

Sociodemographic and health correlates of reimbursement authorizations for cannabis for medical purposes in Canadian veterans: A cross-sectional study linking the *Life After Services Studies 2019* and *Health Administrative Databases*

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Abstract

Background

Evidence on factors associated with cannabis for medical purposes (CMP) authorizations among Veterans Affairs Canada (VAC) clients remains limited and inconsistent, particularly concerning mental health and posttraumatic stress disorder (PTSD), a leading indication for use. We investigated demographic, clinical and service characteristics associated with VAC authorizations for CMP reimbursement.

Method

We linked VAC administrative CMP program data with responses from the 2019 Life After Services Studies cross-sectional survey of Regular Force veterans released between 1998 and 2018. Multivariable logistic regressions examined associations between CMP reimbursement (yes/no) and demographic, clinical and well-being factors, with analyses stratified by PTSD status.

Results

Among 1,289 respondents (weighted $n=33,131$), 18.4% were authorized for CMP reimbursement. Younger age (<40 vs. ≥ 60 years: OR 4.78, 95% CI: 2.24–10.21), unemployment with inability to work vs. employed (OR 3.10, 95% CI: 1.78–5.40), land service vs. air (OR 2.07, 95% CI: 1.22–3.50), PTSD (OR 2.81, 95% CI: 1.69–4.66), anxiety (OR 2.32, 95% CI: 1.45–3.70), and severe pain vs. no pain (OR 3.61, 95% CI: 1.97–6.60) were independently associated with authorization. Unemployment and severe pain were consistent correlates across PTSD strata. Among those without PTSD, younger age, multiple

physical conditions, and frequent mental health visits were significant; among those with PTSD, shorter service, witnessing destruction, and suicidal ideation were additional factors.

Conclusions

CMP authorization patterns among Canadian veterans reflect the intersection of mental health, pain, and functional impairment, with variation by PTSD status. These findings underscore the need for longitudinal research on CMP mechanisms, effectiveness and safety.

Introduction

In recent years, Veterans Affairs Canada (VAC) has seen a substantial increase in authorizations for reimbursement for cannabis for medical purposes (CMP) [1,2]. At the same time, current evidence on factors associated with CMP prescription remains limited and heterogeneous, especially in the context of mental health and posttraumatic stress disorder (PTSD), one of the lead motives of use for medical CMP in veterans [3–5]. Understanding these factors is critical because medical cannabis is increasingly prescribed for a wide range of physical and mental health conditions, often without robust supporting evidence, raising concerns about optimal therapeutic use, patient safety, and the risk of adverse effects or drug interactions [6–11]. This is even more important for the veteran population because of the high burden of other CMP-related conditions in addition to PTSD, like chronic pain, sleep issues, and psychiatric comorbidities, the risk of substance use disorders, and the need for safe, effective, and evidence-based management strategies in this vulnerable population with complex health needs [1,3,12]. Improved understanding of factors associated with CMP prescription and authorization can inform prescriber education, regulatory policy, and the development of evidence-based guidelines to ensure that medical cannabis is used appropriately and safely.

In the general population, factors associated with CMP prescribing include demographic characteristics (younger age; male sex for THC-dominant products and older age or female sex for CBD-dominant products), clinical indications (chronic pain, cancer-related symptoms, anxiety, sleep disorders, PTSD, and depression), and concurrent medication use (e.g., opioids, antipsychotics) [6,7,9]. Socioeconomic status, access to

alternative treatments, and regional regulatory frameworks may also shape prescribing practices for CMP [13,14]. Studies on factors associated with the CMP prescription in veterans demonstrated both overlap and important differences compared to the general population. In veterans, younger age, male sex, lower income, hazardous alcohol use, chronic pain, and mental health conditions, such as PTSD, depression, or anxiety, have been shown to be associated with higher rates of medical cannabis use and prescription [15–18]. Compared to the general population, veterans are also more likely to use cannabis as a substitute for prescription medications, particularly in the context of polypharmacy and opioid use [3]. However, many existing studies rely on self-reported data, lack validated assessment tools, do not differentiate medical from recreational cannabis use, or have limited adjustment for confounding factors and exclude marginalized populations [6,7,9].

Thus, to address the existing knowledge gap, this study aims to help understand how specific characteristics interact with the CMP prescription among veterans by investigating the associations between receiving authorizations for VAC reimbursement for CMP and clinical, demographic, and service characteristics, using administrative information and the 2019 Life After Services Studies (LASS) survey.

Materials and Methods

Study Design and Data Sources

This study utilized linked administrative data on VAC authorization for CMP reimbursement and responses from the 2019 LASS, a cross-sectional survey that collected information on veterans released from the Regular Force between 1998 and 2018 [19]. VAC may provide reimbursement for CMP when it is both authorized by a healthcare

provider and obtained in compliance with Health Canada's Cannabis Regulations, in line with VAC's policy on CMP reimbursement. LASS 2019 was representative of 79,997 veterans, with a response rate of 72% and a response share of 92% [19]. This survey was stratified into three groups by rank at release: officers, senior non-commissioned members (Sr NCM), and junior non-commissioned members (Jr NCM). All identifiers were removed after the data linkage procedure. Figure S1 shows the collection of data sources used in the present analysis.

Ethics approval

Participants who consented to linkage with VAC administrative data were included in this study. Data collection and access procedures for the LASS 2019 survey were reviewed and approved by Statistics Canada policy committees, which serve a role analogous to a research ethics board [20]. Ethics approval for this project was granted by the University of Ottawa Research Ethics Board (H-02-22-7491). All procedures complied with the ethical standards of relevant national and institutional committees on human experimentation and with the 1975 Helsinki Declaration, as revised in 2013. Written informed consent was obtained from all survey participants.

