

# Pain in Canadian Veterans: Analysis of data from the Survey on Transition to Civilian Life

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**BACKGROUND:** Little is known about the prevalence of chronic pain among Veterans outside the United States.

**OBJECTIVE:** To describe the prevalence of chronic pain and associated sociodemographic, health behaviour, employment/income, disability, and physical and mental health factors in Canadian Veterans.

**METHODS:** The 2010 Survey on Transition to Civilian Life included a nationally representative sample of 3154 Canadian Armed Forces Regular Force Veterans released from service between 1998 and 2007. Data from a telephone survey of Veterans were linked with Department of National Defence and Veterans Affairs Canada administrative databases. Pain was defined as constant/reoccurring pain (chronic pain) and as moderate/severe pain interference with activities.

**RESULTS:** Forty-one percent of the population experienced constant chronic pain and 23% experienced intermittent chronic pain. Twenty-five percent reported pain interference. Needing help with tasks of daily living, back problems, arthritis, gastrointestinal conditions and age  $\geq 30$  years were independently associated with chronic pain. Needing help with tasks of daily living, back problems, arthritis, mental health conditions, age  $\geq 30$  years, gastrointestinal conditions, low social support and noncommissioned member rank were associated with pain interference.

**CONCLUSIONS:** These findings provide evidence for agencies and those supporting the well-being of Veterans, and inform longitudinal studies to better understand the determinants and life course effects of chronic pain in military Veterans.

**Key Words:** *Associated factors; Chronic pain; Military; Prevalence; Veterans*

## La douleur chez les anciens combattants canadiens : une analyse des données tirées de l'Enquête sur la transition à la vie civile

**HISTORIQUE :** On ne sait pas grand-chose de la prévalence de la douleur chronique chez les anciens combattants qui ne vivent pas aux États-Unis.

**OBJECTIF :** Décrire la prévalence de la douleur chronique et des facteurs associés aux variables sociodémographiques, aux comportements liés à la santé, à l'emploi et au revenu, aux invalidités et à la santé physique et mentale chez les anciens combattants canadiens.

**MÉTHODOLOGIE :** L'Enquête sur la transition à la vie civile de 2010 incluait un échantillon national représentatif de 3 154 anciens membres de la force régulière des Forces armées canadiennes libérés du service militaire entre 1998 et 2007. Les chercheurs ont relié les données obtenues lors d'une enquête téléphonique auprès des anciens combattants aux bases de données administratives du ministère de la Défense nationale et des Anciens Combattants Canada. La douleur était définie comme une douleur persistante ou récurrente (douleur chronique) et comme une douleur modérée à grave qui nuisait aux activités.

**RÉSULTATS :** Quarante et un pour cent des membres de l'échantillon ressentait des douleurs chroniques persistantes et 23 %, des douleurs chroniques intermittentes. Vingt-cinq pour cent ont déclaré des interférences causées par la douleur. Le besoin d'aide pour les activités de la vie quotidienne, les problèmes de dos, l'arthrite, les affections gastro-intestinales et un âge de 30 ans ou plus s'associaient de manière indépendante à la douleur chronique. Le besoin d'aide pour les activités de la vie quotidienne, les problèmes de dos, l'arthrite, les problèmes de santé mentale, un âge de 30 ans ou plus, les affections gastro-intestinales, un manque de soutien social et le grade de militaire du rang s'associaient aux interférences causées par la douleur.

**CONCLUSIONS :** Ces observations fournissent des preuves aux organismes et aux dispensateurs qui appuient le mieux-être des anciens combattants et orientent les études longitudinales afin de mieux comprendre les déterminants de la douleur chronique et leurs effets sur la vie des anciens combattants.

