What does that mean? Does that mean traumatic content in the context of an investigation? Does that mean traumatic content on TV, because we have [the news] on in this building all the time? So, I think really fleshing out what our jobs require and what people require is where we need to start, and then we can start matching. But, like I said, that information right now isn't there. (police employer, interview 2)

Employer organizations shared that PSP experiencing PTSI are often restricted from cues and duties that are critical to their pre-injury position. These cues can be present in the physical facility, making it difficult to accommodate. Employers expressed the importance of PSP having multiple avenues to access supports that can address their various needs. Participants described various initiatives to bolster PSP support systems, such as having peer support as part of the standard RTW process. Participants also mentioned that building trust between the employer organization and the PSP helps facilitate a successful return as PSP are more transparent about their needs as they move through the RTW plan. This transparency gives employer organizations the opportunity to step in and work with PSP to have their needs met.

Participants also discussed gradual RTW processes that worked closely with PSP to tailor the plan to their needs. For some, PSP were offered the opportunity to do exposure therapy in the workplace and have a

dedicated support person throughout the RTW journey. RTW plans were evaluated regularly with the PSP to ensure the appropriateness of pace, work, and support.

Accommodation challenges

Employer organizations recognized that PSP value and pride themselves on their professional identity. For many PSP, their job is an important aspect of their identity and lifestyle. They explained that if PSP are accommodated in roles where the key functions of their identity are not included, they may not feel that the work is meaningful. Given the importance of their professional identity, returning to work with accommodations may be seen "as a downgrade" (fire employer, interview 1).

> I think the thing that is probably the most impactful is the self-stigma. There's that self-perception, and sort of self-degradation of, I'm not the person I used to be, other people are going to think that as well. That reduces my value to the service, it reduces my credibility as a member of the service, I'm going to be seen as not capable of doing what I ought to be doing, having failed the service, having failed the public. (police employer, interview 6)

Furthermore, employer representatives shared that the severity of PSPs' restrictions and limitations and the specialization of their work can make it hard to pair PSP with meaningful work. This was especially true for smaller organizations with limited resources and job openings, and corrections and paramedic services where there is less diversity of roles available that do not involve exposure to potentially traumatic events or their functional restrictions. A paramedic employer described their limited roles available within their service:

> Each base has a base manager, an assistant, and then the only other people at that base are the frontline staff. It's not like I have a book that I can go, okay, yes, you have these restrictions, you can do this, this, this and this, because we don't have that availability. (interview 14)

Difficulty in accommodating PSP can lead to many individuals being accommodated in a specific role or department, which can be seen as a career-limiting move. For some, suitable accommodations are roles held by senior officers, which can create friction as described by a corrections representative:

> [When a correctional officer] can't work their post, well, you pull them out of that post and then [the accommodated person is] taking a position from a senior officer. Seniority is very, very important. Your seniority gives you your post picks, and a lot of times post picks, it's the preferential schedule, those types of things, and that's what you earn with your seniority. However, a lot of those posts are good accommodation posts as well. So, that's where some of that frustration is. (interview 29)

Compounding accommodation challenges is the stigma supervisors may hold around accommodated work, which can make it difficult for PSP to RTW and reintegrate into the employer organization. Supervisors who stigmatize accommodations may believe that the PSP is not fit to return, drawing from the all-or-nothing assumption mentioned earlier. This can limit supervisors' participation in accommodating PSP as they may be reluctant to accept an accommodated worker:

> I think even sometimes internally the challenge is getting supervisors onboard to have accommodated members within their units. I think there is a lot of stigma out there for it, so just kind of breaking those barriers, right, that even though they have these restrictions, she'll be able to do this, this, and this, and this, which will help ease the workload of the other members and then they can do. So, I think it's just sometimes showing them a different perspective of it. (police employer, interview 33)

As this participant shared, educating supervisors on identifying appropriate accommodations that utilize the PSPs' skills helps challenge accommodation stigma. Other supervisory education described by participants included the duty to accommodate and understanding cognitive restrictions and limitations. A participant went on to explain that "[The] whole education piece is sometimes helpful so [supervisors] understand the importance to the member and also to the service in terms of the responsibilities that we have to look at modified work" (interview 33).

Generally, participants described the importance of being creative in identifying accommodations that consider the organizational needs and the skills and limitations of the PSP. This creativity took different forms, including finding accommodations that align with the PSPs' hobbies, previous education or work experience, and breaking down positions into tasks that are bundled as an accommodation. For many public safety employers who were administratively integrated into their municipality, creativity involved finding positions in different departments of the city.

> We have different aspects of modified work that doesn't involve you needing to do any paramedicine. [PSP] are most successful when we're looking outside of paramedicine completely. And being [part of the municipality], we have [many divisions]. It's proving to be better where they're completely removed out of paramedicine and into a different role while they're recovering. (paramedic employer, interview 35)

A couple of participants mentioned the benefit of framing work as a part of the treatment process to fuel PSPs' encouragement to RTW. While a few participants explicitly named this, many members acknowledged the "better at work" principle[36] and regularly stated that the longer someone is off work, the harder it is for them to return. This reframing placed importance on gradually exposing PSP to the workforce and building their confidence in returning.

> We need to understand the times where [PSP are] able to do something and we can work with them to do a search and see if there's something temporary available for them, just to maybe test the waters for them as part of their treatment. We need to understand what their functional abilities are, their limitations, so that we can put things in place for them and support their return to work. (fire employer, interview 1)

Discussion

PSP in fire, police, paramedicine, and correctional service occupations have high exposure to potentially psychologically traumatic events in their work that can lead to PTSI. A large barrier to seeking treatment and RTW is stigma, which is the negative perceptions of specific characteristics that can lead to the person

being treated unjustly. In this paper, we described the perspectives of public safety employer representatives on the historical influence of stigma, and the current challenges tied to employer obligations to accommodate PSP who experienced PTSI.

Generally, employer representatives recognized that mental health stigma is decreasing among PSP as PTSI is becoming more accepted as a common occupational injury. This change was primarily attributed to broader societal changes that supported the recognition of the importance of mental health and legislative reforms that defined PTSI among PSP as an occupational injury. Arising from the legislative reforms, participants recognized the obligation on employers to accommodate PSP recovering from PTSI and spoke positively of organizational initiatives to strengthen PTSI prevention efforts and decrease the influence of mental health stigma. This reframing encouraged public safety organizations to innovate in creating and strengthening mental health initiatives and supports to reduce mental health stigma and improve prevention of PTSI.

Participants also spoke of challenges related to supporting the mental health of PSP. There was broad acknowledgement that the remnants of historic stigma are present in organizations. Additionally, however, representatives spoke of challenges arising from uncertainty about how organizations can best support the recovery and accommodation of PSP disabled by PTSI. Some organizations have limited options for suitable accommodations, and representatives noted PSP and supervisors may hold stigma towards accommodated employment.

Organizations in our study were at different stages of developing shared knowledge, awareness, and values around mental health and creating a shared vision for their organization's future that prioritizes PSP mental health among peers, staff, and leadership. Building common knowledge, values and vision has the potential to reduce stigma within PSP, between peers, and among leadership.[30] This requires shifting the organization's fundamental approach to mental health. One approach is creating a trauma-informed workplace, which is effective in building trust and reducing stigma.[37] Being trauma-informed means recognizing that most people have experienced or will experience some form of trauma in one or more aspects of their life that change the way they perceive and interact with the world. It acknowledges the broader circumstances that influence someone's behaviour and looks to understand what happened to the person rather than what is "wrong" with the person, being sensitive to the fact people are impacted differently by traumatic exposures.[37,38] Trauma-informed practices aim to prevent traumatic instances, build resilience to adversities, and support those healing from trauma.[38] Trauma-informed workplaces value and develop organizationally integrated practices that enhance psychological safety, transparency, empowerment, collaboration, and demonstrate a commitment to creating an inclusive and equitable environment. Psychological safety is an employee's comfort in expressing their struggles at work (including mental health challenges), making mistakes, and disagreeing with colleagues or leadership.[37] Generally, employers can openly acknowledge stigma in the organization and actively collaborate with staff through ongoing discussions and feedback to create initiatives unique to their organizational context that support mental health and create a culture of safety.[23,39,40] While the general principles of being trauma-informed can help ease stigma and improve mental health, these practices need to be tailored to suit the unique culture and context of the organization. For example, organizations can create a common understanding of mental health through providing tailored and ongoing mental health training in the context of the public safety profession to all levels of the organization.[41] Evidence supports that tailored training can help PSP recognize signs of PTSI within themselves[42,43] and lower stigma towards others.[44] Furthermore, integrating a variety of mental health supports within the organization, such as an in-house psychologist, peer support, or a list of mental health professionals in the community who are versed in the profession, can help lower stigma through improving access to supports, acknowledging the connection between work and PTSI, and empowering PSP to choose a support best suited for them.[45] This aligned with many of the practices and supports shared by participants. Additionally, organizations can lower stigma and support mental health through consistent supervisor support via non-judgmental check-ins, and regular recognition and praise for the work of PSP.[38] Furthermore, organizations can build a trauma-informed workplace by hiring additional staff to allow for better work/life balance, thereby diminishing the guilt and fear of having their mental health and integrity questioned by taking time off work or not working overtime.[46] It is important for organizations to recognize that creating a trauma-informed workplace is an ongoing process that requires a continuous commitment to tailor and adapt practices to ensure employees are empowered and safe.[38]

Tracking the effectiveness of initiatives and formalizing successful initiatives into policy makes sure that trauma-informed values and understandings of mental health are sown into the fabric of the organization, which can inform future practices and policies.[23,40] At an industry level, broader initiatives that target resources, relationships, and legislation can help with longer term destigmatization efforts.[24] For example, Szymanski and Hall [47] noted the potential value of mechanisms to audit public safety organizations' PTSD prevention plans that they were required to create during the presumptive legislation. This could help address stigma on the industry level by holding organizations accountable to their mental health supports.

The findings of this study reinforce observations from previous research documenting the distinct features of stigma surrounding mental health disorders among PSP.[48] This literature, based on studies across the range of public safety sectors (fire, police, paramedics, and corrections), consistently finds that PSP perceive colleagues and their organizations to hold negative attitudes and beliefs about occupational fitness among PSP with PTSI-related mental health conditions and that these perceptions can be a barrier to individual PSP seeking care. As a complement to this previous research, our study focused on perspectives of employer representatives with occupational roles in delivering disability management services in their organizations. This different vantage point reinforces observations from previous research while providing fresh perspectives on organizational strategies to mitigate or diminish the influence of mental health stigma. Participants in this study were also able to offer perspectives on the extent to which mental health stigma has changed over time within their organizations. Monitoring changing perceptions of mental health stigma among PSP is an important research opportunity for the future.

Strengths and limitations

A strength of this study is that the participants were from various public safety professions, which offered a broader perspective of stigma within the public safety field. Additionally, the unique position of participants as employer representatives who oversaw organizational PSP claims and wellness provided unique insights into the mental health stigma among PSP and organizational practices. These roles gave participants knowledge in the challenges, current practices, and aspirations of the organization relating to mental health support.

This study has several limitations. As noted earlier, participants attributed some shifts in mental health stigma to the presumptive legislation in Ontario given that it legally legitimized occupational PTSD and held organizations accountable to PTSI prevention. Not all provinces and territories within Canada have a similar legislation, which may influence mental health stigma within public safety organizations in these areas. Hence, the transferability of these findings may be limited. Furthermore, this study focused on employer representatives' understandings of stigma within their organization. This research did not explore mental health stigma within other stakeholders, such as PSP, supervisors, and WSIB. Understanding how stigma exists within these stakeholders can offer a more fulsome picture of how stigma is actively being maintained and challenged, and how it is transferring between stakeholders. Lastly, the data from this study emerged from research that primarily focused on employer's perspectives of the RTW process for PSP who experience PTSI. Future lines of inquiry could also explore employer representatives' relationship with mental health stigma, specifically asking how employer representatives understand their role in challenging stigma, and how they are trying to challenge stigma within themselves. It could also be useful to explore employer representatives' reflections of the influence of various policies, practices and procedures on mental health stigma in their workplace.

Conclusion

Generally, public safety employer representatives in Ontario shared that mental health stigma is decreasing in their organizations due to shifting understandings of PTSI as a common occupational injury. This change was in part due to the presumptive legislation and broader societal shifts. Despite this, organizational challenges can pose barriers for further stigma reduction. Employer organizations are in different stages of adjusting organizational practices and policies to further reduce stigma and support PSP. The current study provides unique perspectives on organizational strategies to decrease the influence of mental health stigma.

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Conflicts of interest

There are no conflicts of interest.

Authors' contributions and statement

LV: Data curation, formal analysis, investigation, methodology, project administration, resources, validation, visualization, writing—original draft.

CM: Conceptualization, funding acquisition, methodology, supervision, writing—review and editing.

BY: Conceptualization, data curation, formal analysis, funding acquisition, methodology, project administration, supervision, validation, writing—review and editing.

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References

1. Andrews KL, Jamshidi L, Nisbet J, Brunet A, Afifi TO, Asmundson GJG, et al. Potentially psychologically traumatic event exposure histories of new Royal Canadian Mounted Police cadets. Can J Psychiatry. 2023;68(9):663-81. https://doi.org/10.1177/07067437221149467

2. Carleton RN, Afifi TO, Taillieu T, Turner S, Krakauer R, Anderson GS, et al. Exposures to potentially traumatic events among public safety personnel in Canada. Can J Behav Sci. 2019;51(1):37-52. https://doi.org/10.1037/cbs0000115

3. Carleton RN, Afifi TO, Taillieu T, Turner S, Mason JE, Ricciardelli R, et al. Assessing the relative impact of diverse stressors among public safety personnel. Int J Environ Res Public Health. 2020;17(4):1234. https://doi.org/10.3390/ijerph17041234

4. Konyk K, Ricciardelli R, Taillieu T, Afifi TO, Groll D, Carleton RN. Assessing relative stressors and mental disorders among Canadian provincial correctional workers. Int J Environ Res Public Health. 2021;18(19):10018. https://doi.org/10.3390/ijerph181910018

5. Heber A, Testa V, Groll D, Ritchie K, Tam-Seto L, Mulligan A, et al. Glossary of terms: a shared understanding of the common terms used to describe psychological trauma, version 3.0. Health Promot Chronic Dis Prev Can. 2023;43(10/11):S1-45. https://doi.org/10.24095/hpcdp.43.10/11.09

6. Carleton RN, Afifi TO, Turner S, Taillieu T, Duranceau S, LeBouthillier DM, et al. Mental disorder symptoms among public safety personnel in Canada. Can J Psychiatry. 2018;63(1):54-64. https://doi.org/10.1177/0706743717723825

7. Sommer JL, El-Gabalawy R, Taillieu T, Afifi TO, Carleton RN. Associations between trauma exposure and physical conditions among public safety personnel. Can J Psychiatry. 2020;65(8):548-58. https://doi.org/10.1177/0706743720919278

8. Public Health Agency of Canada. About post-traumatic stress disorder (PTSD) [Internet]. Ottawa (ON): Public Health Agency of Canada; 2025 [updated 2025 Mar 21; cited 2025 Jul 5]. Available from: https://www.canada.ca/en/public-health/topics/mental-health-wellness/post-traumatic-stress-disorder/about-ptsd.html

9. Corrigan PW, Penn DL. Lessons from social psychology on discrediting psychiatric stigma. Am Psychol. 1998;54(9):765-76.

10. Pescosolido BA, Martin JK. The stigma complex. Annu Rev Sociol. 2015;41:87-116. https://doi.org/10.1146/annurev-soc-071312-145702

11. Ricciardelli R, Carleton RN, Mooney T, Cramm H. "Playing the system": structural factors potentiating mental health stigma, challenging awareness, and creating barriers to care for Canadian public safety personnel. Health. 2018;24(3):259-78. https://doi.org/10.1177/1363459318800167

12. Ricciardelli R, Andres E, Kaur N, Czarnuch S, Carleton RN. Fit for public safety: informing attitudes and practices tied to the hiring of public safety personnel. Journal of Workplace Behavioural Health. 2019;35(1):14-36. https://doi.org/10.1080/15555240.2019.1664306

13. Haugen PT, McCrillis AM, Smid GE, Nijdam M. Mental health stigma and barriers to mental health care for first responders: a systematic review and meta-analysis. J Psychiatr Res. 2017;94:218-29.

14. Dolezal L. Shame anxiety, stigma and clinical encounters. J Eval Clin Pract. 2022;28(5):854-60. https://doi.org/10.1111/jep.13744

15. Crowe A, Glass JS, Lancaster MF, Raines J, Waggy M. Mental illness stigma among first responders and the general population. J Mil Gov Couns. 2015;3(3):132-228.

16. Drew JM, Martin S. A national study of police mental health in the USA: stigma, mental health and help-seeking behaviors.JPoliceCrimPsychol.2021;36(2):295-306. https://doi.org/10.1007/s11896-020-09424-9

17. Stuart H. Mental illness stigma expressed by police to police. Isr J Psychiatry Relat Sci. 2017;54(1):18-23.

18. Edwards AM, Kotera Y. Mental health in the UK police force: a qualitative investigation into the stigma with mental illness. Int J Ment Health Addict. 2020;19(4):1116-34. https://doi.org/10.1007/s11469-019-00214-x

19. Pasciak AR, Kelley TM. Conformity to traditional gender norms by male police officers exposed to trauma: implications for critical incident stress debriefing. Appl Psychol Crim Justice. 2013;9(2):137-56.