Variable Selection and Definitions

The cannabis authorization variable was dichotomized (yes versus no) based on whether or not a veteran had an active authorization for CMP as of March 2019. Variables were selected through a literature review and experts' opinions (obtained via personal

communication and internal discussions among coinvestigators) from an initial list of 57 variables (see details in Table 1 and Table S1).

Demographic and Military Characteristics

The following variables were considered:

(i) Demographics, including age at the LASS 2019 survey, sex at birth, education status, marital status (married, living common-law, widowed, separated, divorced, and single, never married), province of residence, number of people who live in the household (including those 18 years old or younger), and total household income.

(ii) Service-related characteristics, including rank at release (Officer, Senior NCM, Junior NCM), excluding Entry Ranks – (Recruit, Officer Cadet, 2nd Lieutenant), service environment at release (Air [Air Force], Land [Army], Sea [Navy]), main activity (work/reserves, retired, disability, other), being ever deployed during military service, and length of service years of regular force service (calculated from the first date of enrolment to the last date of release. Length of service years was categorized into more than 20 years, less than 10 years and from 11 to 19 years [19]).

Mental Health and Physical Health Conditions

Chronic conditions were assessed using the question: “Do you currently have any of the following diagnosed conditions (with more than 6 months of duration) by a health professional?” Response options included depression, anxiety, PTSD, hypertension, heart conditions, stroke, migraine, traumatic brain injury (TBI), Alzheimer's disease, diabetes, gastrointestinal conditions, cancer, asthma or COPD, and hearing concerns [19]. Additional variables included pain, health status, having a regular medical doctor, being a patient

overnight in the past 12 months, and the number of times in the past year being seen by a health professional for emotional/mental health.

Psychosocial Factors and Cognitive Status

The following variables were considered: life stress, adjustment to civilian life, life satisfaction, social support, satisfaction with relationships with family members, community belonging, heavy drinking, Kessler Psychological Distress Scale (K10), and cognitive status (ability to remember things and ability to think and solve problems).

Statistical Analysis

Descriptive statistics and bivariate modelling were used to assess unadjusted associations between various veteran characteristics and well-being indicators, and an active authorization for CMP as of March 2019.

For variable selection, a backward elimination process was used, including three blocks of independent variables: the first block included demographic and military factors; the second included life satisfaction, social support, seen or talked to a social worker and seen or talked to a psychologist; and the third included health status for specific comorbid conditions. For the total sample, to avoid multicollinearity, only one of the available PTSD variables, which was also used for stratification, was included in a backward elimination process. The statistical threshold used for the variable selection was defined as $p \leq 0.05$.

Finally, using a multivariable logistic regression approach, we evaluated the association between the final set of variables and the authorization for CMP reimbursement for the total sample and by PTSD status, given this high prevalence and the strong bivariate association between PTSD and CMP reimbursement. The present work followed the same

methods and definitions reported previously for this type of analysis [2]. The interaction between the PTSD status and sex was considered *a priori*, but was reported in the final model as not significant (p=0.787).

Weighted Estimates

The study design includes the application of survey weights to generate findings that are representative of the target Veteran population. This survey weight accounts for unequal probabilities of selection, eligibility, and non-response. In all cases, weighted estimates using Taylor linearization were produced to account for the complex sampling design of the LASS 2019 survey in accordance with previously established methodology[19,21].

Results

Of a total of 1,289 (a weighted estimation of 33,131) survey responders (87.6% males and 21.5% 60 years and older), the frequency of clients authorized to be reimbursed for CMP as of March 31, 2019, was 18.4% (n=238), corresponding to a weighted estimation of 7,140 clients. Table 1 presents the unadjusted associations between CMP 2019 authorizations and the variables of interest per domain.

Table 1. An unadjusted comparison of VAC clients with an active reimbursement for CMP (yes versus no) in 2019 using weighted estimates from the LASS 2019 survey.

Variables	CMP reimbursement 2019 (frequency and percentage with 95% CI)#		Odds ratio (95% CI)	P-value
	No (N=1,051; weighted: 25,991)	Yes (N=238; weighted: 7,140)		
Sex				
Female	3,068	980	1.19	0.477

Variables	CMP reimbursement 2019 (frequency and percentage with 95% CI)#		Odds ratio (95% CI)	P-value
	No (N=1,051; weighted: 25,991)	Yes (N=238; weighted: 7,140)		
	11.83 (9.42-14.74)	13.73 (9.66-19.14)	(0.74-1.90)	
Male	22,876 88.17 (85.26-90.58)	6,160 86.27 (80.86-90.34)	Reference	
Age in 2019, years				
<40	4,101 15.78 (12.65-19.51)	1,731 24.25 (17.84-32.07)	4.18 (2.26-7.73)	0.000
40-49	4,536 17.45 (14.59-20.74)	2,121 29.71 (22.67-37.86)	4.63 (2.61-8.23)	0.000
50-59	10,896 41.92 (38.09-45.85)	2,635 36.91 (29.66-44.80)	2.40 (1.42-4.04)	0.001
60 +	6,460 24.85 (22.17-27.74)	652 9.13 (6.01-13.65)	Reference	
Province of Residence (reference: Ontario)				
Newfoundland and Labrador	704 2.71 (1.83-3.99)	304 4.26 (2.26-7.90)	1.34 (0.59-3.02)	0.486
Prince Edward Island	240 0.92 (0.32-2.67)	65 0.92 (0.27-3.04)	0.84 (0.16-4.40)	0.840
Nova Scotia	3,351 12.89 (10.59-15.62)	971 13.60 (9.64-18.85)	0.90 (0.53-1.50)	0.680
New Brunswick	1,241 4.77 (3.50-6.47)	1,367 19.15 (13.66-26.18)	3.41 (1.90-6.10)	0.000
Quebec	6,549 25.20 (21.99-28.71)	636 8.91 (5.25-14.71)	0.30 (0.15-0.58)	0.000
Ontario	6,983 26.87 (23.49-30.53)	2,257 31.61 (24.56-39.63)	Reference	
Manitoba	624 2.40 (1.49-3.86)	142 1.99 (0.83-4.69)	0.70 (0.25-2.01)	0.511
Saskatchewan	168 0.65 (0.29-1.46)	88 1.24 (0.38-3.95)	1.62 (0.37-7.07)	0.520
Alberta	3,726 14.33 (11.51-17.71)	816 11.43 (6.51-19.30)	0.68 (0.33-1.40)	0.290
British Columbia	2,405 9.25 (7.21-11.80)	493 6.90 (3.59-12.86)	0.63 (0.29-1.40)	0.258
Marital Status (reference: Married/common law)				
Married/common law	20,705 79.66 (76.17-82.76)	5,185 72.62 (64.56-79.43)	Reference	
Separated/widowed/divorced	2,922 11.24 (8.98-13.99)	1,227 17.18 (11.56-24.77)	1.68 (0.99-2.85)	0.056
Single, never married	2,365 9.10 (6.90-11.91)	728 10.20 (6.28-16.15)	1.23 (0.67-2.27)	0.508
Service Environment (reference: Air)				
Air	8,427 32.42 (28.88-36.17)	1,284 17.98 (13.05-24.25)	Reference	