International estimates of the prevalence of chronic pain in the general population range from 18% to 35% (1-3). In the United States, the estimated cost of chronic pain to society is approximately \$635 billion annually (4); this translates into \$65 billion annually when these statistics are applied to Canadian data. The prevalence of chronic pain in military Veterans is not well documented. A recent systematic review cited 12 studies, 11 of which were conducted in the United States and one in Finland (5). The prevalence of any pain ranged from 25% to 72% and the prevalence of moderate to severe pain lasting at least three months was 27%. The wide variation in estimates was partly due to differences in the populations sampled, sample size and measurement tool used. There was some consistency in the prevalence of chronic pain in United States Veterans of Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF), among whom the prevalence ranged from 43% to 48% (6-9).

Few studies have examined characteristics associated with chronic pain in Veterans. In a prospective study involving Veterans of OEF/OIF, women were significantly more likely than men to report back and musculoskeletal pain one and seven years after discharge from service (n=450,329) (8). In a cross-sectional study in the United States, women exhibited a lower prevalence of pain compared with men, but higher prevalence of moderate to severe pain (n=91,414) (7). In the same study, being married, lower levels of education, being enlisted and being in the army were associated with chronic pain (7). In a cross-sectional study involving United States Veterans Affairs Veterans in a primary care setting, being younger, reporting worsening health over the past year, emotional distress, smoking, diet issues, weight concerns and use of more outpatient health care services were associated with chronic pain (10).

Current evidence suggests a high prevalence of chronic pain in Veterans; however, there are no studies involving Canadian Veterans.

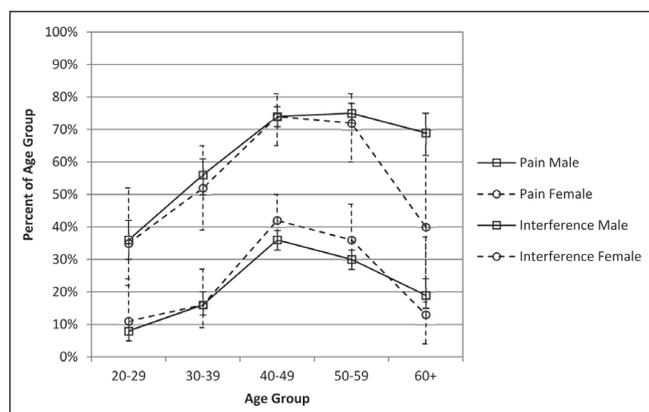
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**Figure 1** Prevalence of chronic pain in Canadian military Veterans according to age and sex

The prevalence of chronic pain and associated characteristics may differ between Veterans in Canada versus the United States due to military service factors, such as role in conflict zones, and conditions after release from the military, such as access to health and social services. Recent Canadian studies suggest that chronic pain in Veterans is associated with low physical health-related quality of life (11) and suicidal ideation (12). The purpose of the present study was to explore the prevalence of chronic pain in Canadian Veterans and identify potential correlates of chronic pain. This will enable comparison with international studies involving Veterans. The objectives were: to describe the prevalence of constant or reoccurring chronic pain/discomfort (chronic pain) and pain-related interference with activities (pain interference); and to identify sociodemographic, health behaviour, employment/income, disability, and physical and mental health factors associated with chronic pain and pain interference.

## METHODS

Data for the present analysis came from the Survey on Transition to Civilian Life, a cross-sectional study of Canadian Armed Forces (CAF) Regular Force Veterans who were released from service between January 1, 1998 and December 31, 2007. Only 30.4% of Veterans in the target population are Veterans Affairs Canada (VAC) clients. Therefore, a stratified random sample was drawn that included an oversampling of VAC clients (14). Veterans living in institutions, the Territories or outside Canada, serving outside Canada, or still serving in the military were excluded. Of the 4721 Veterans sampled, the response rate was 71%. Ninety-four percent agreed to share responses with VAC and the Department of National Defense (DND), providing a nationally representative sample of 3154. Sixty-six percent were not clients of VAC. The current analysis is based on the sample of 3154 Veterans, which represents a weighted total population of 32,015. Military characteristics, VAC status and demographic characteristics were obtained through data linkage with DND and VAC administrative databases and self-report. Details of this computer-assisted telephone survey conducted by Statistics Canada and the variables contained and extracted from the DND and VAC administrative databases are reported elsewhere (13).