20. Carleton RN, Afifi TO, Turner S, Taillieu T, Vaughan AD, Anderson GS, et al. Mental health training, attitudes, towards support and screening positive for mental disorders. Cogn Behav Ther. 2020;49(1):55-73. https://doi.org/10.1080/16506073.2019.1575900

21. Horan KA, Marks M, Ruiz J, Bowers C, Cunningham A. Here for my peer: the future of first responder mental health. Int J Environ Res Public Health. 2021;18(21):11097. https://doi.org/10.3390/ijerph182111097

22. Testa V, Bennett A, Jutai J, Cantor Z, Burke P, McMahon J, et al. Applying the theoretical domains framework to identify police, fire, and paramedic preferences for accessing mental health care in a first responder operational stress injury clinic: a qualitative study. Health Promot Chronic Dis Prev Can. 2023;43(10/11):431-49. https://doi.org/10.24095/hpcdp.43.10/11.02

23. Brend DM, Herttalampi M, Sprang G. Correctional officer experiences of moral distress, trauma-informed organizational practices, and structural stigma. Traumatology. 2025;31(4):634-44. https://doi.org/10.1037/trm0000579

24. Voldby KG, Hellström LC, Berg ME, Eplov LF. Structural discrimination against people with mental illness: a scoping review. SSM - Mental Health. 2022;2. https://doi.org/10.1016/j.ssmmh.2022.100117

25. Ricciardelli R, Czarnuch S, Carleton RN, Gacek J, Shewmake J. Canadian public safety personnel and occupational stressors: how PSP interpret stressors on duty. Int J Environ Res Public Health. 2020;17(13):4736. https://doi.org/10.3390/ijerph17134736

26. Noël C, Scharf D, Hawkins J, Lund J, Kozik J, Koné AP. Experiences, impacts and service needs of injured and ill workers in the WSIB process: evidence from Thunder Bay and district (Ontario, Canada). Health Promot Chronic Dis Prev Can. 2022;42(7):272-87. https://doi.org/10.24095/hpcdp.42.7.02

27. Sears JM, Schulmanb BA, Fulton-Kehoeb D, Hogg-Johnson S. Workplace organizational and psychosocial factors associated with return-to-work interruption and re-injury among workers with permanent impairment. Ann Work Expo Health. 2021;65(5):566-80. https://doi.org/10.1093/annweh/wxaa133

28. Maran DA, Magnavita N, Garbarino S. Identifying organizational stressors that could be a source of discomfort in police officers: a thematic review. Int J Environ Res Public Health. 2022;19(6):3720. https://doi.org/10.3390/ijerph19063720

29. Norman M, Ricciardelli R. Operational and organisational stressors in community correctional work: insights from probation and parole officers in Ontario, Canada. The Journal of Community and Criminal Justice. 2022;69(1):86-106. https://doi.org/10.1177/0264550520984253

30. Cancelliere C, Donovan J, Stochkendahl MJ, Biscardi M, Ammendolia C, Myburgh C, et al. Factors affecting return to work after injury or illness: best evidence synthesis of systematic reviews. Chiropr Man Therap. 2016;24(1):32. https://doi.org/10.1186/s12998-016-0113-z

31. Morgan H. Understanding thematic analysis and the debates involving its use. The Qualitative Report. 2022;27(10):2079-91. https://doi.org/10.46743/2160-3715/2022.5912

32. Guest G, Namey E, Chen M. A simple method to assess and report thematic saturation in qualitative research. PLoS One. 2020;15(5):e0232076. https://doi.org/10.1371/journal.pone.0232076

33. Braun V, Clarke V. Toward good practice in thematic analysis: avoiding common problems and be(com)ing a knowing researcher. Int J Transgend Health. 2022;24(1):1-6. https://doi.org/10.1080/26895269.2022.2129597

34. Braun V, Clarke V. One size fits all? What counts as quality practice in (reflexive) thematic analysis? Qual Res Psychol. 2020;18(3):328-52. https://doi.org/10.1080/14780887.2020.1769238

35. O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. Acad Med. 2014;89(9):1245-51. https://doi.org/10.1097/ACM.0000000000000388

36. WSIB Ontario. Better at work [Internet]. London (ON): WSIB Ontario; 2026 [cited 2026 Jan 19]. Available from: https://www.wsib.ca/en/better-work

37. Choitz V, Wagner S. A trauma-informed approach to workforce: an introductory guide for employers and workforce development organizations. Washington (DC): National Fund for Workforce Solutions; 2021. Available from: https://nationalfund.org/wp-content/uploads/2021/04/A-Trauma-Informed-Approach-to-Workforce.pdf

38. Marris W. Trauma-informed workplaces: concepts, strategies, and tactics to build workplaces that support well-being. Washington (DC): Campaign for Trauma Informed Policy & Practice; 2023 [cited 2024 Nov 18]. Available from: https://www.ctipp.org/post/toolkit-trauma-informed-workplaces

39. Browne AJ, Varcoe C, Ford-Gilboe M, Wathen CN, Smye V, Jackson BE, et al. Disruption as opportunity: impacts of an organizational health equity intervention in primary care clinics. Int J Equity Health. 2018;17(1):154. https://doi.org/10.1186/s12939-018-0820-2

40. Sukhera J, Knaak S. A realist review of interventions to dismantle mental health and substance use related structural stigma in health care settings. SSM - Mental Health. 2022;2. https://doi.org/10.1016/j.ssmmh.2022.100170

41. Lentz L, Smith-MacDonald L, Malloy DC, Anderson GS, Beshai S, Ricciardelli R, et al. A qualitative analysis of the mental health training and educational needs of firefighters, paramedics, and public safety communicators in Canada. Int J Environ Res Public Health. 2022;19(12):6972. https://doi.org/10.3390/ijerph19126972

42. Krakauer RL, Stelnicki AM, Carleton RN. Examining mental health knowledge, stigma, and service use intentions among public safety personnel. Front Psychol. 2020;11:949. https://doi.org/10.3389/fpsyg.2020.00949

43. Hanisch SE, Twomey CD, Szeto AC, Birner UW, Nowak D, Sabariego C. The effectiveness of interventions targeting the stigma of mental illness at the workplace: a systematic review. BMC Psychiatry. 2016;16:1. https://doi.org/10.1186/s12888-015-0706-4

44. Marks MR, Bowers C, Beidel DC, Ortman J, Newins AR. Improving mental health knowledge and reducing mental health stigma among public safety personnel: comparison of live vs. online psychoeducation training programs. Int J Environ Res Public Health. 2024;21(10):1358. https://doi.org/10.3390/ijerph21101358

45. Johnston MS, Ricciardelli R, McKendy L. Improving the mental health of correctional workers: perspectives from the field. Crim Justice Behav. 2022;49(7):951-70. https://doi.org/10.1177/00938548221081468

46. Du BB, Yung M, Gruber J, Yazdani A. Organizational strategies to address post-traumatic stress injuries among Canadian paramedics. WORK: A journal of prevention, assessment & rehabilitation. 2022;72(3):1035-45. https://doi.org/10.3233/WOR-210614

47. Szymanski T, Hall A. Post-traumatic stress disorder and the limits of presumptive legislation. In: Ricciardelli R, Bornstein S, Hall A, Carleton RN, editors. Handbook of post-traumatic stress: psychosocial, cultural, and biological perspectives. Routledge; 2022. p. 109-30.

48. Howatt B, Lee-Braggley D, Pizzo RE. An introduction to trauma-informed workplaces: considerations for employers committed to creating psychologically safe workplaces. 2022. Available from: https://www.smu.ca/webfiles/An-introduction-to-trauma-informed-workplaces-Guidance-for-leaders-and-employees-on-what-to-stop-and-what-to-master-revised.pdf

https://doi.org/10.24095/hpcdp.46.4.03

Original quantitative research

Longitudinal associations between changes in employment status and depressive symptoms during the early COVID-19 pandemic: evidence from the Canadian Longitudinal Study on Aging (CLSA)

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Abstract

Introduction: The COVID-19 pandemic caused unprecedented and inequitably distributed adverse health impacts, which varied across socioeconomic circumstances. We investigated differences in incident depression among individuals aged 50 years and older according to various employment factors during the early stages of the pandemic.

Methods: We included 16 719 Canadian Longitudinal Study on Aging participants who provided data at Follow-up one (2015–2018) (FUP1) and twice during the pandemic (Spring and Autumn 2020). The Center for Epidemiologic Studies Depression Scale (CESD-10) was used to classify individuals with depression (CESD-10 score ≥ 10). Logistic regression, adjusted for possible confounders, estimated the odds of incident depression in Autumn 2020.

Results: We found depression scores worsened from pre-pandemic (FUP1) to Autumn 2020; this pattern was evident across different employment features. Individuals who were newly unemployed in Spring 2020 had over double the odds of depression in Autumn 2020 (odds ratio [OR] = 2.22; 95% confidence interval [CI]: 1.51–3.28) compared to those who remained retired. Higher odds of depression were also observed among those with employment disruptions in Spring 2020 relative to those who did not (OR = 1.65; 95% CI: 1.28–2.12), and individuals primarily working in non-home-based settings in Autumn 2020 had 21% lower odds of depression (OR = 0.79; 95% CI: 0.63–0.98) than those who worked remotely.

Conclusion: Our findings suggest that employment status was an important predictor of depression among Canadians during the early phases of the pandemic.

Keywords: *cohort study, employment status, depression, older adults, COVID-19*

Highlights

- Employment disruptions and unemployment during the pandemic significantly increased the odds of developing depression, highlighting the need for targeted mental health support for affected groups.
- Newly unemployed individuals had 122% higher odds of developing depression than retired individuals.
- Remote workers experienced greater increases in depression compared to those working in non-home-based settings.
- During the early stages of the pandemic, women experienced larger increases in depression scores compared to men.
- Individuals with chronic health conditions, younger age, and lower income had higher depression scores.

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Introduction

Employment status is an important and often overlooked social determinant of health that impacts health in numerous ways.[1] For many, employment is a critical component of social identity and provides the structure and opportunities for social interactions.[2,3] It also follows that unemployment may affect mental well-being adversely,[2] with unemployed individuals reporting lower well-being than their employed counterparts.[4]

During the COVID-19 pandemic, public health measures such as strict lockdowns, physical distancing, and isolation led to a substantial rise in mental illness.[5] Additionally, business closures and reduced working hours increased unemployment in Canada and other countries,[6] contributing to personal stress and exacerbating mental health issues.[7] In Canada, socioeconomic factors, including lower income and unstable working hours, were major drivers of anxiety during the pandemic.[8] Evidence on the mental health impacts of different work arrangements has been mixed. In a Canadian cross-sectional study, Bodner et al.[9] found that those who worked exclusively from home or in person reported poorer self-rated mental health than those who worked in a hybrid arrangement; however, only 13% of their cohort was 50 years of age or older. Elsewhere, Beland et al.[6] noted that deteriorations in mental health among Canadian workers were less severe for essential workers, men, and those who could work remotely. Additionally, several studies have reported that the mental health effects of COVID-19 were greater for women compared to men.[10-13] However, a Korean study evaluated the prevalence of depression before and during the pandemic and reported an increase in depression prevalence in men compared to women, who showed no differences in depressive symptoms between time points.[14]

Outside of Canada, numerous studies have evaluated the impacts of the pandemic on mental health by employment status.[15-23] Several studies reported higher rates of burnout among essential workers,[15,16] including medical professionals,[17-19] and there may be important gender differences in these effects,[20] with females experiencing higher levels than males.[21] Most of these studies have targeted specific occupations and relied on cross-sectional study designs, which are less robust than longitudinal designs. In contrast to Bodner et al.,[9] a Finnish cohort study[22] found that individuals who worked from home had improved perceptions of psychosocial work environment, compared to those in the workplace. Additionally, Wester et al.[23] found decreased sadness and depression among employed and retired participants in a cohort of approximately 36 000 Europeans when compared to pre-pandemic levels.[23]

In Canada, few studies have used longitudinal data to explore the effects of employment status on depression during the early stages of the pandemic. To address this gap, we analyzed data from the Canadian Longitudinal Study on Aging (CLSA), a comprehensive health survey conducted before and twice during the early phase of the pandemic. This survey offers a unique opportunity to assess the effects of employment status on depression in individuals aged 50 and older. Our primary objective was to examine the occurrence of depressive symptoms during this period based on employment circumstances. Additionally, we explored whether these associations varied between men and women.

Methods

Study population

The CLSA comprises a sample of 51 338 individuals recruited from Canadian provinces between 2011 and 2015. At the time of enrolment, these men and women were 45 and 85 years old, could complete the questionnaires in English or French, and were physically and cognitively able to provide consent and participate independently. The CLSA is comprised of two cohorts: the Comprehensive and the Tracking. Those in the Comprehensive cohort participated via in-home interviews and visits to one of the 11 data collection sites for physical and cognitive examinations and optional blood and urine tests. Those in the Tracking cohort were administered the questionnaires via computer-assisted telephone interviews. The Comprehensive and Tracking cohorts were combined in this study. Detailed descriptions of the CLSA design are published elsewhere.[24]

In this study, we used the CLSA data from four waves of questionnaires: the Baseline (2011 to 2015), Follow-up one (2015 to 2018) (hereafter FUP1), COVID-19 Baseline (hereafter Spring 2020), and COVID-19 Exit (hereafter Autumn 2020). The Baseline and FUP1 questionnaires collected data on sociodemographic factors, physical and mental health, and behaviour. The COVID-19 questionnaires were launched to investigate the health effects of the pandemic. All the CLSA participants were invited to partake in the Spring 2020 COVID-19 study, of which 42 700 were alive and did not require a proxy to complete the questionnaire. There were 28 559 (67.2%) individuals who agreed to participate. Additionally, the response rate for the Autumn 2020 questionnaire was 84.4%.

Study sample

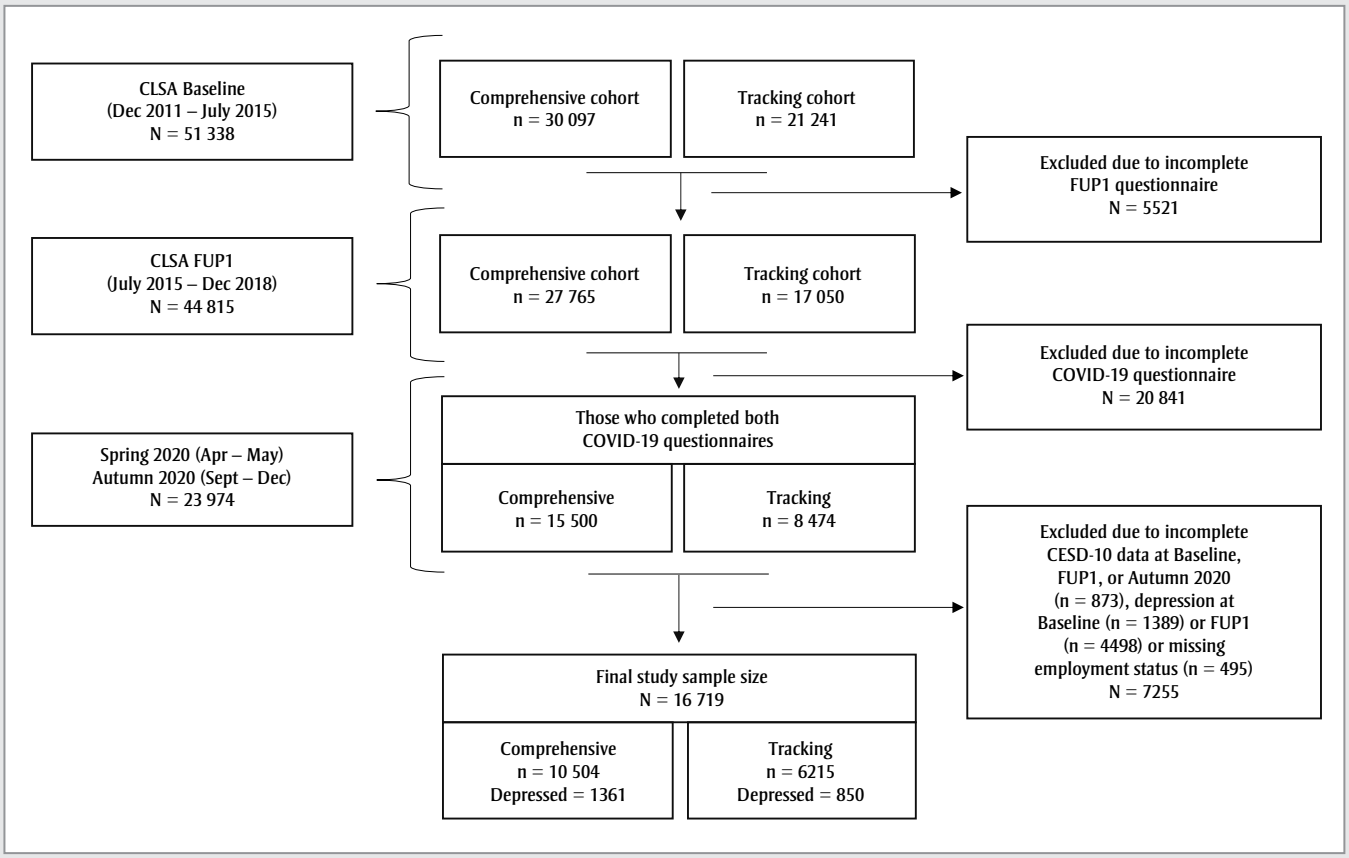
The diagram outlining the number of participants that comprised the analysis file is shown in Figure 1. The initial sample included 23 974 participants who completed the Spring 2020 and Autumn 2020 questionnaires. The Center for Epidemiological Studies Short Depression Scale (CESD-10),[25] a validated self-report measure, was included in each survey wave. There were 7255 participants excluded due to incomplete CESD-10 scores (n = 873) at Baseline, FUP1, or Autumn 2020 surveys, or had depression scores greater than or equal to 10 at Baseline (n = 1389), or FUP1 (n = 4498). The final number of participants was 16 719.