Variables	CMP reimbursement 2019 (frequency and percentage with 95% CI)#		Odds ratio (95% CI)	P-value
	No (N=1,051; weighted: 25,991)	Yes (N=238; weighted: 7,140)		
Land	13,723 52.80 (48.89-56.67)	4,911 68.78 (61.28-75.41)	2.35 (1.53-3.60)	0.000
Sea	3,841 14.78 (12.48-17.42)	945 13.24 (8.80-19.45)	1.62 (0.90-2.89)	0.107
Rank (reference: Officer)				
Officer	3,872 14.90 (13.90-16.95)	378 5.29 (3.60-7.73)	Reference	
Senior NCM	9,776 37.61 (35.45-39.82)	2,085 29.20 (24.04-34.95)	2.18 (1.37-3.48)	0.001
Junior NCM	12,344 47.49 (44.81-50.19)	4,677 65.51 (59.37-71.17)	3.88 (2.38-6.33)	0.000
Main Activity (reference: Work/Reserves)				
Work/Reserves	13,052 50.70 (46.75-54.64)	1,602 22.67 (15.93-31.21)	Reference	
Retired	6,721 26.11 (23.13-29.32)	1,667 23.60 (17.55-30.95)	2.02 (1.17-3.49)	0.011
Disability	3,836 14.90 (12.42-17.78)	2,995 42.39 (34.79-50.37)	6.36 (3.80-10.67)	0.000
Other	2,136 8.30 (6.49-10.55)	801 11.34 (7.41-16.96)	3.06 (1.59-5.88)	0.001
Length of Service (reference: > 20 Years)				
<10	4,354 16.83 (13.47-20.82)	1,875 26.26 (19.04-35.04)	2.88 (1.73-4.82)	0.000
10-19	5,102 19.72 (16.68-23.15)	2,813 39.40 (31.82-47.54)	3.69 (2.49-5.49)	0.000
> 20 Years	16,421 63.46 (59.67-67.18)	2,451 34.34 (28.08-41.18)	Reference	
Number of persons 18 or younger in household (reference: 0)				
0	19,184 73.81 (70.00-77.29)	4,540 63.59 (55.43-71.03)	Reference	
1	2,473 9.51 (7.60-11.85)	1,307 18.31 (13.01-25.15)	2.23 (1.38-3.61)	0.001
2	2,527 9.72 (7.39-12.69)	887 12.43 (7.47-19.96)	1.48 (0.78-2.84)	0.233
3	1,807 6.95 (4.88-9.81)	405 5.68 (6.06-10.30)	0.95 (0.44-2.01)	0.888
Labour Status (reference: Employed)				
Employed	12,997 50.00 (46.06-53.95)	1,438 20.13 (13.98-28.12)	Reference	
Unemployed	1,145 4.41 (2.96-6.51)	229 3.21 (0.90-10.80)	1.81 (0.44-7.42)	0.411
No job, not looking (and unable to work)	11,849 45.59 (41.77-49.46)	5,473 76.66 (68.18-83.43)	4.18 (2.62-6.66)	0.000
Satisfaction with finances (reference: Satisfied)				