The objectives of the Survey on Transition to Civilian Life were to capture self-reported information on health, disability and determinants of health of former CAF members (14). The questionnaire sought information on multiple factors, limiting the ability to collect detailed data on pain. The questionnaire included three questions about pain: "Do you have any pain or discomfort that is always present? (yes/no)"; "Do you have any pain or discomfort that reoccurs from time to time? (yes/no)"; and "During the past four weeks, how much did pain interfere with your normal work (including work both outside the home and housework)? (not at all/a little bit/moderately/quite a bit/extremely)". The first two questions are similar to questions from the Health Utility Index, and the third question comes from the Short Form-12 Health

Outcomes Survey (2,15-17). For the purpose of the present study, pain was defined in two ways: constant or reoccurring pain or discomfort (responded 'yes' for questions 1 and 2; which were referred to as chronic pain) and moderate to severe pain that interfered with activities (selected 'moderately', 'quite a bit' or 'extremely' for question 3; which was referred to as pain interference).

Several factors known to be associated with chronic pain in the general population (1,2,17-20) were examined in the present analysis, including age, sex, education, marital status, household income and employment status. Health-related characteristics included tobacco and alcohol use, diagnosed chronic physical health conditions, body mass index (BMI) and diagnosed mental health conditions. Activity limitation was measured as needing help with at least one basic or instrumental activity of daily living. In addition, military characteristics, including years of service and rank, were examined. Continuous variables were categorized as follows: 10-year age intervals, household income quartiles, years of service (<2, 2 to 9, 10 to 19, ≥20) and BMI (<25 kg/m<sup>2</sup> = underweight/normal, ≥25 kg/m<sup>2</sup> to <30 kg/m<sup>2</sup> = overweight and ≥30 kg/m<sup>2</sup> = obese).

All physical and health-related data were captured through self-report. Details about questions and responses are reported elsewhere (13). Missing data were minimal with the exception of alcohol consumption (13% missing) and income (5.0%). An 'undisclosed' category was created for these variables to allow for the inclusion of the missing respondents.

Statistics Canada respondent sampling weights were applied to account for VAC client status, age, sex and nonresponse (21,22). Data analysis included frequencies and percentages for all independent variables and the two outcome variables. Mean and SD was also calculated for age. Independent variables were cross-tabulated with pain outcome variables. The cross-tabulations were conducted on the sample to ensure adequate sample size to conduct a robust analysis before applying sampling weights. The  $\chi^2$  test was used to assess for differences in the distribution of demographic and clinical variables for those who have chronic pain and those who do not. The same analyses were conducted for those who have moderate to severe pain interference and those who do not. Statistically significant variables identified in the bivariate analyses were included in the multivariable logistic regression analyses. Backwards manual stepwise methods were used to eliminate variables until the most parsimonious model remained. At each iteration, the variable contributing the least to the model was removed. Only variables with  $P < 0.05$  were retained in the final models. Results are expressed as OR and 95% CIs. All analyses were conducted using Stata 11.1 ([www.stata.com](http://www.stata.com));  $P < 0.05$  was considered to be statistically significant. Ethics approval was obtained from the Queen's University Research Ethics Board (Kingston, Ontario).

## RESULTS

The mean ( $\pm$  SD) age of Veterans was  $44 \pm 10$  years (range 20 to 67 years), 88% were men and 60% were married. Forty-seven percent had high school education or less. Fifty-three percent were in the military for  $\geq 20$  years, 58% were junior or senior noncommissioned officers, 21% were senior officers and 21% were private/recruits. Twenty-four percent of the population reported at least one mental health condition. The highest prevalence was reported for anxiety or depression (20%), followed by anxiety or mood disorder (12%) and post-traumatic stress disorder (11%).