Measurement of employment status

The CLSA survey instrument included several items that allowed respondents to describe their employment status. The time points of the variable assessments are provided in Table 1. In this study, the term "employed" refers exclusively to paid employment, as defined by self-reported current work participation and schedule. Unpaid work, such as caregiving or volunteer activities, was not captured within our employment status variables. Employment status definitions combined self-reported retirement status, current work participation, work schedule, and workplace circumstances to create categorical employment variables across survey waves.

Subjective retirement status was considered at FUP1, where participants were classified as fully retired, not retired, partly retired, or never having worked. Those who were not retired or partly retired were further distinguished by current work participation. Individuals who were currently working were categorized as working full-time or part-time based on their work schedule. Respondents who indicated they were not currently working were assigned

FIGURE 1
Flow diagram outlining the number of participants of the Canadian Longitudinal Study on Aging that comprised the analysis file



Abbreviations: CLSA, Canadian Longitudinal Study on Aging; FUP1, Follow-up one.

Note: Individuals were classified as having depression when CESD-10 score was greater than or equal to 10.

TABLE 1
Time points of variable assessments, Canadian Longitudinal Study on Aging, 2020, Canada

	Baseline	FUP1	Spring 2020	Autumn 2020
Sex	✓			
Age (years)			✓	
Marital status		✓		
Household income		✓		
Highest attained education		✓		
Mortgage status		✓		
Smoking status in Spring 2020			✓	
Alcohol consumption since 1 March 2020				✓
Chronic condition status		✓		
Employment status at FUP1		✓		
Employment status in Autumn 2020				✓
Primary work location				✓
Essential worker status			✓	
Work disrupted in the past 30 days			✓	
Depression survey (CESD-10)	✓	✓		✓

Abbreviations: CESD-10, Center for Epidemiological Studies Short Depression Scale; FUP1, Follow-up one.

unemployed if they reported unemployment as the reason or "other reason" otherwise, which included reasons such as disability and caring for family.

In Spring 2020, employment status was determined by combining FUP1 status with questions on employment location. Participants working in non-home-based settings were categorized as working in the workplace, switched to remote work, or had their workplace closed, depending on their responses to workplace distancing implementation items. Those in home-based settings were classified as fully retired, working remotely, unemployed, not working otherwise, or never worked, conditional on their FUP1 status. The Autumn 2020 classification followed a similar process. Retirement was carried forward where applicable, while active workers were defined jointly by work schedule and location. Categories included full-time or part-time work either remotely, in the workplace, or "other." The latter group may represent individuals with hybrid work arrangements, although this cannot be definitively determined from the available data. Respondents who reported being unemployed or retired were classified accordingly.

To capture changes in employment during the pandemic, we derived employment transition variables indicating changes in survey waves (Spring 2020 to Autumn 2020 and FUP1 to Autumn 2020). Transitions were constructed only for participants with non-missing employment status at each survey wave. Transitions between survey waves were classified in stable trajectories, directional shifts, pandemic-related disruptions, and changes in intensity. Stable trajectories captured individuals who remained in the same category across waves, including those who remained retired, remained in the workplace, or remained working remotely. Directional shifts reflected entry into or exit from the labour force, which included individuals who were newly retired (transitioned from employment to retirement), newly employed (entered employment after being unemployed or not working), or newly unemployed (moved from employment to unemployment). Pandemic-related disruptions included temporary workplace closures and changes in work modality. Workplace closure included individuals who were employed at one survey wave but were not working due to workplace shutdowns at the next survey wave. Those who returned to the workplace after closure included individuals who resumed on-site work following the closure of their workplace. Additional categories included individuals who switched to remote work and those who returned to the workplace after working remotely. Changes in work intensity identified shifts in working hours irrespective of location: increased hours (part-time to full-time) and reduced hours (full-time to part-time). Finally, the "other" category represents categories that did not fit the prespecified definitions or those with small sample sizes, such as individuals who remained unemployed or returned from retirement.

In addition to the transition variables, essential worker status was assessed in Spring 2020 with the question, "Are you considered an essential worker?". Whether one's employment was disrupted in the past 30 days was assessed in Spring 2020. Furthermore, participants were asked in Autumn 2020 to indicate whether their primary employment location was non-home based.

Measurement of depression

The CLSA surveys include the CESD-10[25] instrument, which is a validated self-report screening tool for depressive symptoms. The CESD-10 is comprised of 10 questions that allow for the identification of feelings related to depression, loneliness, and happiness. Responses were summed to give a final score between zero and 30. Previous research indicates that a score greater than or equal to 10 has sufficient sensitivity and specificity to identify depression.[25,26] Therefore, CESD-10 scores were classified into a dichotomous outcome, and participants with a cumulative score of 10 or higher were classified as having depression. It is important to note that the CESD-10 does not provide a definitive clinical diagnosis of depression; rather, it identifies individuals with elevated depressive symptomology. In Canada, only qualified health professionals (e.g. physicians, psychiatrists, or psychologists) can diagnose depression. Lifetime prevalence of depression was measured at FUP1 using the question, "Has a doctor ever told you that you suffer from clinical depression?". This question was only asked of the Comprehensive cohort participants.

Covariates

Demographic factors included sex at Baseline, age in Spring 2020, and marital status at FUP1. Socioeconomic factors included household income, highest education achieved, and mortgage status, assessed at FUP1. Smoking status and alcohol consumption were assessed in Spring 2020 and Autumn 2020, respectively. Chronic condition status was assessed at FUP1. Although physical activity data were collected in the CLSA, these measures were only available at FUP1 and not during the Spring 2020 and Autumn 2020 surveys. Because FUP1 data were collected several years before the pandemic and were based on the Physical Activity Scale for the Elderly, which captures typical weekly activity, we did not consider these data a reliable covariate for pandemic analyses. Moreover, evidence shows that physical activity patterns changed substantially during the pandemic,[27] making pre-pandemic measures unlikely to accurately reflect activity during the study period.

Statistical methods

The mean CESD-10 scores were reported across all covariates and employment indicators at Baseline, FUP1, and Autumn 2020. Additionally, the mean difference was reported using the individual paired data, representing the mean change in CESD-10 scores from Baseline to FUP1, and FUP1 to Autumn 2020. A likelihood ratio test was performed to test for interaction with sex, which was not statistically significant. However, we repeated the analyses stratified by sex to present findings separately for men and women.

Unconditional logistic regression was used to calculate odds ratios (ORs) with 95% confidence intervals (CIs) to estimate the odds of incident depression (CESD-10 score $\geq$ 10) in Autumn 2020 for each employment status indicator. A complete-case approach was used for the logistic regression models, and only a single employment indicator was included in the model at any one time. Only individuals without depression (CESD-10 score $<$ 10) at Baseline or FUP1 were retained for analyses of incident depression in Autumn 2020. The final model was adjusted for age, sex, marital status, household income, highest education, mortgage status, chronic conditions, smoking habits, and frequency of alcohol consumption. Additionally, those who had depression at Baseline or FUP1 but not in Autumn 2020 were examined to assess if employment status was associated with remission. The remission analysis was adjusted for the same covariates listed above. Statistical significance was

determined at a $p \leq .05$. Data were analyzed using SAS software 9.4.[28]

The STROBE Cohort Reporting Guidelines were used when writing this manuscript.[29]

Ethics approval and consent to participate

The secondary analysis for this study was approved by the University of Toronto Research Ethics Board (Protocol #41167).

Results

In our study sample of 16 719 CLSA participants aged 50 and older, there were approximately equal proportions of men (50.4%) and women (49.6%) (Table 2). Women, on average, had higher CESD-10 scores at all time points, and larger average increases in depression scores from FUP1 to Autumn 2020, compared to men; this pattern was consistent across nearly all descriptive characteristics (data not shown). There was a consistent inverse relationship between age and average changes in CESD-10 scores, such that younger individuals experienced larger increases in depression scores between FUP1 and Autumn 2020. Additionally, higher average changes in depression scores were observed for those who were single, those with chronic health conditions, and those who smoked and consumed alcohol regularly. Higher-income individuals had larger average increases in depression scores from FUP1 to Autumn 2020; however, there was an inverse relationship between income and CESD-10 scores across all individual time points. Importantly, across nearly all characteristics, there was a worsening of depression scores from FUP1 to Autumn 2020, whereas there was an improvement of depression scores from Baseline to FUP1.

Table 3 presents data related to mean changes in depression scores from FUP1 to Autumn 2020 across various employment characteristics. While increases in depressive symptoms were observed across all employment circumstances, the largest increase was observed for those who became newly unemployed in Spring 2020. Similarly, larger changes in depression scores were observed for those whose workplace closed in Spring 2020 or Autumn 2020, and for those who switched to remote work. Additionally, there were smaller increases in depression scores among those who worked primarily in person, non-essential workers, and those whose work was not disrupted in Spring 2020. Following stratification by sex, women, on average, had larger increases in CESD-10 scores from FUP1 to Autumn 2020, compared to men, across nearly all employment measures (data not shown).

Table 4 presents adjusted ORs and 95% CIs for incident depression in Autumn 2020 by employment status. When examining changes in employment from Spring 2020 to Autumn 2020, newly unemployed individuals had over double the odds of depression (OR = 2.22; 95% CI: 1.51–3.28) compared to those who remained retired. Additionally, those who switched to remote work had a 24% increased risk of depression (OR = 1.24; 95% CI: 1.01–1.53), and those whose workplaces closed had 95% increased risk of depression in Autumn 2020 (OR = 1.95; 95% CI: 1.32–2.88). Consistent patterns were observed for employment changes between FUP1 and Autumn 2020. We also observed that individuals working in non-home-based settings in Autumn 2020 had 21% decreased odds of depression compared to those working remotely (OR = 0.79; 95% CI: 0.63–0.98). Similarly, essential workers had 25% reduced odds of depression compared to non-essential workers (OR = 0.75; 95% CI: 0.62–0.91). Furthermore, those whose employment was disrupted in Spring 2020 had 65% higher odds of depression compared to those whose employment was unaffected (OR = 1.65; 95% CI: 1.28–2.12). Overall, there were only slight differences between sexes, where women had greater risks of depression due to unemployment and workplace closure, and men had greater risks associated with work disruptions in Spring 2020.

The remission analyses among those who were depressed at Baseline or FUP1 but not in Autumn 2020 found that individuals who were newly employed between either survey wave had almost double the odds of remission compared to those who remained retired (OR = 1.99; 95% CI: 1.57–2.53) (data not shown). Individuals who returned to their workplace in Autumn 2020 after working remotely or having their workplace closed in Spring 2020 had 24% and 15% reduced odds of remission in Autumn 2020, respectively, compared to those who remained retired. There was no difference in the odds of remission among those who worked in a non-home-based setting in Autumn 2020 compared to those who worked from home (OR = 0.95; 95% CI: 0.79–1.14), among essential workers compared to non-essential workers (OR = 0.95; 95% CI: 0.81–1.12), or among those who had their employment disrupted in Spring 2020 compared to those who were undisrupted (OR = 1.04; 95% CI: 0.86–1.26).

Discussion

Our longitudinal analyses of CLSA participants found that incident depression during the COVID-19 pandemic varied across several sociodemographic and employment characteristics. Across nearly all subgroups, depressive symptoms improved modestly from Baseline to Follow-up one but worsened from Follow-up one to Autumn 2020. Those aged 50 to 59 years, women, and those with chronic conditions or lower income experienced the largest increases in CESD-10 scores. Notably, those who were newly unemployed in Autumn 2020 had more than double the odds of depression compared with those who remained retired. In contrast, individuals who worked in non-home-based settings or reported being essential workers had reduced odds of depression.

Employment-related determinants of depression appeared stronger among women. Women who became newly unemployed, experienced workplace closure, or transitioned to remote work had higher odds of depression. In contrast, these associations were smaller or not statistically significant among men. These findings underscore the heightened vulnerability of women to employment-related stressors during the pandemic, likely reflecting the dual burden of job disruption and gendered caregiving responsibilities. Other epidemiological studies have found that employment characteristics, such as working remotely, were more strongly related to adverse mental health outcomes in women than men during the pandemic.[30] Additionally, several studies have reported increased psychological stress and adverse mental health outcomes among women compared to men, particularly those with additional caretaking or home-schooling responsibilities during the COVID-19 lockdowns.[31,32]

A compelling finding from our analyses was that mean changes in depression scores worsened across all sociodemographic characteristics, including age, marital status, highest education, household income, and mortgage status. Other epidemiological studies have similarly observed mental health declines.[33,34] One exception has been the study by Wester et al.,[23] who, in a sample

TABLE 2
Means and standard errors (SE) of CESD-10 scores at Baseline, Follow-up one (FUP1), Autumn 2020, and the mean change in scores from Baseline to FUP1, and FUP1 to Autumn 2020, according to different covariates in individuals without depression at Baseline or FUP1 (sample size = 16 719; incident cases in Autumn 2020 = 2211)