Variables	CMP reimbursement 2019 (frequency and percentage with 95% CI)#		Odds ratio (95% CI)	P-value
	No (N=1,051; weighted: 25,991)	Yes (N=238; weighted: 7,140)		
Satisfied	18,192 70.44 (66.43-74.15)	4,141 58.66 (50.27-66.58)	Reference	
Neither	3,952 15.30 (12.59-18.48)	1,438 20.37 (14.40-28.01)	1.60 (0.98-2.60)	0.058
Dissatisfied	3,682 14.26 (11.28-17.86)	1,480 20.97 (14.59-29.19)	1.77 (1.04-2.99)	0.034
Total household income				
<50K	2,883 11.67 (9.16-14.75)	502 7.59 (3.90-14.26)	Reference	
50-99K	9685 39.19 (35.35-43.16)	3133 47.40 (39.28-55.67)	1.86 (0.86-4.06)	0.119
100-149K	6194 25.06 (21.91-28.50)	1853 28.04 (21.46-35.73)	1.72 (0.77-3.83)	0.185
150K+	5953 24.09 (20.65-27.89)	1121 16.96 (11.48-24.33)	1.10 (0.46-2.56)	0.860
Service-related variables				
Ever deployed during military service				
Yes	21,826 84.54 (81.12-87.43)	6,138 85.98 (79.71-90.53)	1.12 (0.68- 1.86)	0.658
No	3,992 15.46 (12.57-18.88)	1,001 14.02 (9.47-20.29)	Reference	
Contact with local civilians overseas during military service				
Yes	21,275 81.93 (78.30-85.07)	5,729 80.62 (73.08-86.45)	0.92 (0.56- 1.49)	0.728
No	4,691 18.07 (14.93-21.70)	1,377 19.38 (13.55-26.92)	Reference	
Witness destruction during military service				
Yes	14,588 56.27 (52.30-60.16)	5,239 73.71 (66.43-79.88)	2.74 (1.48-3.20)	0.000
No	11,338 43.73 (39.84-47.70)	1,869 26.29 (20.12-33.57)	Reference	
Witness widespread suffering during military service				
Yes	14,238 54.87 (50.88-58.79)	5,444 76.94 (69.27-83.17)	2.74 (1.80-4.20)	0.000
No	11,711 45.13 (41.21-49.12)	1,631 23.06 (16.83-30.73)	Reference	
Medical conditions				
Posttraumatic stress disorder (PTSD)*: Yes/No (self-reported from chronic disease)				
Yes	7,801 30.66 (27.17-34.40)	5,185 73.17 (65.97-79.33)	6.17 (4.21-9.03)	0.000
No	17,639 69.34 (65.60-72.83)	1,901 26.83 (20.67-34.03)	Reference	
PTSD 1: Nightmares of experience in past month				

Variables	CMP reimbursement 2019 (frequency and percentage with 95% CI)#		Odds ratio (95% CI)	P-value
	No (N=1,051; weighted: 25,991)	Yes (N=238; weighted: 7,140)		
Yes	8,794 33.94 (30.34-37.74)	4,595 64.52 (56.78-71.57)	3.54 (2.46-5.10)	0.000
No	17,117 66.06 (62.26-69.66)	2,527 35.48 (28.43-43.22)	Reference	
PTSD 2: Avoid thinking of experience in past month				
Yes	8,080 31.54 (28.01-35.29)	5,111 72.39 (65.23-78.57)	5.69 (3.91-8.29)	0.000
No	17,541 68.46 (64.71-71.99)	1,949 27.61 (21.43-34.77)	Reference	
PTSD 3: Constantly on guard in past month due to experience				
Yes	8,860 34.43 (30.77-38.28)	5,459 76.82 (69.79-82.62)	6.31 (4.24-9.40)	0.000
No	16,876 65.57 (61.72-69.23)	1,647 23.18 (17.38-30.21)	Reference	
PTSD 4: Felt numb or detached due to experience				
Yes	8,452 33.00 (29.35-36.86)	5,076 71.81 (64.54-78.10)	5.17 (3.55-7.55)	0.000
No	17,160 67.00 (63.14-70.65)	1,992 28.19 (21.90-35.46)	Reference	
PTSD 5: Experience related to military service				
Yes	13,188 52.66 (48.68-56.61)	5,754 82.46 (75.58-87.71)	4.23 (2.70-6.61)	0.000
No	11,856 47.34 (43.39-51.32)	1,224 17.54 (12.29-24.42)	Reference	
Mood disorder				
Yes	8,066 31.10 (27.54-34.90)	5,169 72.40 (64.63-79.02)	5.81 (3.89-8.68)	0.000
No	17,867 68.90 (65.10-72.46)	1,971 27.60 (20.98-35.37)	Reference	
Anxiety disorder				
Yes	6,571 25.36 (22.13-28.87)	4,742 66.74 (59.06-73.63)	5.91 (4.06-8.60)	0.000
No	19,346 74.64 (71.13-77.87)	2,363 33.26 (26.37-40.94)	Reference	
Any suicidal ideation during the last 12 month				
Yes	2,653 10.29 (8.22-12.80)	2,411 34.42 (26.86-42.87)	4.58 (2.96-7.07)	0.000
No	23,128 89.71 (87.20-91.78)	4,592 65.58 (57.13-73.14)	Reference	
Activities prevented by pain or discomfort (reference: No pain or discomfort)				
No pain or discomfort	8,658 33.36 (29.68-37.25)	841 11.79 (7.89-17.25)	Reference	

Variables	CMP reimbursement 2019 (frequency and percentage with 95% CI)#		Odds ratio (95% CI)	P-value
	No (N=1,051; weighted: 25,991)	Yes (N=238; weighted: 7,140)		
Pain - does not prevent activity	1,117 4.31 (2.91-6.32)	66 0.92 (0.27-3.08)	0.60 (0.16-2.34)	0.466
Pain prevents a few activities	4,567 17.59 (14.84-20.74)	928 13.00 (8.21-19.96)	2.09 (1.06-4.10)	0.032
Pain prevents some activities	6,589 25.39 (22.04-29.05)	1,629 22.82 (16.99-29.93)	2.54 (1.45-4.46)	0.001
Pain prevents most activities	5,024 19.36 (16.58-22.47)	3,675 51.48 (43.47-59.41)	7.53 (4.48-12.65)	0.000
Migraine				
Yes	5,408 20.86 (17.64-24.49)	2,707 37.91 (30.27-46.20)	2.32 (1.55-3.45)	0.000
No	20,517 79.14 (75.51-82.36)	4,433 62.09 (53.80-69.73)	Reference	
Diabetes				
Yes	3,121 12.07 (9.86-14.70)	475 6.65 (3.96-10.95)	0.52 (0.29-0.94)	0.03
No	22,736 87.93 (85.30-90.14)	6,665 93.35 (89.05-96.04)	Reference	
Bowel Ulcer				
Yes	3,836 14.85 (12.33-17.79)	2,035 28.76 (21.93-36.71)	2.31 (1.52-3.53)	0.000
No	21,990 85.15 (82.21-87.67)	5,042 71.24 (63.29-78.07)	Reference	
Asthma				
Yes	2,545 9.80 (7.55-12.64)	697 9.78 (6.16-15.19)	1.00 (0.56-1.79)	0.995
No	23,418 90.20 (87.36-92.45)	6,427 90.22 (84.81-93.84)	Reference	
COPD				
Yes	1,562 6.03 (4.41-8.19)	419 5.86 (2.72-12.17)	1.03 (0.43-2.45)	0.947
No	24,347 93.97 (91.81-95.59)	6,721 94.14 (87.83-97.28)	Reference	
Ever diagnosed with high blood pressure				
Yes	9,465 36.46 (32.92-40.16)	2,375 33.53 (26.32-41.62)	0.88 (0.60-1.29)	0.507
No	16,493 63.54 (59.84-67.08)	4,708 66.47 (58.38-73.68)	Reference	
Taken medicine for high blood pressure in past month				
Yes	6,381 67.75 (61.45-73.46)	1,277 54.15 (39.82-67.82)	1.78 (0.94-3.38)	0.079
No	3,038 32.25 (26.54-38.55)	1,082 45.85 (32.18-60.18)		