Forty-one percent of Veterans experienced constant pain or discomfort, and 23% experienced reoccurring pain. The weight-adjusted combined prevalence of constant/reoccurring pain (chronic pain) was 64%. The prevalence of chronic pain ranged from 36% (20 to 29 years of age) to 75% (50 to 59 years of age) among men and 35% (20 to 29 years of age) to 74% (40 to 49 years of age) among women. The prevalence of moderate to severe pain interference in the total population of Veterans was 25%. Pain interference ranged from 8% (20 to 29 years of age) to 36% (40 to 49 years of age) among men and 11% (20 to 29 years of age) to 42% (40 to 49 years of age) among women (Figure 1).

**TABLE 1**  
**Sociodemographic characteristics of the study population**

Characteristic*	% of total sample	Pain, always or recurrent			Pain interference with work, moderate to extreme		
		Sample, n	Weighted, total population, n	Weighted, % with pain	Sample, n	Weighted, total population, n	Weighted, % with pain
Sex							
Male	88	2777	28,202	65	2775	28,191	25
Female	12	373	3785	63	371	3775	30
Age group, years							
20–29	16	304	5047	36	304	5046	8.2
30–39	18	437	5884	55	436	5881	16
40–49	34	1251	10798	74	1249	10,782	37
50–59	24	894	7726	75	893	7722	31
60–69	7.9	264	2534	67	264	2534	19
Education							
Less than high school	6.8	233	2160	68	233	2160	32
High school	41	1345	12,991	64	1342	12,972	28
Post-secondary	53	1569	16,811	64	1568	16,808	22
Household income							
1st quartile	26	820	7610	66	818	7599	35
2nd quartile	23	712	7076	65	712	7076	26
3rd quartile	27	864	8736	68	862	8725	25
4th quartile	19	598	6959	57	599	6963	15
Undisclosed	5.0	156	1606	63	155	1602	26
Employment status							
Employed	75	2188	24,112	61	2188	24,108	20
Not employed	25	959	7852	74	955	7833	42
Smoker type							
Daily	19	617	6085	68	616	6082	33
Occasional	5.3	163	1706	63	163	1706	26
Nonsmoker	76	2367	24,166	64	2364	24,148	24
Drinker type							
Heavy	26	767	8150	62	766	8146	24
Not heavy	62	1930	19,747	64	1927	19,728	23
Undisclosed	13	453	4091	70	453	4091	38
Years of service							
<2	18	327	5605	33	327	5605	8.4
2–9	17	414	5293	58	413	5289	16
10–19	13	493	4212	79	494	4216	42
≥20	53	1916	16,877	73	1912	16,855	30
Military rank							
Officer	21	553	6551	52	553	6551	11
Senior NCM	28	1043	9025	75	1042	9018	33
Junior NCM	31	1127	9634	79	1124	9619	38
Private/Recruit	21	427	6778	41	427	6777	12

\*All comparisons were significant at  $P < 0.05$ . NCM Noncommissioned member

The distribution of sociodemographic characteristics according to the presence of chronic pain and moderate to severe pain interference are provided in Table 1.  $\chi^2$  testing indicated that the distribution of all demographic characteristics differed between those with chronic pain and those who did not report chronic pain ( $P < 0.05$ ). Chronic pain was most common in Veterans with the following characteristics: 10 to 19 years of military service, rank of junior noncommissioned officer, 50 to 59 years of age, unemployed, undisclosed alcohol consumption, less than high school education, daily smoker and male sex. Similar findings were present for pain interference, except women were more likely than men to report pain interference.

Chronic pain and pain interference were highly prevalent in Veterans with physical conditions such as arthritis, gastrointestinal issues, back problems and respiratory issues (Table 2). Pain was also highly prevalent in the presence of mental health conditions.