		Sample size	Mean (SE) Baseline CESD-10 score	Mean (SE) FUP1 CESD-10 score	Mean (SE) Autumn 2020 CESD-10 score	Mean (SE) change in CESD-10 scores from Baseline to FUP1	Mean (SE) change in CESD-10 scores from FUP1 to Autumn 2020
Total		16 719	3.30 (0.02)	3.25 (0.02)	4.86 (0.03)	−0.06 (0.02)	1.61 (0.03)
Sex	Male	8 434	3.19 (0.03)	3.12 (0.03)	4.47 (0.04)	−0.08 (0.03)	1.36 (0.04)
	Female	8 285	3.42 (0.03)	3.38 (0.03)	5.25 (0.05)	−0.04 (0.03)	1.87 (0.05)
Age (years)	50–54	744	3.52 (0.09)	3.22 (0.09)	5.76 (0.18)	−0.30 (0.10)	2.55 (0.17)
	55–59	2 257	3.39 (0.05)	3.21 (0.05)	5.15 (0.09)	−0.18 (0.06)	1.94 (0.09)
	60–64	2 666	3.42 (0.05)	3.15 (0.05)	4.74 (0.08)	−0.27 (0.05)	1.59 (0.08)
	65–69	3 194	3.26 (0.04)	3.13 (0.04)	4.71 (0.07)	−0.13 (0.05)	1.58 (0.07)
	70–74	2 962	3.16 (0.04)	3.15 (0.05)	4.60 (0.07)	−0.01 (0.05)	1.46 (0.07)
	≥ 75	4 896	3.28 (0.04)	3.46 (0.04)	4.89 (0.06)	0.18 (0.04)	1.44 (0.06)
Marital status	Single/never married	1 195	3.70 (0.07)	3.55 (0.07)	5.36 (0.13)	−0.15 (0.08)	1.81 (0.13)
	Married/common-law	12 414	3.19 (0.02)	3.13 (0.02)	4.72 (0.04)	−0.06 (0.02)	1.59 (0.04)
	Widowed/separated/divorced	3 102	3.61 (0.05)	3.59 (0.05)	5.20 (0.08)	−0.02 (0.05)	1.60 (0.08)
	Missing	8	3.07 (0.98)	2.13 (0.44)	5.88 (1.46)	−0.94 (0.80)	3.75 (1.39)
Highest attained education	No post-secondary	1 166	3.46 (0.07)	3.47 (0.07)	5.02 (0.12)	0.02 (0.08)	1.55 (0.12)
	Any post-secondary	9 464	3.34 (0.03)	3.25 (0.03)	4.94 (0.04)	−0.09 (0.03)	1.70 (0.04)
	Above post-secondary	3 814	3.04 (0.04)	3.00 (0.04)	4.75 (0.07)	−0.03 (0.04)	1.75 (0.06)
	Missing	2 275	3.52 (0.05)	3.53 (0.05)	4.58 (0.09)	0.01 (0.06)	1.05 (0.08)
Household income	≤ $20 000	402	3.91 (0.12)	3.98 (0.13)	4.84 (0.22)	0.07 (0.15)	0.87 (0.21)
	$20 000–$50 000	2 995	3.63 (0.05)	3.61 (0.05)	5.01 (0.08)	−0.03 (0.05)	1.40 (0.08)
	$50 000–$100 000	6 091	3.28 (0.03)	3.26 (0.03)	4.89 (0.05)	−0.01 (0.03)	1.62 (0.05)
	$100 000–$150 000	3 449	3.18 (0.04)	3.04 (0.04)	4.80 (0.07)	−0.14 (0.04)	1.76 (0.06)
	≥ $150 000	2 941	3.06 (0.04)	2.89 (0.04)	4.66 (0.08)	−0.16 (0.05)	1.77 (0.07)
	Missing	841	3.39 (0.08)	3.53 (0.09)	4.98 (0.15)	0.14 (0.10)	1.46 (0.15)
Dwelling location	Rural	1 700	3.17 (0.06)	3.11 (0.06)	4.47 (0.10)	−0.06 (0.07)	1.36 (0.09)
	Urban	15 011	3.32 (0.02)	3.26 (0.02)	4.90 (0.03)	−0.06 (0.02)	1.64 (0.03)
	Missing	8	4.38 (1.15)	4.63 (1.02)	3.93 (0.75)	0.25 (1.00)	−0.69 (1.12)
Comorbidity status	No chronic condition	701	2.72 (0.09)	2.51 (0.09)	3.86 (0.14)	−0.22 (0.09)	1.35 (0.14)
	At least one chronic condition	15 810	3.33 (0.02)	3.29 (0.02)	4.91 (0.03)	−0.05 (0.02)	1.62 (0.03)
	Missing	208	2.93 (0.17)	2.71 (0.15)	4.28 (0.26)	−0.22 (0.16)	1.58 (0.25)
Smoking status in Spring 2020	Never	15 755	3.29 (0.02)	3.23 (0.02)	4.84 (0.03)	−0.06 (0.02)	1.61 (0.03)
	Occasional	190	3.64 (0.18)	3.57 (0.18)	5.00 (0.33)	−0.08 (0.19)	1.44 (0.32)
	Daily	675	3.46 (0.10)	3.36 (0.10)	5.09 (0.17)	−0.10 (0.11)	1.74 (0.17)
	Missing	99	3.92 (0.27)	3.89 (0.28)	5.24 (0.41)	−0.03 (0.30)	1.35 (0.44)
Alcohol consumption since 1 March 2020	Never	2 772	3.37 (0.05)	3.38 (0.05)	4.57 (0.08)	0.01 (0.05)	1.19 (0.08)
	1–3 times per month	4 563	3.43 (0.04)	3.37 (0.04)	4.91 (0.06)	−0.06 (0.04)	1.54 (0.06)
	1–5 times per week	6 636	3.21 (0.03)	3.13 (0.03)	4.88 (0.05)	−0.07 (0.03)	1.75 (0.05)
	Almost daily	2 727	3.26 (0.05)	3.18 (0.05)	5.00 (0.08)	−0.08 (0.05)	1.82 (0.08)
	Missing	21	3.86 (0.45)	3.71 (0.57)	5.12 (0.99)	−0.14 (0.49)	1.40 (0.67)

Abbreviation: CESD-10, Center for Epidemiological Studies Short Depression Scale.

Note: Higher CESD-10 scores indicate more severe depressive symptoms. Individuals were classified as having depression when CESD-10 score was greater than or equal to 10.

TABLE 3
Means and standard errors (SE) of CESD-10 scores at Baseline, Follow-up one (FUP1), Autumn 2020, and the mean change in scores from Baseline to FUP1 and FUP1 to Autumn 2020, according to employment situation in individuals without depression at Baseline or FUP1 (sample size = 16 719; incident cases in Autumn 2020 = 2211)

		Sample size	Mean (SE) Baseline CESD-10 score	Mean (SE) FUP1 CESD-10 score	Mean (SE) Autumn 2020 CESD-10 score	Mean (SE) change in CESD-10 scores from Baseline to FUP1	Mean (SE) change in CESD-10 scores from FUP1 to Autumn 2020
Change from Spring 2020 to Autumn 2020	Remained retired	9 184	3.29 (0.03)	3.31 (0.03)	4.82 (0.04)	0.02 (0.03)	1.51 (0.04)
	Newly retired	264	3.05 (0.15)	3.28 (0.15)	4.40 (0.25)	0.23 (0.15)	1.12 (0.25)
	Newly employed	293	3.63 (0.14)	3.72 (0.15)	5.26 (0.28)	0.09 (0.17)	1.54 (0.29)
	Newly unemployed	191	3.65 (0.18)	3.62 (0.19)	6.30 (0.39)	−0.03 (0.19)	2.68 (0.33)
	Retired after workplace closure	252	3.32 (0.15)	3.09 (0.14)	4.81 (0.29)	−0.23 (0.16)	1.72 (0.29)
	Returned to workplace after closure	1 391	3.30 (0.07)	3.07 (0.07)	4.77 (0.12)	−0.23 (0.07)	1.70 (0.11)
	Returned to workplace after remote work	564	3.35 (0.10)	3.09 (0.10)	4.60 (0.17)	−0.26 (0.11)	1.51 (0.17)
	Switched to remote work	1 322	3.32 (0.07)	3.06 (0.07)	5.26 (0.12)	−0.26 (0.07)	2.19 (0.11)
	Remained in workplace	399	3.43 (0.13)	3.17 (0.12)	4.80 (0.23)	−0.25 (0.13)	1.63 (0.22)
	Remained remote	2 575	3.25 (0.05)	3.18 (0.05)	4.73 (0.08)	−0.07 (0.05)	1.55 (0.08)
	Workplace closed	192	3.50 (0.19)	3.31 (0.18)	5.86 (0.32)	−0.19 (0.21)	2.56 (0.31)
	Other	92	3.87 (0.29)	3.31 (0.26)	4.72 (0.42)	−0.56 (0.30)	1.40 (0.41)
Change from FUP1 to Autumn 2020	Remained retired	9 313	3.29 (0.03)	3.31 (0.03)	4.82 (0.04)	0.02 (0.03)	1.51 (0.04)
	Newly retired	369	3.12 (0.13)	3.15 (0.12)	4.55 (0.22)	0.03 (0.14)	1.40 (0.22)
	Newly employed	418	3.59 (0.12)	3.65 (0.13)	5.21 (0.24)	0.06 (0.14)	1.56 (0.23)
	Newly unemployed	187	3.60 (0.18)	3.58 (0.19)	6.26 (0.39)	−0.02 (0.20)	2.68 (0.33)
	Switched to remote work	3 824	3.27 (0.04)	3.14 (0.04)	4.91 (0.07)	−0.13 (0.04)	1.78 (0.06)
	Remained in workplace	354	3.55 (0.13)	3.23 (0.14)	5.01 (0.23)	−0.32 (0.14)	1.78 (0.22)
	Increased hours	306	3.33 (0.14)	3.18 (0.14)	4.61 (0.24)	−0.15 (0.16)	1.43 (0.24)
	Reduced hours	1 550	3.29 (0.06)	3.06 (0.06)	4.70 (0.11)	−0.22 (0.07)	1.64 (0.11)
	Workplace closed	178	3.45 (0.20)	3.21 (0.19)	5.88 (0.34)	−0.23 (0.21)	2.67 (0.33)
	Other	220	3.59 (0.17)	3.01 (0.16)	4.46 (0.26)	−0.57 (0.19)	1.45 (0.26)
Primary work location in Autumn 2020	Working from home	1 242	3.26 (0.07)	3.00 (0.07)	5.17 (0.12)	−0.26 (0.07)	2.17 (0.11)
	Working in non-home-based setting	2 319	3.35 (0.05)	3.10 (0.05)	4.71 (0.09)	−0.25 (0.06)	1.62 (0.09)
	Other location	263	3.49 (0.15)	3.17 (0.14)	5.35 (0.28)	−0.32 (0.18)	2.18 (0.27)
	Skipped	12 891	3.29 (0.02)	3.30 (0.02)	4.84 (0.04)	0.00 (0.02)	1.54 (0.04)
	Missing	4	3.50 (1.19)	4.75 (1.49)	5.25 (1.31)	1.25 (1.60)	0.50 (0.96)
Essential worker status in Spring 2020	No	2 389	3.29 (0.05)	3.09 (0.05)	5.15 (0.09)	−0.19 (0.05)	2.06 (0.08)
	Yes	1 783	3.41 (0.06)	3.13 (0.06)	4.69 (0.10)	−0.28 (0.06)	1.56 (0.10)
	Skipped	12 321	3.29 (0.02)	3.29 (0.02)	4.81 (0.04)	0.00 (0.02)	1.52 (0.04)
	Missing	226	3.40 (0.16)	3.33 (0.16)	5.54 (0.29)	−0.07 (0.19)	2.21 (0.28)
Work disrupted in Spring 2020	No	965	3.44 (0.08)	3.13 (0.08)	4.36 (0.14)	−0.30 (0.09)	1.23 (0.14)
	Yes	3 415	3.32 (0.04)	3.12 (0.04)	5.15 (0.08)	−0.20 (0.04)	2.04 (0.07)
	Skipped	12 321	3.29 (0.02)	3.29 (0.02)	4.81 (0.04)	0.00 (0.02)	1.52 (0.04)
	Missing	18	2.39 (0.31)	3.06 (0.51)	5.67 (1.02)	0.67 (0.58)	2.61 (0.88)

Abbreviation: CESD-10, Center for Epidemiological Studies Short Depression Scale.

Note: Higher CESD-10 scores indicate more severe depressive symptoms. Individuals were classified as having depression when CESD-10 score was greater than or equal to 10.

TABLE 4
Odds ratios and 95% confidence intervals for incident depression in Autumn 2020 according to various employment factors in individuals without depression at Baseline or Follow-up one (sample size = 16 719; incident cases in Autumn 2020 = 2211)

		No. cases	Model 1 OR (95% CI)	Model 2 OR (95% CI)		
			Overall	Overall	Females	Males
Change from Spring 2020 to Autumn 2020	Remained retired	1 182	1.0	1.0	1.0	1.0
	Newly retired	29	0.86 (0.58–1.28)	0.92 (0.60–1.42)	0.94 (0.52–1.68)	0.90 (0.47–1.70)
	Newly employed	50	1.30 (0.95–1.79)	1.40 (0.97–2.03)	1.62 (1.04–2.52)	1.02 (0.50–2.06)
	Newly unemployed	47	2.18 (1.54–3.09)	2.22 (1.51–3.28)	2.69 (1.60–4.52)	1.79 (0.98–3.24)
	Retired after workplace closure	36	1.16 (0.81–1.67)	1.25 (0.85–1.83)	1.78 (1.10–2.88)	0.73 (0.36–1.46)
	Returned to workplace after closure	180	0.92 (0.76–1.12)	0.91 (0.73–1.13)	0.89 (0.67–1.19)	0.95 (0.68–1.33)
	Returned to workplace after remote work	64	0.78 (0.59–1.05)	0.81 (0.59–1.10)	0.94 (0.63–1.40)	0.68 (0.41–1.13)
	Switched to remote work	206	1.18 (0.97–1.42)	1.24 (1.01–1.53)	1.18 (0.88–1.57)	1.32 (0.97–1.79)
	Remained in workplace	52	0.97 (0.71–1.33)	0.96 (0.67–1.37)	1.10 (0.67–1.79)	0.81 (0.47–1.38)
	Remained remote	314	0.94 (0.81–1.09)	0.99 (0.84–1.16)	1.06 (0.86–1.32)	0.88 (0.69–1.13)
	Workplace closed	39	1.75 (1.21–2.53)	1.95 (1.32–2.88)	2.19 (1.20–4.00)	1.79 (1.06–3.00)
	Other	12	1.05 (0.57–1.94)	1.20 (0.61–2.37)	0.53 (0.12–2.32)	1.56 (0.72–3.39)
Change from FUP1 to Autumn 2020	Remained retired	1 199	1.0	1.0	1.0	1.0
	Newly retired	47	1.00 (0.72–1.37)	1.05 (0.74–1.48)	1.20 (0.77–1.88)	0.87 (0.51–1.50)
	Newly employed	66	1.17 (0.88–1.54)	1.22 (0.88–1.68)	1.44 (0.97–2.13)	0.88 (0.48–1.59)
	Newly unemployed	46	2.14 (1.51–3.03)	2.19 (1.49–3.23)	2.67 (1.59–4.50)	1.73 (0.95–3.14)
	Switched to remote work	512	1.01 (0.88–1.15)	1.06 (0.91–1.23)	1.09 (0.89–1.32)	1.02 (0.81–1.27)
	Remained in workplace	49	0.98 (0.71–1.35)	0.92 (0.64–1.33)	1.11 (0.71–1.72)	0.67 (0.34–1.30)
	Increased hours	39	0.85 (0.60–1.21)	0.85 (0.57–1.26)	0.87 (0.55–1.37)	0.83 (0.36–1.95)
	Reduced hours	191	0.86 (0.70–1.04)	0.86 (0.69–1.07)	0.90 (0.66–1.21)	0.83 (0.60–1.14)
	Workplace closed	37	1.78 (1.22–2.60)	1.96 (1.32–2.92)	2.09 (1.11–3.93)	1.87 (1.11–3.15)
	Other	25	0.88 (0.57–1.34)	0.92 (0.57–1.49)	0.60 (0.27–1.32)	1.24 (0.68–2.27)
Primary work location in Autumn 2020	Working from home	180	1.0	1.0	1.0	1.0
	Working in non-home-based setting	294	0.83 (0.68–1.02)	0.79 (0.63–0.98)	0.83 (0.61–1.12)	0.76 (0.55–1.04)
	Other location	46	1.34 (0.94–1.92)	1.28 (0.87–1.90)	1.19 (0.65–2.17)	1.35 (0.80–2.27)
	Skipped	1 691	0.98 (0.81–1.18)	0.96 (0.79–1.17)	1.05 (0.79–1.38)	0.87 (0.65–1.16)
Essential worker status in Spring 2020	No	368	1.0	1.0	1.0	1.0
	Yes	219	0.75 (0.63–0.90)	0.75 (0.62–0.91)	0.77 (0.59–1.00)	0.72 (0.54–0.97)
	Skipped	1 585	0.85 (0.74–0.98)	0.84 (0.72–0.98)	0.84 (0.68–1.03)	0.84 (0.67–1.06)
Work disrupted in Spring 2020	No	98	1.0	1.0	1.0	1.0
	Yes	525	1.60 (1.27–2.02)	1.65 (1.28–2.12)	1.41 (1.01–1.97)	2.01 (1.36–2.98)
	Skipped	1 585	1.37 (1.09–1.73)	1.40 (1.09–1.81)	1.25 (0.89–1.74)	1.60 (1.08–2.38)

Abbreviations: CI, confidence interval; FUP1, Follow-up one; OR, odds ratio.

Notes: Model 1 was adjusted for age and sex. Model 2 was adjusted for age, sex, highest attained education, marital status, household income, mortgage status, dwelling location, smoking status in Spring 2020, frequency of alcohol consumption since 1 March 2020 and chronic condition status.

The number of cases is based on Model 1.

Individuals were classified as having depression when CESD-10 score was greater than or equal to 10.

of 36 478 UK participants aged 50 and older, reported decreased prevalence of sadness or depression during the pandemic. However, they observed a concurrent rise in loneliness, particularly among women, which may indicate different manifestations of psychological distress across settings.

Interestingly, we observed reduced odds of depression among essential workers compared with non-essential workers. These findings contrast with reports of increased rates of burnout and stress among medical professionals and other frontline health care workers,[17-19] and other essential lower-income workers who experienced inadequate COVID-19 safeguards and a lack of worker health protection.[35] Given the demographics in the CLSA, which is comprised of those who would have been at least 50 years of age when the pandemic began, and who are predominantly Caucasian and more affluent, our analyses would underrepresent these types of essential workers. Furthermore, essential worker status was assessed early in the pandemic (Spring 2020) when essential workers may not have yet reached burnout.

Similarly, those working in person in Autumn 2020 were less likely to be depressed. This may reflect that those who chose to continue working in person, assuming they had the discretion to make this choice, had fewer concerns about the health impacts of COVID-19. It may also reflect the mental health benefits of maintaining social connections[36] and a lower chance of disruption to routine.[37] Robust evidence exists that maintaining social connections throughout the pandemic protected against depression.[38] However, it is important to note that remote work is not inherently detrimental to mental health. Its effects likely depend on the supports available to workers, such as opportunities for social connection, maintaining structured routines, and organizational guidance. Policy and workplace interventions that strengthen these supports may help to protect the mental well-being of remote workers, allowing them to benefit from the flexibility of remote arrangements without compromising psychological health. Our analysis categorized participants as working primarily at home, in the workplace, or "other," the last of which may reflect hybrid situations but cannot be definitively interpreted as such. This inability to isolate the effects of hybrid work is a limitation, as hybrid arrangements may confer different mental health benefits than either fully remote or fully in-person work arrangements. In fact, previous work has shown that those who can work in hybrid situations have optimal trajectories for mental health compared to those who work fully remotely or fully in person.[9] Furthermore, maintaining a regular schedule is important for one's well-being, and those who have experienced disruptions in their work schedule or were required to shift to remote work may be at a higher risk for depression,[39] a pattern that was evident in our study, where both workplace disruptions and transitions to remote work were associated with increased odds of depression.