Variables	CMP reimbursement 2019 (frequency and percentage with 95% CI)#		Odds ratio (95% CI)	P-value
	No (N=1,051; weighted: 25,991)	Yes (N=238; weighted: 7,140)		
Heart disease				
Yes	1,849 7.15 (5.63-9.04)	265 3.72 (2.16-6.33)	0.50 (0.27-0.93)	0.029
No	24,012 92.85 (90.96-94.37)	6,858 96.28 (93.67-97.84)	Reference	
TBI (reference: No)				
Yes	1,945 7.49 (5.53-10.07)	1,618 22.75 (16.04-31.21)	3.80 (2.21-6.55)	0.000
No	23,488 90.46 (87.55-92.74)	5,132 72.15 (63.63-79.32)	Reference	
Stroke				
Yes	360 1.39 (0.74-2.56)	101 1.42 (0.58-3.44)	1.02 (0.34-3.08)	0.968
No	25,610 98.61 (97.44-99.26)	7,023 98.58 (96.56-99.42)	Reference	
Cancer				
Yes	856 3.30 (2.38-4.55)	183 2.56 (1.29-5.02)	0.77 (0.35-1.68)	0.509
No	25,075 96.70 (95.45-97.62)	6,957 97.44 (94.98-98.71)	Reference	
Number of Physical Health Conditions (reference: 0)				
0	1,924 7.43 (5.54-9.91)	455 6.40 (2.94-13.37)	Reference	
1	5,603 21.64 (18.40-25.29)	883 12.42 (8.54-17.73)	0.67 (0.26-1.73)	0.404
2	6,718 25.95 (22.72-29.47)	2,029 28.55 (21.56-36.74)	1.28 (0.51-3.23)	0.603
3+	11,641 44.97 (41.09-48.92)	3,741 52.64 (44.53-60.61)	1.36 (0.56-3.31)	0.497
Mental health problem groups (reference: No/Little)				
No/Little	9,046 35.46 (31.85-39.26)	242 3.41 (1.75-6.52)	Reference	
Mild/Moderate	8,263 32.39 (28.77-36.24)	1,761 24.77 (18.74-31.98)	7.96 (3.75-16.88)	0.000
Severe	8,200 32.14 (28.50-36.03)	5,106 71.82 (64.48-78.16)	23.25 (11.34-47.63)	0.000
Doctor visits				
Yes	23,284 89.58 (86.92-91.76)	6,537 91.55 (87.13-94.55)	1.26 (0.73-2.16)	0.399
No	2,708 10.42 (8.24-13.08)	603 8.45 (5.45-12.87)	Reference	
Been patient overnight in past 12 months				

Variables	CMP reimbursement 2019 (frequency and percentage with 95% CI)#		Odds ratio (95% CI)	P-value
	No (N=1,051; weighted: 25,991)	Yes (N=238; weighted: 7,140)		
Yes	2,737 10.55 (8.32-13.29)	838 11.73 (8.28-16.38)	0.89 (0.56-1.42)	0.616
No	23,198 89.45 (86.71-91.68)	6,302 88.27 (83.62-91.72)	Reference	
Life Stress (reference: Not at All)				
Not at All	8,479 32.69 (29.10-36.49)	942 13.25 (8.84-19.39)	Reference	
A Bit	10,796 41.62 (37.78-45.56)	2,307 32.47 (25.66-40.12)	1.92 1.14-3.26)	0.015
Quite a Bit/Extremely	6,664 25.69 (22.34-29.35)	3,856 54.27 (46.27-62.06)	5.21 (3.09-8.80)	0.000
Adjustment to civilian life (reference: Easy)				
Easy	9,673 37.27 (33.68-41.00)	627 8.78 (5.81-13.06)	Reference	
Neither	3,998 15.40 (12.72-18.52)	835 11.69 (7.04-18.81)	3.22 1.58-6.59)	0.001
Difficult	12,284 47.33 (43.42-51.27)	5,678 79.53 (72.34-85.23)	7.14 (4.41-11.55)	0.000
Life satisfaction (reference: Satisfied)				
Satisfied	20,017 77.12 (73.63-80.28)	3,622 50.73 (42.72-58.70)	Reference	
Neither	3,122 12.03 (9.69-14.84)	1,106 15.48 (10.64-21.99)	1.96 (1.17-3.28)	0.011
Dissatisfied or Very Dissatisfied	2,816 10.85 (8.60-13.60)	2,412 33.78 (26.59-41.82)	4.73 (3.03-7.39)	0.000
Social Support (reference: High)				
High	19,035 76.05 (72.16-79.54)	3,429 51.64 (43.20-59.99)	Reference	
Not High	5,996 23.95 (20.46-27.84)	3,211 48.36 (40.01-56.80)	2.97 (2.00-4.42)	0.000
Satisfaction with relationships with family members (reference: Very satisfied)				
Very satisfied	11,976 46.29 (42.39-50.24)	1,409 19.92 (14.90-26.11)	Reference	
Satisfied	8,905 34.42 (30.84-38.19)	2,788 39.42 (32.02-47.33)	2.66 (1.75-4.04)	0.000
Neither satisfied nor dissatisfied	3,235 12.50 (9.93-15.63)	1,181 16.70 (11.16-24.24)	3.10 (1.72-5.61)	0.000
Dissatisfied	1,365 5.27 (3.58-7.71)	1,013 14.32 (8.84-22.35)	6.31 (3.05-13.05)	0.000
Very dissatisfied	391 1.51 (0.76-2.97)	683 9.65 (5.39-16.69)	14.86 (5.63-39.19)	0.000
Community belonging (reference: Strong)				
Strong	12,451	1,570	Reference	