Eighty-five percent of Veterans with at least one mental health condition had chronic pain and 55% had pain interference. The prevalence of chronic pain was high in Veterans with depression or anxiety (86%), anxiety or mood disorder (88%), and post-traumatic stress disorder (93%). In addition, 95% of individuals with mental health conditions also had at least one physical health condition. The prevalence of chronic pain was highest in the subgroup of Veterans who were obese, compared with overweight and normal/underweight Veterans.

Table 3 reports the findings of the most parsimonious model for chronic pain. The strongest association was found for requiring help with activities, followed by back problems and arthritis. Given that back problems and arthritis may be highly correlated with requiring help, the model was rerun after requiring help with activities was removed. The odds of chronic pain increased for back problems (OR 10.89 [95% CI 8.26 to 14.35]), arthritis (OR 9.23 [95% CI 6.24 to

**TABLE 2**  
**Health characteristics of the study population**

Characteristic*	% of total sample	Pain, always or recurrent			Pain interference with work <sup>†</sup>		
		Sample, n	Weighted, total population, n	Weighted, %	Sample, n	Weighted, total population, n	Weighted, %
Needs help with activities							
Sometimes/often	56	2191	17867	90	2187	17,845	44
Never	44	943	13,974	32	943	13,973	1.8
Back problems							
Yes	40	1546	12,813	92	1544	12,802	45
No	60	1602	19,163	46	1599	19,149	12
Arthritis							
Yes	23	992	7459	95	991	7456	55
No	77	2145	24,413	55	2141	24,390	16
Diabetes							
Yes	5.5	214	1760	77	214	1760	37
No	95	2931	30,199	64	2926	30,173	25
Heart disease							
Yes	4.1	154	1312	78	153	1305	42
No	96	2989	30,628	64	2985	30,609	25
High blood pressure							
Yes	18	685	5872	77	685	5871	34
No	82	2456	26,045	61	2451	26,019	23
Gastrointestinal disorder							
Yes	11	448	3514	91	448	3514	54
No	89	2681	28,315	61	2676	28,289	22
Respiratory disorder							
Yes	8.0	278	2408	80	278	2408	41
No	92	2691	27,524	63	2687	27,502	24
Body mass index							
Normal/underweight	29	777	9058	56	775	9050	19
Overweight	43	1361	13,551	64	1360	13,543	25
Obese	28	973	8943	73	973	8943	32
At least one mental health condition							
Yes	24	1015	7541	85	1013	7534	55
No	76	2117	24,279	58	2114	24,260	16

\*All analysis are significant at  $P < 0.05$ ; <sup>†</sup>Moderate to extreme interference with work

13.66]) and age (30 to 39 years, OR 1.79 [95% CI 1.24 to 2.58]; 40 to 49 years, OR 3.07 [95% CI 2.20 to 4.28]; 50 to 59 years, OR 3.17 [95% CI 2.23 to 4.52];  $\geq 60$  years, OR 1.65 [95% CI 1.04 to 2.63]).

Table 4 reports the findings for the pain interference model. Similar to the chronic pain model, requiring help with activities had the highest odds of pain interference. Removal of this variable from the model changed the ORs for some of the other variables but not to the same extent as in the chronic pain model; back problems (OR 3.33 [95% CI 2.68 to 4.13]), arthritis (OR 3.77 [95% CI 3.02 to 4.72]), having a mental health condition (OR 2.73 [95% CI 2.16 to 3.44]), older age (40 to 49 years OR 3.00 [95% CI 1.77 to 5.11]; 50 to 59 years OR 2.23 [95% CI 1.29 to 3.88]), having gastrointestinal problems (OR 1.79 [95% CI 1.30 to 2.46]), low social support (OR 1.48 [95% CI 1.19 to 1.83]), being unemployed (OR 2.3 [95% CI 1.85 to 2.9]) and being a junior noncommissioned member remained nonsignificant (OR 1.02 [95% CI 0.65 to 1.59]); however, the OR increased to being the same as the OR for private/recruit (reference category).