The employment-depression relationship is likely bidirectional. Depression can hinder job acquisition and retention,[40] while employment changes can impact mental health.[41] During the pandemic, social assistance aided those unable to work due to health issues, potentially introducing selection bias, excluding individuals with or at risk for severe depression from the sample. A further limitation concerns reverse causality and self-selection in work location during Autumn 2020. Individuals who opted to work in person may have differed systematically from those working remotely, for example, by having lower levels of anxiety, fewer health concerns, or stronger coping mechanisms. These underlying differences may have influenced both work location and the risk of depression, limiting the causal interpretation of our findings.

It is worth noting that, due to the focus of the CLSA on midlife and older Canadians, this study excludes individuals younger than 50 years. Individuals below this age threshold also experienced stressors, including balancing childcare and homeschooling while adapting to remote work. Furthermore, essential workers with children faced additional difficulty finding childcare arrangements following school closures. The overwhelming stress experienced by younger workers is likely to have impacted their mental health and well-being. However, further research is necessary to understand better the impact of employment factors on depression within that population.

Strengths and limitations

We acknowledge that this study has limitations. The CLSA cohort is more affluent and less diverse than the general Canadian population, and excludes residents of the Territories and of First Nations reserves, individuals in institutionalized care and those who could not speak French or English. These criteria likely resulted in the recruited sample being healthier than the general population. Another limitation was the inability to adjust for physical activity levels during the pandemic. Although these data were collected during the Follow-up one survey wave, they were several years old at the onset of the pandemic and were based on the Physical Activity Scale for the Elderly,[42] which provided only a limited snapshot of weekly activity. In addition, physical activity levels changed markedly during COVID-19 lockdowns and restrictions. As a result, pre-pandemic measures were not suitable for capturing these dynamic changes and were omitted from our analyses, which may have introduced residual confounding.

In addition, although we defined employment transitions across survey waves, some heterogeneity within categories may remain. For example, differences in job quality or temporary disruptions were not fully captured by our measures. Additionally, these employment transitions cannot account for heterogeneity across occupations, as returning to in-person work may have carried different implications for health care workers compared to those in retail or other sectors. Furthermore, the classification of "essential worker" in our study was broad and did not distinguish between occupational groups such as health care, retail, or transportation, each of which may involve different levels of exposure risk, stress, and job security. Although standardized occupational codes are available in the CLSA Follow-up one data, they are part of the controlled access files that we were unable to obtain. Moreover, these codes were not collected in the COVID-19 surveys and could not be used to refine essential worker status during the pandemic. As a result, our estimates may obscure nuances within this category and could be influenced by unmeasured occupational characteristics.

Another limitation was the relatively large loss to follow-up from the Follow-up one wave of data collection to the COVID-19 surveys, as nearly 20 000 participants from Follow-up one did not participate in the urgent CLSA COVID-19 questionnaires. Those lost to follow-up had slightly higher CESD-10 scores at Baseline and Follow-up one and were more likely to have lower household income and lower educational attainment compared with the analytical cohort (data not shown). To facilitate direct comparisons with Table 2, both analyses

were restricted to participants without depression at Baseline or Follow-up one, thereby focusing on the same at-risk cohort for incident depression in Autumn 2020. This restriction ensured consistency across analyses but does not capture differences among participants with pre-existing depression, who may have been particularly vulnerable to dropout. Although the observed differences between the analytical cohort and the lost-to-follow-up cohort were modest, selective attrition of individuals with poor mental health and socioeconomic disadvantage may have led to an underestimation of the association between employment status and depression in our study.

Our study also has notable strengths, such as the use of substantial longitudinal data obtained, which provides comprehensive information on sociodemographic factors and mental health measures, before and twice during the first year of the COVID-19 pandemic. This provided the opportunity to evaluate changes in mental health within the same individuals before and during the pandemic, thereby enriching the depth and breadth of our research. Unlike many cross-sectional studies, which are prone to temporal biases, our approach is more robust for studying the pandemic's impact, particularly on depression.

Conclusion

In this large cohort of older Canadians, we observed worsening depression scores early in the pandemic and identified several employment-related risk factors for incident depression in Autumn 2020. Transitions such as becoming newly unemployed or experiencing workplace closure were associated with nearly double the odds of depression, whereas working in person and essential worker status were linked to lower odds. These findings highlight the need for public health and workplace policies that mitigate the impact of employment disruptions. Remote work arrangements should not be discouraged; rather, they should be supported through policies that promote social connection, stability and routine, helping to protect mental well-being while preserving the flexibility remote work provides.

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Conflicts of interest

Margaret de Groh is the journal's former Associate Editor-in-Chief and Paul Villeneuve is a former Associate Scientific Editor, but both have recused themselves from the review process for this article. The authors declare that they have no competing interests.

The study sponsors did not play a role in the study design, the collection, analysis, and interpretation of data, or the writing of the report. The CLSA team has approved the submission of this paper for publication.

Authors' contributions and statement

BF: Formal analysis, investigation, methodology, validation, writing—original draft, writing—review and editing.

YJ: Investigation, project administration, validation, writing—review and editing.

MdG: Conceptualization, funding acquisition, investigation, project administration, validation, writing—review and editing.

EFT: Conceptualization, funding acquisition, investigation, project administration, writing—review and editing.

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References

1. Hergenrather KC, Zeglin RJ, McGuire-Kuletz M, Rhodes SD. Employment as a social determinant of health: a systematic review of longitudinal studies exploring the relationship between employment status and physical health. Rehabil Res Policy Educ. 2015;29(1):2-26. https://doi.org/10.1891/2168-6653.29.1.2

2. Nordenmark M, Strandh M. Towards a sociological understanding of mental well-being among the unemployed: the role of economic and psychosocial factors. Sociology. 1999;33(3):577-97. https://doi.org/10.1177/s003803859900036x

3. Ebling S, Ebrahimi OV, Johnson SU, Skjerdingstad N, Hoffart A. Psychological well-being in times of COVID-19: associated factors and levels in the general population. Front Public Health. 2022;10. https://doi.org/10.3389/fpubh.2022.860863

4. Chanfreau J, Lloyd C, Byron C, Roberts C. Predicting wellbeing. England (UK): NatCen Social Research; 2013. https://doi.org/10.13140/2.1.3267.4564

5. Santomauro DF, Mantilla Herrera AM, Shadid J, Zheng P, Ashbaugh C, Pigott D, et al. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. Lancet. 2021;398(10312):1700-12. https://doi.org/10.1016/s0140-6736(21)02143-7

6. Beland LP, Brodeur A, Mikola D, Wright T. The short-term economic consequences of COVID-19: occupation tasks and mental health in Canada. Can J Econ. 2022;55(Suppl 1):214-47. https://doi.org/10.1111/caje.12543

7. Ruffolo M, Price D, Schoultz M, Leung J, Bonsaksen T, Thygesen H, et al. Employment uncertainty and mental health during the COVID-19 pandemic initial social distancing implementation: a cross-national study. Glob Soc Welf. 2021;8(2):141-50. https://doi.org/10.1007/s40609-020-00201-4

8. Plett D, Pechlivanoglou P, Coyte PC. The impact of provincial lockdown policies and COVID-19 case and mortality rates on anxiety in Canada. PsychiatryClinNeurosci.2022;76(9):468-74. https://doi.org/10.1111/pcn.13437

9. Bodner A, Ruhl L, Barr E, Shridhar A, Skakoon-Sparling S, Card KG. The impact of working from home on mental health: a cross-sectional study of Canadian worker's mental health during the third wave of the COVID-19 pandemic. Int J Environ Res Public Health. 2022;19(18):11588. https://doi.org/10.3390/ijerph191811588

10. Jacques-Aviñó C, López-Jiménez T, Medina-Perucha L, de Bont J, Gonçalves AQ, Duarte-Salles T, et al. Gender-based approach on the social impact and mental health in Spain during COVID-19 lockdown: a cross-sectional study. BMJ Open. 2020; 10(11):e044617. https://doi.org/10.1136/bmjopen-2020-044617

11. Kolakowsky-Hayner SA, Goldin Y, Kingsley K, Alzueta E, Arango-Lasprilla JC, Perrin PB, et al. Psychosocial impacts of the COVID-19 quarantine: a study of gender differences in 59 countries. Medicina. 2021;57(8):789. https://doi.org/10.3390/medicina57080789

12. Liu S, Yang L, Zhang C, Xu Y, Cai L, Ma S, et al. Gender differences in mental health problems of health care workers during the coronavirus disease 2019 outbreak. J Psychiatr Res. 2021; 137:393-400. https://doi.org/10.1016/j.jpsychires.2021.03.014

13. Seens H, Modarresi S, Fraser J, MacDermid JC, Walton DM, Grewal R. The role of sex and gender in the changing levels of anxiety and depression during the COVID-19 pandemic: a cross-sectional study. Womens Health. 2021;17:17455065211062964. https://doi.org/10.1177/17455065211062964

14. Jeong H, Yim HW, Lee SY, Jung DY. Impact of the COVID-19 pandemic on gender differences in depression based on national representative data. J Korean Med Sci. 2023;38(6):e36. https://doi.org/10.3346/jkms.2023.38.e36

15. Cogan N, McGibbon M, Gardiner A, Morton L. Understanding the mental health impacts of the COVID-19 pandemic on railway workers: risks and protective factors. J Occup Environ Med. 2023;65(2):172-83. https://doi.org/10.1097/jom.0000000000002711

16. Haar J, O'Kane C. A post-lockdown study of burnout risk amongst New Zealand essential workers. Soc Sci Med. 2022;306:115157. https://doi.org/10.1016/j.socscimed.2022.115157

17. González-Nuevo C, Postigo Á, González-Menéndez A, Alonso-Pérez F, Cuesta M, González-Pando D. Professional quality of life and fear of COVID-19 among Spanish nurses: a longitudinal repeated cross-sectional study. J Clin Nurs. 2023;33(1):357-67. https://doi.org/10.1111/jocn.16688

18. Lee J, Jang SN, Kim NS. Burnout among public health workers during the COVID-19 pandemic in South Korea. J Occup Environ Med. 2023;65(3):e141-6. https://doi.org/10.1097/jom.0000000000002773

19. Cahill AG, Olshavsky ME, Newport DJ, Benzer J, Chambers KM, Custer J, et al. Occupational risk factors and mental health among frontline health care workers in a large US metropolitan area during the COVID-19 pandemic. Prim Care Companion CNS Disord. 2022;24(2):21m03166. https://doi.org/10.4088/pcc.21m03166

20. Wang S, Kamerāde D, Bessa I, Burchell B, Gifford J, Green M, et al. The impact of reduced working hours and furlough policies on workers' mental health at the onset of COVID-19 pandemic: a longitudinal study. J Soc Policy. 2022;53(3):702-26. https://doi.org/10.1017/s0047279422000599

21. Barello S, Palamenghi L, Graffigna G. Burnout and somatic symptoms among frontline health care professionals at the peak of the Italian COVID-19 pandemic. Psychiatry Res. 2020;290: 113129. https://doi.org/10.1016/j.psychres.2020.113129

22. Ervasti J, Aalto V, Pentti J, Oksanen T, Kivimäki M, Vahtera J. Association of changes in work due to COVID-19 pandemic with psychosocial work environment and employee health: a cohort study of 24 299 Finnish public sector employees. Occup Environ Med. 2022;79(4):233-41. https://doi.org/10.1136/oemed-2021-107745

23. Wester CT, Bovil T, Scheel-Hincke LL, Ahrenfeldt LJ, Möller S, Andersen-Ranberg K. Longitudinal changes in mental health following the COVID-19 lockdown: results from the Survey of Health, Ageing, and Retirement in Europe. Ann Epidemiol. 2022;74:21-30. https://doi.org/10.1016/j.annepidem.2022.05.010

24. Raina P, Wolfson C, Kirkland S, Griffith LE, Balion C, Cossette B, et al. Cohort profile: the Canadian Longitudinal Study on Aging (CLSA). Int J Epidemiol. 2019;48(6):1752-3j. https://doi.org/10.1093/ije/dyz173

25. Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: evaluation of a short form of the CES-D. Am J Prev Med. 1994;10(2):77-84. https://doi.org/10.1016/s0749-3797(18)30622-6

26. Fu H, Si L, Guo R. What is the optimal cut-off point of the 10-item Center for Epidemiologic Studies Depression Scale for screening depression among Chinese individuals aged 45 and over? An exploration using latent profile analysis. Front Psychiatry. 2022;13. https://doi.org/10.3389/fpsyt.2022.820777

27. Stockwell S, Trott M, Tully M, Shin J, Barnett Y, Buttler L, et al. Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: a systematic review. BMJ Open Sport Exerc Med. 2021;7(1):e000960. https://doi.org/10.1136/bmjsem-2020-000960

28. SAS Institute Inc. SAS Software. 9.4 ed: SAS Institute Inc; 2023.

29. von Elm E AD, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. The Equator Network; 2024.

30. Matthews TA, Chen L, Omidakhsh N, Zhang D, Han X, Chen Z, et al. Gender difference in working from home and psychological distress - a national survey of U.S. employees during the COVID-19 pandemic. Ind Health. 2022;60(4):334-44. https://doi.org/10.2486/indhealth.2022-0077

31. Xue B, McMunn A. Gender differences in unpaid care work and psychological distress in the UK COVID-19 lockdown. PLoS One 2021;16(3): e0247959. https://doi.org/10.1371/journal.pone.0247959

32. Zamarro G, Prados MJ. Gender differences in couples' division of childcare, work and mental health during COVID-19. Rev Econ Househ. 2021; 19(1):11-40. https://doi.org/10.1007/s11150-020-09534-7

33. Pieh C, Budimir S, Humer E, Probst T. Comparing mental health during the COVID-19 lockdown and 6 months after the lockdown in Austria: a longitudinal study. Front Psychiatry. 2021;12: 625973. https://doi.org/10.3389/fpsyt.2021.625973

34. Ramiz L, Contrand B, Rojas Castro MY, Dupuy M, Lu L, Sztal-Kutas C, et al. A longitudinal study of mental health before and during COVID-19 lockdown in the French population. Global Health. 2021;17(1):29. https://doi.org/10.1186/s12992-021-00682-8

35. Gallagher S, Roy A, Domeracki SJ, Mohrmann T, Missar V, Jule J, et al. The low-wage essential worker: occupational concerns and needs in the COVID-19 pandemic—a round table. Workplace Health Saf. 2021;69(4): 154-60. https://doi.org/10.1177/2165079920988682

36. Humphrey A, March E, Lavender AP, Miller KJ, Alvarenga M, Mesagno C. Buffering the fear of COVID-19: social connectedness mediates the relationship between fear of COVID-19 and psychological wellbeing. Behav Sci. 2022;12(3):86. https://doi.org/10.3390/bs12030086

37. Hou WK, Lai FT, Ben-Ezra M, Goodwin R. Regularizing daily routines for mental health during and after the COVID-19 pandemic. J Glob Health. 2020;10(2):020315. https://doi.org/10.7189/jogh.10.020315

38. Pietrabissa G, Simpson SG. Psychological consequences of social isolation during COVID-19 outbreak. Front Psychol. 2020;11. https://doi.org/10.3389/fpsyg.2020.02201

39. Matli W. The changing work landscape as a result of the COVID-19 pandemic: insights from remote workers life situations in South Africa. Int J Sociol Soc Policy. 2020;40(9/10):1237-56. https://doi.org/10.1108/ijssp-08-2020-0386

40. Beck A, Crain AL, Solberg LI, Unützer J, Glasgow RE, Maciosk MV, et al. Severity of depression and magnitude of productivity loss. Ann Fam Med. 2011;9(4):305-11. https://doi.org/10.1370/afm.1260

41. Yoo K-B, Park E-C, Jang S-Y, Kwon JA, Kim JS, Cho K-H, et al. Association between employment status change and depression in Korean adults. BMJ Open. 2016;6(3):e008570. https://doi.org/10.1136/bmjopen-2015-008570

42. Washburn RA, Smith KW, Jette AM, Janney CA. The Physical Activity Scale for the Elderly (PASE): development and evaluation. J Clin Epidemiol. 1993;46(2):153-62. https://doi.org/10.1016/0895-4356(93)90053-4

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Original quantitative research

The impact of recreational cannabis legalization on pediatric emergency department visits in British Columbia, Canada

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Abstract

Introduction: Canadian youth report some of the highest rates of cannabis use globally, raising concerns about child and youth poisonings from unintentional exposures and recreational use following legalization. This study examines and compares trends in cannabis poisonings among children and youth aged 16 years or younger treated in the emergency department (ED) of a Canadian pediatric hospital before and after the legalization of non-medical cannabis.

Methods: Cannabis-related ED visits at BC Children's Hospital (BCCH) (2016–2021) were identified from the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) database using injury codes and keyword searches. Key variables included age, sex, intent, method of cannabis use, poisoning intent, season, peer use, and mode of ED arrival. Chi-square tests were used to assess associations between characteristics, and interrupted time series analysis evaluated legalization impact.