Variables	CMP reimbursement 2019 (frequency and percentage with 95% CI)#		Odds ratio (95% CI)	P-value
	No (N=1,051; weighted: 25,991)	Yes (N=238; weighted: 7,140)		
	48.34 (44.44-52.25)	22.11 (16.50-28.96)		
Weak	13,308 51.66 (47.75-55.56)	5,532 77.89 (71.04-83.50)	3.30 (2.22-4.90)	0.000
Heavy drinking				
Yes: Heavy	5,853 22.55 (19.31-26.17)	2,276 32.11 (24.67-40.59)	Reference	
Not heavy	20,097 77.45 (73.83-80.69)	4,812 67.89 (59.41-75.33)	1.62 (1.07- 2.46)	0.023
Cognition - ability to remember things (reference: Able to)				
Able to	12,920 49.74 (45.82-53.67)	1,129 15.86 (10.67-22.92)	Reference	
Somewhat forgetful	10,418 40.11 (36.29-44.06)	3,602 50.59 (42.57-58.57)	3.96 (2.38-6.59)	0.000
Very forgetful	2,527 9.73 (7.70-12.22)	2,175 30.54 (23.70-38.37)	9.85 (5.54-17.52)	0.000
Unable to remember anything at all	109 0.42 (0.12-1.50)	215 3.01 (1.62-5.53)	22.52 (5.10-99.42)	0.000
Cognition - ability to think and solve problems (reference: Able to)				
Able to	16,696 64.29 (60.42-67.98)	1,635 23.01 (17.15-30.14)	Reference	
Having a little difficulty	5,119 19.71 (16.78-23.01)	1,698 23.90 (17.57-31.64)	3.39 (2.04-5.62)	0.000
Having some difficulty	3,563 13.72 (11.09-16.86)	2,742 38.60 (30.90-46.91)	7.86 (4.82-12.81)	0.000
Having a great deal of difficulty	565 2.18 (1.35-3.50)	941 13.25 (9.09-18.91)	17.00 (8.44-34.26)	0.000
Unable to think or solve problems	27 0.11 (0.03-0.43)	88 1.24 (0.38-3.98)	32.82 (5.06-212.69)	0.000
Perceived Health (reference: Excellent)				
Excellent	6,351 24.44 (21.30-27.88)	575 8.05 (4.42-14.23)	Reference	
Good	10,189 39.20 (35.39-43.16)	1,513 21.18 (15.57-28.14)	1.64 (0.79-3.39)	0.182
Fair/Poor	9,451 36.36 (32.66-40.23)	5052 70.76 (63.03-77.46)	5.90 (3.00-11.61)	0.000
Perceived Mental Health (reference: Excellent/Very good)				
Excellent/Very good	10,407 40.12 (36.25-44.12)	529 7.43 (4.11-13.08)	Reference	
Good	6,545 25.24 (22.21-28.52)	1,144 16.06 (10.92-22.98)	3.43 (1.61-7.31)	0.001
Fair/Poor	8,985 34.64 (30.96-38.51)	5,450 76.51 (68.90-82.72)	11.92 (6.15-23.10)	0.000
Number of times in past year seen health professional for emotional or mental health				

Variables	CMP reimbursement 2019 (frequency and percentage with 95% CI)#		Odds ratio (95% CI)	P-value
	No (N=1,051; weighted: 25,991)	Yes (N=238; weighted: 7,140)		
Mean, 95% CI	12.87 (11.61-14.13)	18.47 (16.12-20.82)	1.04 (1.02-1.06)	0.000

*The analysis was stratified on this PTSD variable (see Table 2)

#unless stated otherwise

An important aspect to highlight from the crude associations is that the self-reported PTSD diagnosis and the PTSD screener questions (responded positivity) were highly prevalent (65% to 82%) and associated with about three to six times higher odds of being authorized for CMP compared to those who did not report the symptoms or diagnosis (OR for self-reported PTSD diagnosis of 6.17; CI 95%: 4.21-9.03) (see Table 1). Given this high prevalence and the strong bivariate association, the multivariate analysis was performed for the total sample and using the subpopulation estimation method by PTSD status [20]. Of note, in unadjusted analyses, anxiety (OR of 5.91; 95% CI: 4.06-8.60) and mood (OR of 5.81; 95% CI: 3.89-8.68) disorders were also associated with being authorized for CMP, with a progressive increase in the strength of associations with CMP as the severity of mental health problems increased (see Table 1). In terms of physical health, traumatic brain injury (OR of 3.80; 95% CI: 2.21-6.55), migraines (OR of 2.32; 95% CI: 1.55-3.45), and bowel ulcers (OR of 2.31; 95% CI: 1.52-3.53) were more likely to be authorized for CMP, whereas, those with diabetes (OR of 0.52; 95% CI: 0.29-0.94) or heart diseases (OR of 0.50; 95% CI: 0.27-0.93) were less likely. Additionally, odds ratios were greater in New Brunswick (OR of 3.41; 95% CI: 1.90-6.10) and smaller in Quebec (OR of 0.30; 95% CI: 0.15-0.58) compared to Ontario.