## DISCUSSION

The present study was the first to explore the epidemiology of chronic pain in Canadian Veterans and, in addition to a Finnish study, one of the only studies outside of the United States. Sixty-four percent of Canadian Veterans experienced constant or intermittent chronic pain or discomfort, and 25% had moderate to severe interference with activities due to pain. After controlling for several significant covariates, there was a strong

association between physical health conditions and the presence of chronic pain and moderate to severe pain interference. Mental health conditions were associated with pain interference but not with the presence of chronic pain.

The prevalence of 64% with constant or reoccurring chronic pain in our study is higher than the range reported in a recent systematic review of chronic pain in Veterans (25% to 50%) (5); however, our finding of 41% with constant pain is consistent with the review. The definition of chronic pain in our study is closest to the measure used in a convenience sample of Veterans from primary care in the VA Connecticut Healthcare System (10), which obtained a prevalence of 48% (10). Our estimate is higher than international estimates of approximately 30% (23) and Canadian estimates that range from 18% to 35% (2,17,24,25). The Canadian National Population Health Survey definition (18%) is based on constant pain only (ie, "are you usually free of pain or discomfort?"), while our definition is based on constant or reoccurring pain or discomfort. The heterogeneity in prevalence estimates in Veteran and civilian populations is partially due to the variability in sampling techniques, populations studied and measurement tools used. Research involving chronic pain is more advanced in the general populations, in whom more studies have been conducted using more detailed and validated measurement tools. This has likely led to the more refined range of estimates in general populations (2,17,23,26).

Some physical health conditions were up to twice as prevalent in this Veteran population than in the age- and sex-adjusted Canadian general population: back problems, arthritis, gastrointestinal conditions

**TABLE 3**  
**Factors associated with chronic pain in Canadian Veterans**

Independent variables*	Unadjusted OR	95% CI	Adjusted OR	95% CI
Needs help with activities of daily living				
No	1.0		1.0	
Yes	18.96	15.20–23.64	8.36	6.54–10.68
Back problems				
No	1.0		1.0	
Yes	13.86	10.67–18.00	7.15	5.27–9.71
Arthritis				
No	1.0		1.0	
Yes	14.43	10.04–20.74	5.49	3.59–8.40
Gastrointestinal conditions				
No	1.0		1.0	
Yes	6.93	4.43–10.83	2.64	1.54–4.51
Age, years				
20–29	1.0		1.0	
30–39	2.24	1.63–3.10	1.55	1.05–2.31
40–49	5.23	3.93–6.96	1.97	1.39–2.81
50–59	5.37	3.98–7.24	1.80	1.23–2.65
≥60	3.75	2.58–5.45	1.20	0.71–2.03

\*Removed from model in the following order: diabetes, mental health condition, smoking, respiratory condition, hypertension, length of service, alcohol, education, rank, obesity, heart disease, sex, employment, income, social support

and obesity (13). Back problems, arthritis and gastrointestinal conditions were associated with chronic pain and pain interference. Musculoskeletal disorders and gastrointestinal disorders are commonly associated with chronic pain and discomfort in other populations (27–32). These findings are supported by the association between physical health-related quality of life and chronic pain reported in a previous study involving this study population (11).

Seventy-one percent of Veterans were overweight or obese, which is slightly higher than the estimate of 60% in the general population (13,33). The prevalence of chronic pain and pain interference was higher for overweight and obese Veterans; however, after adjusting for other factors, BMI was not retained in the final multivariate model. Obesity has been correlated with chronic pain in other studies (20,34,35) and the relationship is believed to be multifactorial (36). The finding of a strong association between chronic pain and physical health conditions, such as musculoskeletal disorders, suggests that painful health conditions for which obesity is a risk factor could have mediated the effect of obesity, which would account for the lack of association between obesity and chronic pain and pain interference in the final models. Furthermore, musculoskeletal disorders may contribute to activity limitation, which may lead to obesity, and vice versa (20,37–40).