Results: There were 304 pediatric-related cannabis poisoning ED visits to BCCH between 2016 and 2021, increasing 55.5% from pre-legalization (n = 119) to post-legalization (n = 185). Unintentional poisonings rose from 4% to 12%, mainly involving the ingestion of edibles among children with a median age of 3 years. Ninety percent of cases involved intentional use, with co-consumption with other substances more common than cannabis use only. Interrupted time series analysis showed an upward trend in poisonings from 2016 to 2018, an immediate 48% increase in ED visits following legalization, followed by a decline.

Conclusion: Findings highlight the need for strengthened substance use prevention efforts, education programs, and continued surveillance to reduce harm among children and youth from intentional use and unintentional cannabis exposures, particularly involving edibles.

Keywords: *child, adolescent, cannabis, edibles, poisoning, risk, legislation*

Highlights

- ED visits at BC Children's Hospital related to unintentional cannabis consumption primarily affected children with a median age of 3 years, increasing from 4% pre-cannabis legalization to 12% post-legalization.
- ED visits at BC Children's Hospital related to poisoning from intentional cannabis use mostly involved individuals with an average age of 15 years, with co-consumption with other substances more common than cannabis-only both pre- and post-cannabis legislation.
- After legalization, youth co-consumption poisonings seen at BC Children's Hospital ED were more common among females, and youth cannabis-only poisonings increased on weekends.
- ED visits at BC Children's Hospital for cannabis poisoning rose from 2016 to 2018, spiked 48% at legalization, and declined in the post-cannabis legalization period.

Introduction

Canadian youth have some of the highest cannabis use rates worldwide, with 43% of youth aged 16 to 19 years reporting using cannabis at least once in the past 12 months as of 2023.[1,2] The enactment of Bill C-45 (*The Cannabis Act*) on 17 October 2018, legalized and regulated the production, distribution, sale and possession of cannabis in Canada.[3] While legalization was intended only for adults 18 years of age and older, it raised concern for increased intentional use as a result of increased access among adolescents and inadvertent exposure among young children, including unintentional poisonings.[4] Unintentional cases usually involve young children

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inadvertently ingesting cannabis products, especially edibles, whereas intentional cases are more common in adolescents and linked to recreational use, overconsumption, polysubstance use, or self-harm. Despite the high prevalence of cannabis use among Canadian youth prior to legalization, concerns remain that health risks may be escalating, as reflected by increases in emergency department (ED) visits and changes in presentation patterns.[5,6] These increases may result from increased social acceptability and shifts in perceptions, access, and consumption patterns among youth following cannabis legalization.[7-9]

In several US states with legalized recreational cannabis, intentional exposures among youth have risen (ages 12–24 years), reflected in increased ED visits, hospitalizations and poison control calls.[10-13] In Massachusetts, over half of intentional exposure calls among adolescents aged 15 to 19 years involved polysubstance use, most often alcohol.[10] Similar patterns appear in Canada, where adolescent cannabis-related ED visits and poison control centre calls increased following legalization, with most cases involving recreational use, many involving edibles, and self-harm exposures often involving multiple substances (ages 11–18).[14-17] In the Canadian provinces of Alberta and Ontario, ED cases rose after recreational cannabis legalization, with a 20% increase in youth poisonings, particularly among adolescents aged 12 to 17 years.[14] There are also notable changes in consumption patterns among youth in British Columbia (BC). The 2023 BC Adolescent Health Survey by the McCreary Centre Society showed a shift in cannabis consumption patterns, where compared to 2018, youth aged 12 to 18 were less likely to have smoked cannabis and more likely to have consumed it in edible form during their most recent use.[16]

Cannabis poses particular risks for children, who are susceptible to severe intoxication and long-term impacts on brain development.[18] US studies show rising pediatric poisonings after cannabis legalization (ages 0–12 years), mostly from young children unintentionally ingesting edibles.[19-24] Specifically in California, cannabis exposures rose sharply after legalization in 2016 and retail sales in 2018, with the largest increase in poison control calls among children under the age of 13 years and especially under the age of 6 years, driven by ingestion of cannabis gummies and candies.[25] Similar patterns have emerged in Canada, where edibles, including food and drink products infused with cannabis, were legalized in 2019.[26] Since then, unintentional pediatric exposures (ages 0–12 years), particularly from edibles, have risen, contributing to higher ED visits, hospitalizations and poison control calls across several provinces.[5,15,27-29] Data from the British Columbia Drug and Poison Information Centre (BC DPIC), which managed nearly 4000 cannabis-related calls between 2013 and 2021, show steady increases in calls even before legalization, with the highest rates in calls for unintentional edible exposures among children under the age of 5.[15] Another Canadian study found that among children aged 0 to 9 years, cannabis poisoning hospitalizations increased after dried cannabis flower legalization in 2018 and doubled after edibles legalization, where hospitalizations rose more in provinces permitting edibles (Ontario, Alberta, BC) compared to Quebec, a jurisdiction that prohibited edibles at that time.[30] As of 2025, all Canadian provinces and territories allow edible cannabis sales, with variations in rollout timelines; however, Quebec currently restricts products that may appeal to minors, such as sweets, chocolates and desserts, permitting only select edibles such as dried fruits and nuts.[31]

There was also a notable rise in substance use among children and youth in the USA and Canada during the COVID-19 pandemic, coinciding with increased poisoning-related ED visits compared to pre-pandemic levels, with cannabis accounting for a growing proportion of poisonings. Relative increases were observed among young children (ages 6 months to 5 years) and adolescents (aged 11–18 years), with elevated proportions persisting into young adulthood (up to 24 years).[13,17,32] One US study suggested that the increase in unintentional exposures among children aged 6 months to 5 years was likely linked to more time at home and greater availability of cannabis products in households.[32] As for youth aged 11 to 24, the increased ED visits, particularly for recreational use and intentional self-harm, may be attributed to pandemic-related stressors and disruptions to routines.[13,17]

Understanding the impact of legislative changes on cannabis poisonings can guide prevention policies, given young children's susceptibility to unintentional exposures and adolescents' risk of intentional, often polysubstance, use, which may harm their health.[33,34] A 2020 study examined cannabis poisonings in children and youth 16 years of age and younger seen at BC Children's Hospital (BCCH) before recreational cannabis legalization to establish a baseline.[35] The purpose of this study is to examine trends and patterns in cannabis poisonings among children and youth under 16 years of age, seen at BCCH following the 2018 legalization of cannabis for non-medical purposes in Canada, and includes factors such as co-consumption, routes of exposure, and product types. Analyzing these changes can identify emerging risks, evaluate the effectiveness of existing safeguards like packaging and product labelling requirements, and inform development of targeted education for caregivers and communities.

Ethics approval was obtained from The University of British Columbia (UBC), Children's and Women's Health Centre of British Columbia (CW), Research Ethics Board; certificate number H23-00948.

Methods

Data collection and extraction

Data on cannabis poisoning-related ED visits at BCCH from 1 January 2016 to 31 December 2021 were extracted from the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) database. CHIRPP is an ED surveillance system that records injury cases, including poisonings, through the completion of forms collected at registration by patients or their caregivers. Cannabis-related poisoning cases were identified using CHIRPP codes "50NI" (poisoning or toxic effect) and "900BP" (body part not required), along with a keyword search in the injury descriptions for terms such as "cannabis," "hash," "CBD," "marijuana," "weed," "THC," "bong," or "edible." To ensure completeness, injury descriptions were reviewed to capture any missed cases.

Description of variables

Key variables extracted included age, sex, intent of cannabis consumption, intent of poisoning, patient disposition, time of cannabis use, season, method of cannabis use, peer substance use, treatment-seeking individual, and mode of ED arrival.

Cannabis use was classified as unintentional (e.g. young children inadvertently ingesting edibles) or intentional (deliberate use for psychoactive effects). The intent of poisoning was classified as intentional

(including but is not exclusive to self-harm or harm by others) or unintentional. Time of poisoning was categorized by time of day—morning (12:00 a.m.–11:59 a.m.), afternoon (12:00 p.m.–5:59 p.m.), and evening (6:00 p.m.–11:59 p.m.)—and by day of the week, grouped into weekdays (Monday to Friday) and weekends (Saturday and Sunday). Seasons were defined as spring (March–May), summer (June–August), autumn (September–November), and winter (December–February). Method of cannabis use included inhalation (e.g. joint, bong, vaporizer), ingestion (e.g. brownies, gummies), or both. Peer substance use indicated whether substances were used with peers. The treatment-seeking individual was the person who brought the patient to the ED—categorized as a bystander (not involved and unrelated), family or friend, or the patient themself. Mode of ED arrival included emergency health services (e.g. ambulance or police), family, or other (e.g. self-admittance, social worker, or friend).

Data analyses

Chi-square tests were used to assess whether the distribution of cannabis-only and co-consumption poisoning cases differed across categorical variables such as sex and timing. An interrupted time series (ITS) analysis using segmented Poisson regression evaluated the immediate and long-term impact of cannabis legalization on cannabis poisoning-related ED visits. Due to the low number of monthly cases, data were aggregated quarterly, resulting in only 24 data points available for analysis. Given the small number of observations, the study was underpowered to detect modest effect, and significance was assessed at the 10% level to reduce the risk of false negatives.

The post-legalization period was defined as starting on 1 January 2019 to account for the gradual rollout and limited initial supply from licensed cannabis producers.[36] The study period was divided into pre-legalization (Q1 2016–Q4 2018) and post-legalization (Q1 2019–Q4 2021). The outcome variable was the number of cannabis poisoning cases, and the exposure variable was cannabis legalization, marked in Q1 2019. To capture the multiplicative effect of quarterly changes, the ITS model coefficient was exponentiated to produce a rate ratio. All the data analyses were conducted using R, version 4.2.3.[37]

Results

During the 3-year pre-legalization period (January 2016–December 2018), there were 119 ED visits for pediatric cannabis poisoning at BCCH.[35] After legalization (January 2019–December 2021), this rose to 185 cases, representing a 55.5% increase. In both periods, over 85% of cases involved intentional cannabis use, with few resulting from unintentional consumption.

Unintentional cannabis consumption

After cannabis legalization, 12% of cannabis-related poisonings at BCCH involved unintentional consumption, compared to 4% pre-legalization.[35] In both periods, the median age was 3 years, with most cases involving the ingestion of edibles like cookies, gummies or chocolate. Most patients were treated and discharged from the ED, with few requiring admissions.

Before legalization, 80% of ED visits related to unintentional cannabis consumption involved males, with 73% on weekends.[35] After legalization, 59% involved females, with most on weekdays. In the post-legalization period, 90% of cases occurred after edibles were legalized in late 2019.

Intentional cannabis consumption

Intentional cannabis use was classified as cannabis-only or co-consumption with alcohol, illicit drugs, or medications. It accounted for 96% of cases pre-legalization and 88% post-legalization. Among 114 pre-legalization cases, 29% involved cannabis only and 71% co-consumption.[35] Post-legalization, 34% of the 163 patients used cannabis only, and 66% reported co-consumption.

The demographic comparison of intentional cannabis poisoning at BCCH before and after legalization is presented in Table 1. The median patient age was 15 years (IQR:14–16 years) for both periods. Pre-legalization, cannabis-only and co-consumption cases were evenly distributed by sex ($p = 0.29$).[35] Post-legalization, male cases were more likely to be cannabis-only use, while co-consumption was more common among females ($p = 0.01$). For co-consumption specifically, males were more likely to co-consume before legalization, while females were more likely to co-consume afterward ($p < 0.01$). Over 85% of cannabis poisonings were due to recreational use rather than self-harm or assault. Nearly 90% of patients were treated or observed in the ED and discharged during both periods.

During the pre-legalization period, cannabis-only and co-consumption poisoning differed significantly in timing (Table 2).[35] Nearly half of cannabis-only cases occurred in the afternoon, with the rest occurring in the evening ($p < 0.01$).[35] Co-consumption cases occurred mostly in the evening (58%), followed by morning (24%) and afternoon (16%) ($p = 0.01$).[35] Post-legalization, time of day was unknown for 33% of cannabis-only cases and 58% of co-consumption cases. Poisonings were more common on weekdays pre-legalization ($p = 0.01$)[35] with a rise in weekend cannabis-only poisonings observed post-legalization. Seasonality was associated with poisoning type pre-legalization ($p = 0.05$), with fewer cannabis-only cases in spring (15%) and fewer co-consumption cases in winter (12%).[35] No seasonal association was found post-legalization.

Inhalation alone was the most common method of cannabis consumption for both cannabis-only and co-consumption poisonings (Table 3). Over half of cannabis poisoning cases involved peer substance use for both cannabis-only and co-consumption for both periods. Pre-legalization, individuals who used only cannabis were most often brought in by family members, and those who co-consumed cannabis with other substances were more often brought in by both bystanders and family ($p = 0.01$). Post-legalization, family continued to be the main group helping individuals access treatment, for both cannabis-only use and co-use with alcohol. Emergency health services (EHS), including police and ambulance (ground or air), accounted for most ED arrivals for both cannabis-only and co-consumption poisonings during both the pre- and post-legalization periods.

Impact of cannabis legalization

The observed and predicted trends in child cannabis poisoning cases are shown in Figure 1, highlighting the impact of the cannabis legislation, with the interrupted time series results provided in Table 4. From 2016 to 2021, there was a non-significant average increase per quarter of 4.6% in the number of BCCH ED cannabis poisoning cases. Cannabis legalization was associated with an immediate increase of 47.9% (90% confidence interval [CI]:

TABLE 1
Demographics of patients seen at the emergency department of British Columbia Children's Hospital due to poisoning resulting from the intentional consumption of cannabis, pre- and post-legalization, CHIRPP, January 2016 to December 2021

Descriptive	Substance used					
	Pre-legalization January 2016–December 2018 (n = 114)			Post-legalization January 2019–December 2021 (n = 163)		
	Cannabis co-consumption		Chi-square χ^2, *p*, *df*	Cannabis co-consumption		Chi-square χ^2, *p*, *df*
	No n (%)	Yes n (%)		No n (%)	Yes n (%)	
Median age in years (IQR)	15 (14–15)	15 (14–16)		15 (14–15)	15 (14–16)	
Sex						
Male	16 (49%)	48 (59%)	$\chi^2 = 1.11$, $p = 0.29$, $df = 1$	33 (60%)	39 (36%)	$\chi^2 = 7.49$, $p = 0.01$, $df = 1$
Female	17 (52%)	33 (41%)		22 (40%)	69 (64%)	
Intent of poisoning						
Unintentional	45 (98%)	59 (87%)		53 (96%)	87 (81%)	
Intentional self-harm	[a]	6 (9%)	[b]	[a]	12 (11%)	[b]
Other intents	[a]	[a]		[a]	8 (7%)	
Patient disposition						
No treatment (advice only, diagnostic testing, referred to GP)	7 (21%)	19 (24%)		16 (29%)	21 (19%)	
Treated, follow-up may or may not be required	7 (21%)	27 (33%)		17 (36%)	35 (32%)	
Observation, follow-up may or may not be required	16 (49%)	26 (32%)	[b]	12 (22%)	31 (29%)	[b]
Admittance into hospital for treatment	[a]	8 (10%)		5 (11%)	13 (12%)	
Other treatments	[a]	[a]		[a]	8 (7%)	

Abbreviations: CHIRPP, Canadian Hospitals Injury Reporting and Prevention Program; *df*, degrees of freedom; GP, general practitioner; IQR, interquartile range.

Notes: Pre-legalization table adapted from Table 1 in Cheng P et al.[35] Adapted with permission.

"Other intents" are unspecified assault or event of undetermined intent.

Other treatments are admitted primarily for a reason other than poisoning treatment.

[a] Absolute frequencies of fewer than five.

[b] Absence of a χ^2 test due to the violation of one or more assumptions of the test.

3.0%–113.1%) in cannabis poisoning cases. This increase was statistically significant at the 10% level ($p = 0.076$). Since the 2019 legalization, cannabis poisoning cases have declined by 7.1% per quarter (90% CI: −12.3%, −1.8%, $p = 0.030$), a decrease that is statistically significant at the 5% level.