Different predictors were retained in the final logistic models. Table 2 presents the results of the final multivariate models for the total sample and each of the PTSD categories.

For the total sample, compared to those aged ≥ 60 , younger age groups (< 40 and 40-49 years) were significantly more likely to be authorized for the CMP reimbursement, with the greater odds for those < 40 (OR of 4.78; 95% CI: 2.24-10.21). Other variables that were significantly associated with higher odds of authorization for CMP reimbursement were serving in a land environment (OR versus air of 2.07, 95% CI: 1.22-3.50), reporting "no job, not looking (and unable to work)" (a category that was distinct from being "unemployed"; OR versus employed of 3.10, 95% CI: 1.78-5.40), having PTSD (OR of 2.81, 95% CI: 1.69-4.66) and anxiety (OR of 2.32, 95% CI: 1.45-3.70) as well as pain, which prevents most activities (OR versus "no pain or discomfort" of 3.61, 95% CI: 1.97-6.60).

219 **Table 2. Multivariable logistic regression models for the total sample and by the PTSD status*. Estimates are presented as**
220 **odds ratios (OR) and 95% confidence intervals (CI).**
221

Variables	Total			No PTSD			PTSD		
	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value
Age in 2019, years (reference: ≥60)									
<40	4.78	2.24-10.21	0.000	31.04	2.60- 369.90	0.007			
40-49	3.23	1.62-6.44	0.001	11.62	1.26- 106.98	0.030			
50-59	1.72	0.97-3.08	0.066	6.84	0.80- 58.85	0.080			
Sex#									
Female vs Male	0.79	0.36-1.73	0.562						
Environment of Service (reference: Air)									
Land	2.07	1.22-3.50	0.007						
Sea	1.22	0.61-2.47	0.573						
Length of Service (reference: > 20 Years)									
<10							4.46	1.89-10.51	0.001
10-19							3.73	2.10-6.63	0.000
Labour Status (reference: Employed)									
Unemployed	1.02	0.32-3.27	0.967	0.04	0.002-0.910	0.042	1.30	0.24-7.07	0.759
No job, not looking (and unable to work)	3.10	1.78-5.40	0.000	5.42	1.41-20.80	0.014	2.41	1.19-4.88	0.015
Posttraumatic stress disorder									
Yes vs No	2.81	1.69-4.66	0.000						
Anxiety									
Yes vs No	2.32	1.45-3.70	0.000						
Witness destruction during military service									
Yes vs No							2.52	1.21-5.24	0.014
Suicidal Ideation in the past year									
No vs. Yes							2.21	1.24-3.94	0.007
Pain Health Status (reference: No pain or discomfort)									

Variables	Total			No PTSD			PTSD		
	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value
Pain does not prevent activity	0.39	0.10-1.55	0.180	0.32	0.03-3.27	0.334	0.60	0.11-3.33	0.563
Pain prevents a few activities	2.04	0.94-4.44	0.071	13.42	1.37-131.70	0.026	2.33	0.86-6.33	0.096
Pain prevents some activities	1.87	0.97-3.62	0.062	6.14	0.93-40.43	0.059	1.70	0.66-4.38	0.275
Pain prevents most activities	3.61	1.97-6.60	0.000	21.33	2.97-153.30	0.002	3.01	1.34-6.77	0.008
Number of Physical Health Conditions (reference: 0)									
1				1.27	0.06-26.65	0.876			
2				17.25	1.14-260.11	0.040			
3+				3.66	0.21-63.39	0.372			
Life Stress (reference: Not at All)									
A Bit				0.11	0.01-0.83	0.033			
Quite a Bit/Extremely				0.09	0.01-0.80	0.031			
CMH_010: No. times in past year - seen health prof. emotional/mental health				1.08	1.02-1.14	0.009			

*This model was additionally adjusted for the province of residence.

#For the total sample, interaction term between PTSD and sex was considered in the final model but was not statistically significant (p=0.787).

In stratified analyses, for those without PTSD, variables retained in the final model that were significantly associated with authorization for CMP reimbursement were age below 49 years old (versus 60 years and older), reporting "no job, not looking (and unable to work)" (versus employed) and pain, which prevents most activities (versus "no pain or discomfort") as well as suffering from two physical health conditions, seeing more frequently health professionals for emotional/mental health, but at the same time reported no life stress.

On the other hand, for those with PTSD, having spent 20 or fewer years in service (versus > 20 years), reporting "no job, not looking (and unable to work)" (versus employed), pain which prevents most activities (versus "no pain or discomfort"), witness destruction during military service and suicidal ideation in the past year (versus not) were retained in the final model and significantly associated with CMP reimbursement.

Notably, reporting "no job, not looking (and unable to work)" (versus employed) and pain, which prevents most activities, were retained in the total sample and both subgroups by PTSD status.

Discussion

In this large cross-sectional study, linking survey and administrative data on a representative sample of Canadian veterans released from the Canadian Regular Force (1998-2018), several sociodemographic, health, and service-related factors were associated with authorization for CMP reimbursement.