Other physical health problems, such as heart disease and diabetes, were not associated with chronic pain or pain interference in the adjusted model in our study. Physical health conditions accumulate with age; however, some conditions may be more prevalent at earlier ages. For example, arthritis and back problems are more common earlier in life than heart disease or adult-onset diabetes. This was a relatively young population with a mean age of 44 years; thus, larger sample sizes are likely required to detect associations between heart disease or diabetes and chronic pain.

In bivariate analysis, 85% of Veterans with at least one mental health condition had chronic pain and 55% had pain interference compared with 58% and 16%, respectively, of Veterans without a mental health condition. Additionally, 95% of respondents with a mental health condition also had a physical health condition. In multivariable regression, mental health conditions were not associated with chronic pain independently of chronic musculoskeletal and gastrointestinal

**TABLE 4**  
**Factors associated with pain interference with activities (moderate to severe) in Canadian Veterans**

Independent variables*	Unadjusted OR	95% CI	Adjusted OR	95% CI
Needs help with activities				
No	1.0		1.00	
Yes	41.88	26.22–66.89	17.45	10.23–29.73
Back problems				
No	1.0		1.00	
Yes	5.84	4.89–6.98	2.22	1.77–2.79
Arthritis				
No	1.0		1.00	
Yes	6.27	5.24–7.50	2.77	2.21–3.47
Mental health condition				
No	1.0		1.00	
Yes	6.13	5.12–7.34	2.08	1.64–2.65
Age, years				
20–29	1.0		1.00	
30–39	2.10	1.32–3.33	1.07	0.58–1.96
40–49	6.50	4.30–9.82	2.06	1.12–3.80
50–59	4.89	3.21–7.45	1.41	0.75–2.66
≥60	2.53	1.54–4.14	0.82	0.40–1.71
Gastrointestinal problems				
No	1.0		1.00	
Yes	4.11	3.26–5.18	1.56	1.16–2.15
Low social support				
No	1.0		1.00	
Yes	2.56	2.16–3.03	1.30	1.04–1.63
Employed				
No	1.0		1.00	
Yes	0.34	0.29–0.41	0.43	0.34–0.54
Rank				
Private/recruit	1.0		1.00	
Officer	0.88	0.61–1.27	0.32	0.18–0.58
Senior NCM	3.42	2.52–4.65	0.62	0.36–1.08
Junior NCM	4.34	3.20–5.89	0.71	0.43–1.20

\*Removed from model in the following order: sex, diabetes, heart disease, length of service, education, respiratory condition, obesity, alcohol, income, hypertension, smoking. NCM Noncommissioned member

conditions. Respondents may have understood the phrase “pain or discomfort” to relate more to physical than mental health conditions. However, chronic pain is well known to have mental health dimensions (41), which could, in part, explain why physical and mental health conditions were independently associated with interference with activity by pain. The importance of the co-occurrence of physical and mental health conditions in the epidemiology of disability is well established in population studies (42–48), and the findings of our study implicate the role of painful physical health conditions together with mental health status in disability in Veterans.

In the present study, being employed and having higher levels of income decreased the odds of pain interference, which is supported by the literature (2,20,25). Military rank reflects socioeconomic factors and was also associated with pain interference. In bivariate analysis, noncommissioned member rank was associated with increased odds of pain interference before controlling for physical and mental health conditions. Noncommissioned members had the highest rates of medical release, physical and mental health conditions and activity limitations in this population (48). It is possible that the disproportionate rate of chronic health conditions in former noncommissioned members, especially painful musculoskeletal conditions, are attributable to higher occupational physical demands.

Studies in the United States have reported similar gradients in self-reported health according to rank and higher odds of disability discharge in Veterans with physically demanding occupations (49-52).