Discussion

Our study showed that cannabis-related ED visits at BCCH rose yearly from 2016 to 2018, with an immediate 48% increase at legalization, after which the rate of increase declined. Data from the McCreary Centre Society showed that self-reported cannabis uses among youth aged 12 to 19 years fell from 25% in 2018 to 22% in 2023.[16] BC DPIC reported that although cannabis poisoning calls rose from 2013 through 2021, cannabis legalization did not have an immediate effect on the rate of cannabis poisoning cases, and that the rate of increase slowed post-legalization.[15]

Building on these trends, unintentional cannabis poisonings remain a concern, particularly among young children. Our findings showed that during the post-legalization period, 90% of inadvertent cannabis consumption by young children occurred after the legalization of edibles in late 2019. This pattern extended beyond BC, as hospitalization data from Ontario and Alberta show a rise in unintentional cannabis poisonings among children aged 0 to 9 years with the increase in the commercial sale of cannabis edibles in 2019.[30] BC DPIC reported that children under the age of 5 years consistently had the highest rates of unintentional cannabis edible exposures from 2013 to 2021. While poison centre calls involving edibles continued to rise after legalization, the pace of increase was slower than during the pre-legalization period.[15] Despite this difference from our ED findings, the continued rise in pediatric exposures points to greater household availability of cannabis edibles post-legalization, increasing the risk of unintentional ingestion. Canada's *Cannabis Act* requires all cannabis products to be sold in plain packaging and child-resistant containers, restricts promotions that could appeal to youth, mandates Health Warning Messages on packaging as well as display of the standardized cannabis symbol, and limits edible cannabis to a maximum of 10 mg THC per package to reduce the risk of

TABLE 2
Temporal distribution of cannabis and co-consumption poisoning due to intentional consumptions seen at the emergency department of British Columbia Children's Hospital, pre- and post-legalization, CHIRPP, January 2016 to December 2021

Descriptive	Substance used					
	Pre-legalization January 2016–December 2018 (n = 114)			Post-legalization January 2019–December 2021 (n = 163)		
	Cannabis co-consumption		Chi-square χ^2, *p*, *df*	Cannabis co-consumption		Chi-square χ^2, *p*, *df*
	No n (%)	Yes n (%)		No n (%)	Yes n (%)	
Time of the day						
Morning	[a]	19 (24%)	**$\chi^2 = 11.86$, p < 0.01, df = 2**	7 (13%)	12 (11%)	[b]
Afternoon	15 (46%)	13 (16%)		18 (33%)	17 (16%)	
Evening	14 (42%)	47 (58%)		12 (22%)	16 (15%)	
Unknown	[a]	[a]		18 (33%)	63 (58%)	
Time of the week						
Weekday	30 (91%)	56 (69%)	**$\chi^2 = 6.00$, p = 0.01, df = 1**	39 (71%)	70 (65%)	$\chi^2 = 0.37$, $p = 0.54$, $df = 1$
Weekend	[a]	25 (31%)		16 (29%)	38 (35%)	
Season						
Spring	5 (15%)	23 (28%)	$\chi^2 = 7.76$, p = 0.05, df = 3	9 (16%)	17 (16%)	$\chi^2 = 5.39$, $p = 0.15$, $df = 3$
Summer	10 (30%)	18 (22%)		20 (36%)	26 (24%)	
Autumn	8 (24%)	30 (37%)		18 (33%)	33 (31%)	
Winter	10 (30%)	10 (12%)		8 (15%)	32 (30%)	
Year						
2016	8 (24%)	27 (33%)	[c]	[c]	[c]	[c]
2017	10 (30%)	25 (31%)	$\chi^2 = 1.2$, $p = 0.55$, $df = 2$	[c]	[c]	
2018	15 (46%)	29 (36%)		[c]	[c]	
2019	[c]	[c]		23 (42%)	49 (45%)	
2020	[c]	[c]		20 (36%)	28 (26%)	$\chi^2 = 2.11$, $p = 0.35$, $df = 2$
2021	[c]	[c]		12 (22%)	31 (29%)	

Abbreviations: CHIRPP, Canadian Hospitals Injury Reporting and Prevention Program; *df*, degrees of freedom.

Notes: Pre-legalization table adapted from Table 2 in Cheng P et al.[35] Adapted with permission.

Bolded values indicate significant findings at the $p < 0.05$ level.

[a] Absolute frequencies of fewer than five.

[b] Due to a large number of unknown cases distorting the analysis, the chi-squared results are not displayed.

[c] Absence of a χ^2 test due to the violation of one or more assumptions of the test.

unintentional overconsumption.[38] Nevertheless, overconsumption may still occur if multiple packages are opened and stored together, illicit products are used or if products are made at home. These findings highlight the need for stronger poisoning prevention strategies, including public education on safe storage and awareness to help families distinguish legal from illegal products, as well as continued efforts to shift consumers toward the legal market.

Nearly 90% of pediatric cannabis-related ED visits in BC involved intentional use, mainly among youth with an average age of 15 years, with inhalation being the most common mode of consumption both before and after legalization. This ongoing predominance likely reflects, in part, the legalization of inhaled cannabis extracts in late 2019. Age-based differentiation in routes of exposure aligns with previous research—that ingestion is more common in children under 10 years of age while inhalation tends to be more prevalent among older youth, highlighting age-specific differences in access and modes of consumption.[10,11,21] In Canada, intentional cannabis use among youth is frequently associated with the co-consumption of other substances, particularly alcohol.[35] This pattern is not unique to Canada, as European surveys of youth aged 15 to 20 years report most adolescent cannabis use occurs with alcohol, and US surveys indicate that about 20% of Grade 12 students use alcohol and cannabis simultaneously.[39,40] Teens who co-consume alcohol and cannabis tend to exhibit more problematic behavioural and substance use profiles; they smoke and drink more, and are more likely to experience social and behavioural challenges.[41]

TABLE 3
Characteristics of cannabis and co-consumption poisonings from intentional consumptions seen at the emergency department of British Columbia Children's Hospital, pre- and post-legalization, CHIRPP, January 2016 to December 2021

Descriptive	Substance used					
	Pre-legalization January 2016–December 2018 (n = 114)			Post-legalization January 2019–December 2021 (n = 163)		
	Cannabis co-consumption		Chi-square χ^2, *p*, *df*	Cannabis co-consumption		Chi-square χ^2, *p*, *df*
	No n (%)	Yes n (%)		No n (%)	Yes n (%)	
Method of cannabis use						
Inhalation	20 (67%)	59 (81%)	[b]	27 (53%)	56 (55%)	[b]
Ingestion	10 (33%)	[a]		14 (27%)	14 (14%)	
Multiple	[a]	[a]		[a]	[a]	
Unknown	[a]	10 (14%)		6 (12%)	30 (29%)	
Peer substance use						
No	11 (33%)	13 (16%)	$\chi^2 = 2.93$, $p = 0.09$, $df = 1$	8 (15%)	9 (8%)	[c]
Yes	18 (55%)	49 (61%)		18 (33%)	58 (54%)	
Unknown	[a]	19 (24%)		29 (53%)	41 (38%)	
Treatment-seeking individual						
Bystander	[a]	32 (40%)	**$\chi^2 = 9.14$, $p = 0.01$, $df = 2$**	13 (24%)	28 (26%)	[c]
Patient	8 (24%)	9 (11%)		5 (9%)	10 (9%)	
Family	15 (45%)	28 (35%)		16 (29%)	43 (40%)	
Unknown	6 (18%)	9 (15%)		21 (38%)	27 (25%)	
Mode of ED arrival						
EHS	23 (70%)	72 (89%)	[b]	28 (51%)	82 (76%)	[b]
Family	7 (21%)	5 (6%)		9 (16%)	10 (9%)	
Other(s)	[a]	[a]		[a]	[a]	
Unknown	[a]	[a]		17 (31%)	15 (14%)	

Abbreviations: CHIRPP, Canadian Hospitals Injury Reporting and Prevention Program; *df*, degrees of freedom; ED, emergency department; EHS, emergency health services.

Notes: Pre-legalization table adapted from Table 3 in Cheng P et al.[35] Adapted with permission.

Bolded values indicate significant findings at the $p < 0.05$ level.

[a] Absolute frequencies of fewer than five.

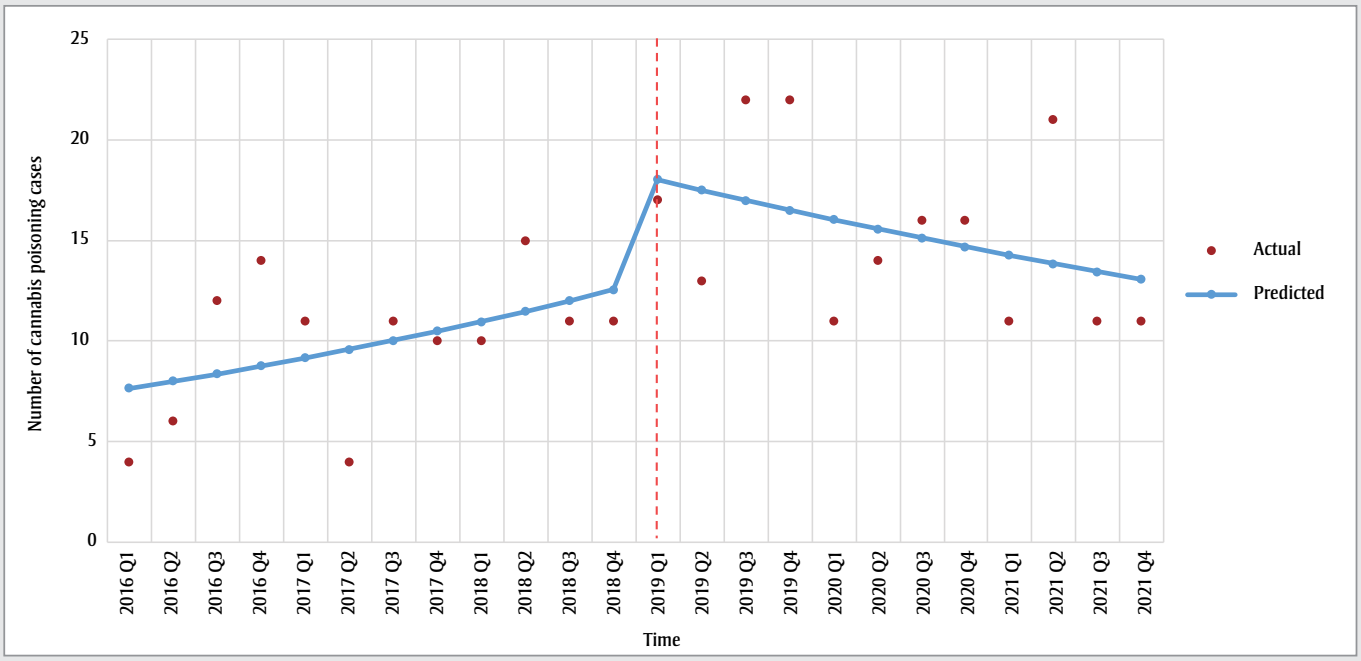
[b] Absence of a χ^2 test due to the violation of one or more assumptions of the test.

[c] Due to a large number of unknown cases distorting the analysis, the chi-squared results are not displayed.

Sex-based patterns in intentional consumption shifted after legalization. Before legalization, cannabis-only and co-consumption poisonings were similarly distributed between males and females. Post-legalization, females were more likely to present with co-consumption and accounted for a larger proportion of ED admissions. This may reflect the overlap with the COVID-19 pandemic, during which some evidence suggests that adolescent girls were more likely to use cannabis as a coping mechanism.[13] Another possible factor is the increased social acceptability of cannabis following legalization, which may have particularly influenced female youth.[42] The narrowing gender gap in cannabis use appears to be shaped by changing social and gender norms, as well as increased accessibility and normalization.

According to the McCreary Centre Society, youth most often cite experimentation, fun and peer influence as reasons for cannabis use, though some report using it to manage stress or pain.[16] Strengthening family communication and school connectedness may help reduce risks, as a 2022 study found both factors had a direct protective effect against recent cannabis use among middle and high school students.[43] School connectedness includes feeling cared for and participating in school activities; and supportive family practices include regular family meals, family routines, and strong parent-child relationships.[44] A meta-analysis of youth cannabis prevention programs found that school-based prevention programs combining drug education with emotional and behavioural skill-building are more effective than those relying only on social influence (e.g. resisting peer pressure).[45] School-based programs that last longer tend to be more effective at reducing cannabis use among youth. These programs produce stronger outcomes by making students less likely to

FIGURE 1
Interrupted time series analysis of cannabis poisonings seen at the emergency department of British Columbia Children's Hospital, pre- and post-legalization, CHIRPP, January 2016 to December 2021



Abbreviation: CHIRPP, Canadian Hospitals Injury Reporting and Prevention Program.

Note: The red dotted line represents the timing of cannabis legalization as defined in this study.

start or more likely to reduce cannabis use, as longer duration allows more opportunities to reinforce prevention messages.[45]

Beyond school-based programs, strong regulations play a critical role in preventing youth cannabis use. In Canada and the USA, similar strict age limits apply, legalizing cannabis use for adults aged 18 years and older. Licensed retailers must verify the customer's age for all purchases, often using scanners, making it difficult for underage individuals to purchase cannabis.[46] For online purchases, customers are required to confirm their age at the point of sale, and upon delivery, couriers must verify the recipient's age by checking government-issued identification to ensure compliance with legal requirements.[47] Additionally, regulations limit the proximity of cannabis stores to sensitive areas; for instance, Ontario requires a minimum distance of 150 metres from schools, Alberta mandates 100 metres, and Edmonton has extended buffers to 200 metres from schools, parks and libraries.[48] Because of these strict regulations, youth face barriers to accessing cannabis through legal channels and often turn to illegal markets, where no such restrictions exist.[49] The McCreary Centre Society survey found that 10% of youth aged 12 to 18 years reported buying cannabis from a store, and 3% had bought it online.[16] While the survey did not specify whether it was from the illegal market, the findings highlight the ongoing need to strengthen efforts to limit youth access to cannabis.

Strengths and limitations

Few studies have examined the impact of cannabis legalization in BC. This paper builds upon our prior work, which analyzed the landscape of pediatric cannabis poisonings at BCCH before legalization.[35] By continuing surveillance and analyzing patient records following legalization, this study examines post-legalization records to show how policy changes affected pediatric cannabis-related ED visits.

The study period includes the COVID-19 pandemic, during which data collection practices were adapted to minimize virus transmission. To reduce contact, CHIRPP forms were not distributed to patients; incident details were abstracted from medical

TABLE 4
Interrupted time series analysis of cannabis poisonings seen at the emergency department of British Columbia Children's Hospital in relation to cannabis legalization, CHIRPP, January 2016 to December 2021

Predictor	% change (from rate ratio)	90% confidence interval	*p* value
Pre-legalization trend	4.6%	0.1%, 9.3%	0.093*
Change at time of legalization	47.9%	3.0%, 113.1%	0.076*
Trend since legalization	−7.1%	−12.3%, −1.8%	0.030*

Abbreviation: CHIRPP, Canadian Hospitals Injury Reporting and Prevention Program

* Indicates statistical significance at the 10% level ($p < 0.10$).

charts; staff contact with patients was limited, and discharges were expedited due to COVID-19 policies that restricted in-person interactions to reduce the risk of infection. Because of the overlap with the COVID-19 pandemic, it is not possible to disentangle the effects of cannabis legalization from pandemic-related shifts in health care use and youth-substance-use patterns. Although Canadian data showed a decline in youth substance-related ED visits during the early pandemic period, this may be attributed to changes in care-seeking behaviour, particularly if poisoning cases were milder and less likely to visit hospital.[50] Therefore, ED visit data may be undercounted. Another limitation pertains to the ascertainment of intent, as limited interaction with patients during the pandemic made it more difficult to assess whether the poisoning was intentional or unintentional. Ongoing surveillance of pediatric ED visits in the post-legalization and post-pandemic periods is essential for tracking trends and patterns in cannabis-related harms. This will allow the public to evaluate the effectiveness of current regulations, and inform timely, evidence-based policy and prevention strategies.

Conclusion

The number of pediatric-related cannabis ED visits seen at BCCH rose from 119 pre-legalization to 185 post-legalization; however, while visits were rising, the rate of increase declined following legalization. Most cannabis poisonings involved intentional inhalation, with a median age of 15 years, across both pre- and post-legalization periods. After legalization, females were more likely to present with co-consumption and accounted for a larger proportion of ED visits. This study highlights the characteristics of unintentional and intentional cannabis exposures among children and youth. These findings underscore the importance of ongoing surveillance, including the need to create positive social environments, promote school-based education programs, and increased enforcement to reduce youth access and minimize harm among children and youth. The post-legalization shifts in sex-based patterns, including rises in co-consumption among adolescent females, point to the need for gender-sensitive substance use prevention strategies. In addition, the rise in unintentional edible exposures among young children reinforces the need for strengthened poisoning prevention efforts, particularly targeting cannabis edibles.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Authors' contributions and statement

AZ, SB, PC conceptualized the plan and objectives for this study. AZ led the data collection. MX conducted the analyses and interpretation of the results, and drafted the manuscript. AI conducted the literature review, drafted the manuscript and contributed to interpreting results. FR, KQ, MK helped with the analysis and interpretation of the results. KT provided support with the ethics application and interpretation. All authors contributed to the review and revision of the manuscript. All authors read and approved the final manuscript.