We found that about one-fifth of veterans were authorized for CMP reimbursement, with particularly strong associations observed for variables related to PTSD, anxiety and mood disorders (unadjusted ORs>5) and severe pain (OR>7.5). From a physical health standpoint, individuals reporting traumatic brain injury, migraines and bowel ulcers were more likely to be

authorized for CMP, whereas those with diabetes or heart diseases were less likely. Considering that these last two conditions have been associated with certain risks for complications following regular cannabis use [22,23], results from the current analyses could possibly point to contraindications preventing healthcare providers from authorizing cannabis for people with this medical profile. Unadjusted analyses also unveiled associations with poorer relations and social supports, as well as provincial differences, with significantly lower CMP authorizations in Quebec, which has a global regulatory approach known to be especially conservative, compared to Ontario. How different levels of the social environment, from individual relationships to political views about cannabis, may influence medical use should be further investigated under psychosocial and health equity lenses. Although retired individuals were twice as likely to be authorized for CMP than those actively working or on reserve, being on disability leave was the work status that was the most strongly associated with CMP (OR>6).

In multivariate analysis, younger age, inability to work, disabling pain that prevents most activities, PTSD and anxiety emerged as key correlates of CMP authorization in the overall sample.

Similar to what was seen in unadjusted analyses, inability to work and severe disabling pain were consistent correlates across PTSD strata, but additional associations differed by PTSD status. Among veterans without PTSD, younger age, multiple physical conditions, and frequent mental health service use were notable correlates, whereas among those with PTSD, fewer years of service, witnessing destruction during service, and suicidal ideation were associated with CMP authorization. These findings suggest that CMP authorization patterns may reflect not only mental and physical health conditions, but also broader functional limitations and service-related exposures.

Our results are consistent with prior studies documenting that younger veterans are more likely to use cannabis compared to older veterans [24]. However, while younger veterans (e.g., ages 18–25) have previously been shown to have higher overall rates of cannabis use, older veterans (especially those aged 60 and above) were more likely to report using cannabis specifically for medical reasons, such as pain management and mental health conditions [25]. The strong associations with inability to work and pain are also in line with previous reports linking cannabis use to self-management of chronic pain [26] and functional impairments [27]. The observed associations with PTSD and anxiety also mirror findings from other studies [15–18]. In veteran populations, cannabis use has been described as a strategy for coping with intrusive symptoms and hyperarousal [28]. However, cannabis use in the context of mental health disorders remains controversial, with some evidence suggesting potential short-term symptom relief but limited evidence of long-term efficacy and growing concerns regarding dependence, psychiatric comorbidity, and cognitive effects [1,29,30]. Longitudinal studies are urgently needed to assess longer-term effects and determine whether evidence supports these concerns.

The stratified analyses by PTSD status highlight the complex interplay of mental health, service experiences, and functional status. In Veterans without PTSD, CMP authorization was more strongly associated with markers of poor physical health and healthcare engagement, whereas in those with PTSD, service-related trauma and suicidality were key correlates. This distinction may reflect differing pathways to CMP authorization: for some Veterans, cannabis may be pursued primarily for physical health conditions, while for others, it may be linked to trauma and its sequelae. However, pain and functional disability seem to be key factors, regardless of the physical or psychological nature of health issues.

A key strength of this study is the use of large, population-level administrative data linked to the survey, which minimizes recall bias and captures real-world patterns of CMP authorization across a representative veteran population in Canada. The high response (72%) and share (92%) rates minimize selection bias. The inclusion of a broad range of variables, including physical and mental health conditions, functional limitations, and service-related exposures, provides a more comprehensive view than many prior studies, which have typically focused on narrower domains. The stratification by PTSD status represents a novel contribution, uncovering differences in correlates that were obscured in pooled analyses. Furthermore, this study examined CMP authorization rather than self-reported cannabis use, thereby offering unique insights into the regulated, physician-mediated process of access to medical cannabis. Together, these strengths enhance the policy and clinical relevance of our findings, particularly in the Canadian context, where authorization is tied to reimbursement through Veterans Affairs Canada.

Several limitations should be acknowledged. First, the cross-sectional design precludes causal inference; associations cannot establish whether these factors drive CMP authorization or instead reflect the characteristics of those already authorized. Second, reliance on administrative data and survey may underrepresent symptom burden, functional impairment, or informal cannabis use. Third, although we included a broad set of potential correlates, residual confounding remains a possibility. For example, reliance on self-reported data, including PTSD diagnosis and symptoms, pain severity, and employment status, introduces potential for recall and social desirability bias and lacks clinical validation. Importantly, information on actual cannabis use and substance use problem/disorder was not available. Nevertheless, the large

sample size and use of data sources based on reimbursement strengthen the robustness of our findings.

Building on these study findings, future studies should prioritize longitudinal designs to establish relationships between potential predictors and CMP authorization/cannabis use, as well as to evaluate CMP's real-world effectiveness on outcomes highly relevant for veteran (e.g., pain interference, PTSD symptoms, functional recovery) and identify individuals who may benefit the most. For policy makers, distinct correlates by PTSD status highlight the importance of integrated pain-mental health services and careful benefit-risk discussions regarding cannabinoids, particularly where poly-morbidity and functional limitations are present.

Conclusion

In this large cross-sectional study on a representative sample of Canadian veterans, CMP authorization among Canadian veterans was most strongly associated with younger age, inability to work, severe disabling pain, and mental health conditions, with notable differences between those with and without PTSD. These results underscore the need for careful assessment of functional status, service exposures, and mental health in evaluating cannabis authorization. Longitudinal studies are needed to determine how these factors influence long-term outcomes and to guide evidence-based policies for CMP prescribing and reimbursement.

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Supporting Information

Table S1. List of variables considered for inclusion in the statistical model.
Figure S1. Administrative cannabis for medical purposes (CMP) authorizations database as of March 31, 2019, and the Life After Service Survey 2019 data linkage.