The prevalence of chronic pain and pain interference was highest in Veterans 40 to 59 years of age and prevalence decreased for those  $\geq 60$  years of age. Reports describing the relationship between chronic pain and age are inconsistent; however, the results in the current study support the findings in a large European study of chronic pain in the general population in which prevalence declined in the older age groups, particularly after 60 years of age (1). In a systematic review investigating pain in Veterans, only one study identified age as a correlate of chronic pain and higher rates were also reported in younger Veterans compared with older Veterans (5). Specific age categories were not provided. The finding of lower levels of pain in older age groups may be related to expectations that pain is normal with aging and, therefore, individuals may be less likely to report it. Another factor may be that pain interference decreases, because work-related activity usually decreases with age. The socioemotional selectivity theory may also contribute to decreased pain reports with older age. This theory posits that as time horizons shrink (ie, as people age), individuals increasingly focus on positive thoughts or memories (53).

The prevalence of chronic pain was similar for women (63%) and men (65%), while women were more likely to report moderate to severe pain interference (30% of women versus 25% of men). These findings are similar to a study involving OEF/OIF Veterans in the United States in which women had a lower prevalence of chronic pain compared with men, even after adjusting for other factors, but they were slightly more likely to report moderate to severe pain (7). The lack of a statistically significant association for sex in the final models may be related to a lack of statistical power owing to the low proportion of women compared with men in the study, or factors that moderate the relationship between sex and pain. However, the low numbers of women in the survey limited the analysis. Future prospective studies in larger cohorts of women Veterans are needed to explore these outcomes further.

A strength of the present study was the ability to generalize findings to all Regular Force Veterans who transitioned to civilian life from the Canadian military between 1998 and 2007. Random sampling and weighting of the sample to the total population to account for VAC status, age, sex and nonresponse also contribute to the generalizability of the findings (13). The good response rate and high consent-to-share rate reduced the likelihood of response bias. Sociodemographic and military characteristics were captured from DND administrative databases rather than self-report, thereby minimizing recall bias.

A limitation of the present study was that indicators and determinants of health were captured by self-report. There is potential for under-

over-reporting health conditions when relying on self-report. However, self-report has long been used in Canadian population health studies to study determinants of health. Self-report is also the standard means of capturing pain outcomes given that pain is a subjective experience. The three questions used to capture pain outcomes are general, do not capture the level of detail available from other validated survey instruments and do not include a measure of pain duration. However, the questions are similar to those used to measure chronic pain in several Canadian studies (2,15-17), allowing for comparison of pain in Canadian Veterans to Canadians in the general population. The study sample was limited to regular forces members; therefore, these findings cannot be generalized to reservists. The findings do not necessarily apply to CAF personnel who deployed to Afghanistan because it was conducted before the conclusion of Canada's Afghanistan combat mission, and most of those who deployed were and even today remain in service and, therefore, were not included in the 2010 survey. The findings cannot be generalized to elderly Veterans, given that the oldest participant in the study sample was 67 years of age. A further limitation is the small sample of women included in the study, which limited the ability to adequately assess the relationship between pain and sex. Due to the cross-sectional nature of the study, causality and directionality of the relationship cannot be determined.

The present study identified a group of Veterans who have a high prevalence of chronic pain and discomfort and pain-related activity interference, along with associated chronic health conditions and socioeconomic barriers. These findings add to the growing knowledge about chronic pain in Veterans, and offer useful information for providers and agencies supporting Veterans' well-being. The results support the importance of considering physical health conditions when treating Veterans with mental health conditions and chronic pain because 95% of those with mental health conditions had chronic physical health conditions and many chronic physical health conditions are painful. In addition, chronic pain, mental health conditions and physical health conditions are all highly correlated with disability in this population (48). The results of the present study will inform the design of longitudinal studies of chronic pain and research to identify optimum approaches to mitigate chronic pain and the disabling effects of chronic pain in military Veterans.

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