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References

1. Health Canada. Health Canada releases new data on cannabis use in Canada [Internet]. Ottawa (ON): Health Canada; 2024 [cited 2024 May 2]. Available from: https://www.canada.ca/en/health-canada/news/2024/01/health-canada-releases-new-data-on-cannabis-use-in-canada.html

2. Charrier L, van Dorsselaer S, Canale N, Baska T, Kilibarda B, Comoretto RI, et al. A focus on adolescent substance use in Europe, central Asia and Canada: Health Behaviour in School-aged Children international report from the 2021/2022 survey, Volume 3 [Internet]. Copenhagen (DK): WHO Regional Office for Europe; 2024 [cited 2024 May 2]. Available from: https://www.who.int/europe/publications/i/item/9789289060936

3. Justice Canada. *Cannabis legalization and regulation* [Internet]. Ottawa (ON): Justice Canada; 2021 [cited 2025 Nov 5]. Available from: https://www.justice.gc.ca/eng/cj-jp/cannabis/

4. Karbakhsh M, Smith J, Pike I. "Where does the high road lead?" Potential implications of cannabis legalization for pediatric injuries in Canada. Can J Public Health. 2018;109(5-6):752-5. http://doi.org/10.17269/s41997-018-0137-3

5. Varin M, Champagne A, Venugopal J, Li L, McFaull SR, Thompson W, et al. Trends in cannabis-related emergency department visits and hospitalizations among children aged 0–11 years in Canada from 2015 to 2021: spotlight on cannabis edibles. BMC Public Health. 2023;23(1):2067. https://doi.org/10.1186/s12889-023-16987-9

6. Yeung MEM, Weaver CG, Janz K, Haines-Saah R, Lang E. Clearing the air: a study of cannabis related presentations to urban Alberta emergency departments following legalization. CJEM. 2020;22(6):776-83. https://doi.org/10.1017/cem.2020.384

7. Fischer B, Russell C, Sabioni P, van den Brink W, Le Foll B, Hall W, et al. Lower-Risk Cannabis Use Guidelines: a comprehensive update of evidence and recommendations. Am J Public Health. 2017;107(8):e1-12. https://doi.org/10.2105/AJPH.2017.303818

8. Stone AL. Adolescent cannabis use and perceived social norm trends pre- and post-implementation of Washington State's liberalized recreational cannabis policy: Healthy Youth Survey, 2008–2018. Prev Sci. 2020;21(6):772-83. https://doi.org/10.1007/s11121-020-01136-0

9. Zuckermann AME, Gohari MR, Romano I, Leatherdale ST. Changes in cannabis use modes among Canadian youth across recreational cannabis legalization: data from the COMPASS prospective cohort study. Addict Behav. 2021;122:107025. https://doi.org/10.1016/j.addbeh.2021.107025

10. Whitehill JM, Harrington C, Lang CJ, Chary M, Bhutta WA, Burns MM, et al. Incidence of pediatric cannabis exposure among children and teenagers aged 0 to 19 years before and after medical marijuana legalization in Massachusetts. JAMA Netw Open. 2019; 2(8):e199456. https://doi.org/10.1001/jamanetworkopen.2019.9456

11. Wang GS, Davies SD, Halmo LS, Sass A, Mistry RD. Impact of marijuana legalization in Colorado on adolescent emergency and urgent care visits. J Adolesc Health. 2018;63(2):239-41. https://doi.org/10.1016/j.jadohealth.2017.12.010

12. Harvey T, Gomez R, Wolk B, Ozcan A. Varied presentations of pediatric patients with positive cannabinoid tests. Cureus. 2022;14(3):e2349. https://doi.org/10.7759/cureus.23493

13. Roehler DR, Smith H IV, Radhakrishnan L, Holland KM, Gates AL, Vivolo-Kantor AM, et al. Cannabis-involved emergency department visits among persons aged < 25 years before and during the COVID-19 pandemic — United States, 2019–2022. Morb Mortal Wkly Rep. 2023;72:758-65. https://doi.org/10.15585/mmwr.mm7228a1

14. Callaghan RC, Sanches M, Vander Heiden J, Kish, S. Impact of Canada's cannabis legalisation on youth emergency department visits for cannabis-related disorders and poisoning in Ontario and Alberta, 2015-2019. Drug Alcohol Rev. 2023;42(5):1104-13. https://doi.org/10.1111/dar.13637

15. Trieu J, Dobbin N, Henderson SB, McVea D. Impact of legalization on cannabis exposure calls to the British Columbia Poison Control Centre. Can J Public Health. 2025. https://doi.org/10.17269/s41997-025-01022-8

16. Smith A, Peled M, Poon C, Anderson L, Casey E. Blunt Talk III: cannabis use among BC youth aged 12–18. Vancouver (BC): McCreary Centre Society; 2025.

17. Zhang EWJ, Davis A, Finkelstein Y, Rosenfield D. The effects of COVID-19 on poisonings in the paediatric emergency department. Paediatr Child Health. 2022;27(Suppl 1):S4-8. https://doi.org/10.1093/pch/pxab100

18. Stoner MJ, Dietrich A, Lam SH, Wall JJ, Sulton C, Rose E. Marijuana use in children: an update focusing on pediatric tetrahydrocannabinol and cannabidiol use. Clinical Toxicology. 2023;61(8):591-8. https://doi.org/10.1080/15563650.2023.2238121

19. Thomas AA, Von Derau K, Bradford MC, Moser E, Garrard A, Mazor S. Unintentional pediatric marijuana exposures prior to and after legalization and commercial availability of recreational marijuana in Washington State. J Emerg Med. 2019;56(4):398-404. https://doi.org/10.1016/j.jemermed.2019.01.004

20. Thomas AA, Dickerson-Young T, Mazor S. Unintentional pediatric marijuana exposures at a tertiary care children's hospital in Washington State: a retrospective review. Pediatr Emerg Care. 2021;37(10):e594-8. https://doi.org/10.1097/PEC.0000000000001703

21. Dean D, Passalacqua KD, Oh SM, Aaron C, Van Harn MG, King A. Pediatric cannabis single-substance exposures reported to the Michigan Poison Center from 2008–2019 after medical marijuana legalization. J Emerg Med. 2021;60(6):701-8. https://doi.org/10.1016/j.jemermed.2020.12.028

22. Wang GS, Hoyte C, Roosevelt G, Heard K. The continued impact of marijuana legalization on unintentional pediatric exposures in Colorado. Clin Pediatr. 2019;58(1):114-6. https://doi.org/10.1177/0009922818805206

23. Wang GS, Le Lait MC, Deakyne SJ, et al. Unintentional pediatric exposures to marijuana in Colorado, 2009–2015. JAMA Pediatr. 2016;170(9):e160971. https://doi.org/10.1001/jamapediatrics.2016.0971

24. Wang GS, Roosevelt G, Le Lait MC, Deakyne SJ, Bronstein AC, Bajaj L, et al. Association of unintentional pediatric exposures with decriminalization of marijuana in the United States. Ann Emerg Med. 2014;63(6):684-9. https://doi.org/10.1016/j.annemergmed.2014.01.017

25. Roth W, Tam M, Bi C, Kim J, Lewis J, Ho Raymond, et al. Changes in California cannabis exposures following recreational legalization and the COVID-19 pandemic. Clin Toxicol. 2022;60(5):632-8. https://doi.org/10.1080/15563650.2021.2006212

26. Health Canada. Regulations under the Cannabis Act [Internet]. Ottawa (ON): Health Canada; 2019 [cited 2024 May 15]. Available from: https://www.canada.ca/en/health-canada/sevices/drugs-medication/cannabis/laws-regulations/regulations-suport-cannabis-act.html

27. Coret A, Rowan-Legg A. Unintentional cannabis exposures in children pre- and post-legalization: a retrospective review from a Canadian paediatric hospital. Paediatr Child Health. 2022; 27(5):265-71. https://doi.org/10.1093/pch/pxab090

28. Myran DT, Cantor N, Finkelstein Y, Pugilese M, Guttman A, Jesseman R, et al. Unintentional pediatric cannabis exposures after legalization of recreational cannabis in Canada. JAMA Netw Open. 2022;5(1):e2142521. https://doi.org/10.1001/jamanetworkopen.2021.42521

29. Cohen N, Galvis Blanco L, Davis A, Kahane A, Mathew M, Schuh S, et al. Pediatric cannabis intoxication trends in the pre and post-legalization era. Clin Toxicol (Phila). 2022;60(1):53-8. https://doi.org/10.1080/15563650.2021.1939881

30. Myran DT, Tanuseputro P, Auger N, Konikoff L, Talarico R, Finkelstein Y. Pediatric hospitalizations for unintentional cannabis poisonings and all-cause poisonings associated with edible cannabis product legalization and sales in Canada. JAMA Health Forum. 2023; 4(1):e225041. https://doi.org/10.1001/jamahealthforum.2022.5041

31. Rowe DJ. Cannabis-infused poutine sauce, jerky, nuts among new edible options in Quebec [Internet]. CTV News; 2024 [cited 2025 May 13]. Available from: https://www.ctvnews.ca/montreal/article/cannabis-infused-poutine-sauce-jerky-nuts-among-new-edible-options-in-quebec/

32. Laudone TW, Leonard JB, Hines EQ, Seung H, Klein-Schwartz. Changes in unintentional cannabis exposures in children 6 months to 5 years reported to United States poison centers during the first nine months of the coronavirus-19 pandemic. Clin Toxicol. 2022; 60(9):1029-31. https://doi.org/10.1080/15563650.2022.2064867

33. Burggren AC, Shirazi A, Ginder N, London ED. Cannabis effects on brain structure, function, and cognition: considerations for medical uses of cannabis and its derivatives. Am J Drug Alcohol Abuse. 2019;45(6):563-79. https://doi.org/10.1080/00952990.2019.1634086

34. Jacobus J, Tapert SF. Effects of cannabis on the adolescent brain. Curr Pharm Des. 2014;20(13):2186-93. http://doi.org/10.2174/13816128113199990426

35. Cheng P, Zagaran A, Rajabali F, Turcotte K, Babul S. Setting the baseline: a description of cannabis poisonings at a Canadian pediatric hospital prior to the legalization of recreational cannabis. Health Promot Chronic Dis Prev Can. 2020;40(5/6):193-200. http://doi.org/10.24095/hpcdp.40.5/6.08

36. Cherney MA. Canada's struggle to supply legal weed described as 'national shortage' that could last months [Internet]. MarketWatch; 2018 [cited 2025 Apr 22]. Available from: https://www.marketwatch.com/story/canadas-struggle-to-supply-legal-weed-described-as-national-shortage-that-could-last-months-2018-11-26

37. R Core Team. R: a language and environment for statistical computing. Vienna (Austria): R Foundation for Statistical Computing; 2023. Available from: https://www.R-project.org/

38. Health Canada. Packaging and labelling guide for cannabis products. Ottawa (ON): Health Canada; 2025 [cited 2025 Sept 14]. https://www.canada.ca/en/health-canada/services/cannabis-regulations-licensed-producers/packaging-labelling-guide-cannabis-products/guide.html

39. Patrick ME, Veliz PT, Terry-McElrath YM. High-intensity and simultaneous alcohol and marijuana use among high school seniors in the U.S. Subst Abus. 2017;38(4):498-503. https://doi.org/10.1080/08897077.2017.1356421

40. Pape H, Rossow I, Storvoll EE. Under double influence: assessment of simultaneous alcohol and cannabis use in general youth populations. Drug Alcohol Depend. 2009;101(1-2):69-73. https://doi.org/10.1016/j.drugalcdep.2008.11.002

41. Chun TH, Spirito A, Hernández L, Fairlie AM, Sindelar-Manning H, Eaton CA, et al. The significance of marijuana use among alcohol using adolescent ED patients. Acad Emerg Med. 2010; 17(1):63-71. https://doi.org/10.1111/j.1553-2712.2009.00615.x

42. Matheson J, Le Foll B. Impacts of recreational cannabis legalization on use and harms: a narrative review of sex/gender differences. Front Psychiatry. 2023;14:1127660. http://doi.org/10.3389/fpsyt.2023.1127660

43. Clements-Nolle KD, Lensch T, Drake CS, Pearson JL. Adverse childhood experiences and past 30-day cannabis use among middle and high school students: the protective influence of families and schools. Addict Behav. 2022;129:107280. http://doi.org/10.1016/j.addbeh.2022.107280

44. Education Development Center (EDC). Preventing youth marijuana use: factors associated with use [Internet]. Waltham (MA): EDC; 2017 [cited 2025 May 20]. Available from: https://solutions.edc.org/sites/default/files/Preventing-Youth-Marijuana-use-Factors-Associated-with-Use_0.pdf

45. Porath-Waller AJ, Beasley E, Beirness DJ. A meta-analytic review of school-based prevention for cannabis use. Health Educ Behav. 2010;37(5):709-23. https://doi.org/10.1177/1090198110361315

46. Canadian Centre on Substance Use and Addiction (CCSA). Cannabis legalization: considerations for children and young people [Internet]. Ottawa (ON): CCSA; 2023 [cited 2025 May 20]. Available from: https://www.ccsa.ca/sites/default/files/2023-03/Cannabis-Legalization-Children-and-Young-People-policy-brief.pdf

47. Public Safety Canada. Buying cannabis – what you need to know [Internet]. Ottawa (ON): Public Safety Canada; 2022. Available from: https://www.publicsafety.gc.ca/cnt/cntrng-crm/llgl-drgs/llgl-nln-sls-cnnbs-en.aspx

48. Cannabis Retailer. The legalities of store location considerations [Internet]. Surrey (BC): Cannabis Retailer; 2021 [cited 2025 May 21]. Available from: https://cannabisretailer.ca/2021/the-legalities-of-store-location-considerations/

49. Canadian Centre on Substance Use and Addiction (CCSA). A public health perspective on cannabis legalization and regulation in Canada [Internet]. Ottawa (ON): CCSA; 2023 [cited 2025 May 20]. Available from: https://www.ccsa.ca/sites/default/files/2023-01/CCSA_Cannabis_Act_Legislative_review_update_1_en.pdf

50. Dharma C, Al-Jaishi AA, Collins E, Orchard C, Amankwah N, Lang JJ, et al. Assessing the impact of the COVID-19 pandemic on the mental health–related hospitalization rate of youth in Canada: an interrupted time series analysis. Health Promot Chronic Dis Prev Can. 2024;44(10):417-30. https://doi.org/10.24095/hpcdp.44.10.02

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Bioku AA, Lu B, Harris P, Sarimiye FO, Jimeta-Tuko J, Manoj N, **Olagunju TO**, et al. Coping strategies and perception of patients with breast cancer post-surgery in an underserved region of Nigeria. Psychooncology. 2026;35(1):e70370. https://doi.org/10.1002/pon.70370

Boucher LM, Lau J, **Scott MM**, Everett K, Gomes T, Tanuseputro P, et al. Relationship between palliative care and location of death among people with opioid use disorder: a retrospective cohort study. J Palliat Care. 2025:08258597251392965. https://doi.org/10.1177/08258597251392965

Crompton L, **Chu N**, **Pollock NJ**, Fluke J, **Tonmyr L**. Measuring social and community services for children, youth, and families in contact with the child welfare system: a scoping review. Child Prot Pract. 2026;8:100266. https://doi.org/10.1016/j.chipro.2025.100266

Hutt-Taylor K, Chamberland-Fontaine S, Bardekjian AC, Khan A, Duncan A, Mokdad A, […] **Prince SA**, et al. Improving cross-sectoral collaboration towards urban nature-based solutions: insights from a participatory workshop. Facets. 2025;10. https://doi.org/10.1139/facets-2025-0035

Liu L, **Contreras G**, **Thompson W**. Suicidal ideation and suicide attempts among adolescents in Canada based on the 2023 Canadian Health Survey on Children and Youth. Discover Public Health. 2025;22(1):826. https://doi.org/10.1186/s12982-025-01179-0

Piché-Renaud P, Buchan CA, Burton C, Chapdelaine H, Jeewa A, Morris SK, […] **Salvadori MI**, et al. Revaccination of individuals with cardiac adverse events following COVID-19 vaccination: a Canadian Immunization Research Network study. Vaccine. 2026;70:128016. https://doi.org/10.1016/j.vaccine.2025.128016

Prince SA, **Shan Y**, **Butler GP**, **Lang JJ**, McCormack GR, Colley RC. Comparing perceived and objective measures of neighbourhood built environments among youth and adults in Canada. Public Health. 2026;251:106110. https://doi.org/10.1016/j.puhe.2025.106110

Pugh A, **Dave S**, **Ebrahim M**, **Laroche JA**. Factors associated with COVID-19 non-vaccination among children and adolescents with chronic health conditions in Canada: a national cross-sectional study. Vaccine X. 2025;27:100753. https://doi.org/10.1016/j.jvacx.2025.100753

Sette S, Coplan RJ, **Ooi LL**, Zuffianò A, Xiao B, Wong QJJ, et al. Measurement invariance of the Straightforwardly-Worded Social Interaction Anxiety Scale and associations with life satisfaction among emerging adults attending university in 10 countries. J Anxiety Disord. 2025;116:103092. https://doi.org/10.1016/j.janxdis.2025.103092

Sharma P, **Pollock NJ**, **Hovdestad W**, **Williams G**, **Tonmyr L**. Prevalence of out-of-home care among school-aged children in Canada, 2002–2018: an analysis of nationally-representative student survey data. Int J Public Health. 2025;70:1608481. https://doi.org/10.3389/ijph.2025.1608481

Shereefdeen H, **Thaivalappil A**, Young I, MacKay M. A pilot study on generative artificial intelligence's reliability in qualitative research quality appraisal using CASP and JBI checklists. Inquiry. 2025;62. https://doi.org/10.1177/00469580251399374