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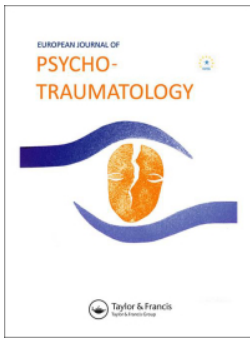
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## Moral injury associated with increased odds of past-year mental health disorders: a Canadian Armed Forces examination

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### ABSTRACT

**Background:** Potentially morally injurious experiences (PMIEs) are common during military service. However, it is unclear to what extent PMIEs are related to well-established adverse mental health outcomes.

**Objective:** The objective of this study was to use a population-based survey to determine the associations between moral injury endorsement and the presence of past-year mental health disorders in Canadian Armed Forces (CAF) personnel and Veterans.

**Methods:** Data were obtained from the 2018 Canadian Armed Forces Members and Veterans Mental Health Follow-up Survey (CAFVMHS). With a sample of 2,941 respondents, the weighted survey sample represented 18,120 active duty and 34,380 released CAF personnel. Multiple logistic regressions were used to assess the associations between sociodemographic characteristics (e.g. sex), military factors (e.g. rank), moral injury (using the Moral Injury Events Scale [MIES]) and the presence of specific mental health disorders (major depressive episode, generalized anxiety disorder, panic disorder, social anxiety disorder, PTSD, and suicidality).

**Results:** While adjusting for selected sociodemographic and military factors, the odds of experiencing any past-year mental health disorder were 1.97 times greater (95% CI = 1.94–2.01) for each one-unit increase in total MIES score. Specifically, PTSD had 1.91 times greater odds (95% CI = 1.87–1.96) of being endorsed for every unit increase in MIES total score, while odds of past-year panic disorder or social anxiety were each 1.86 times greater (95% CI = 1.82–1.90) for every unit increase in total MIES score. All findings reported were statistically significant ( $p < .001$ ).

**Conclusion:** These findings emphasize that PMIEs are robustly associated with the presence of adverse mental health outcomes among Canadian military personnel. The results of this project further underscore the necessity of addressing moral injury alongside other mental health concerns within the CAF.

### Daño moral asociado con mayores probabilidades de trastornos de salud mental en el último año: un estudio de las Fuerzas Armadas Canadienses

**Antecedentes:** Experiencias potencialmente dañinas para la moral (PMIEs por sus siglas en inglés) son frecuentes durante el servicio militar. Sin embargo, no está claro en qué medida las PMIEs se relacionan con las consecuencias adversas de salud mental bien establecidas.

**Objetivo:** El objetivo de este estudio fue utilizar una encuesta basada en la población para determinar las asociaciones entre la atribución del daño moral y la presencia de trastornos de salud mental en el último año en los veteranos y personal de las Fuerzas Armadas Canadienses (CAF por sus siglas en inglés).

**Métodos:** Los datos se obtuvieron de la Encuesta de Seguimiento de Salud Mental de los Veteranos y Miembros de las Fuerzas Armadas Canadienses del 2018 (CAFVMHS). Con una muestra de 2.941 encuestados, la muestra ponderada de la encuesta representó 18.120 miembros en servicio activo y 34.380 liberados de la CAF. Se utilizaron regresiones logísticas múltiples para evaluar las asociaciones entre las características sociodemográficas (ej., sexo), factores militares (ej., rango), daño moral (utilizando la Escala de Eventos de Daño Moral [MIES por sus siglas en inglés]) y la presencia de trastornos de salud mental específicos (episodio depresivo mayor, trastorno de ansiedad generalizada, trastorno de pánico, trastorno de ansiedad social, TEPT y suicidalidad).

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### KEYWORDS

Mental health; mental health disorders; military personnel; stress disorders; post-traumatic; moral injury

### PALABRAS CLAVE

Salud Mental; Trastornos de Salud Mental; Personal Militar; Trastornos de Estrés; Postraumático; Daño Moral

### 关键词

心理健康; 心理健康障碍; 军人; 应激障碍; 创伤后; 道德伤害

### HIGHLIGHTS

- Potentially morally injurious experiences are common during military service, but it is poorly understood how these experiences are related to other mental health disorders in Canadian Armed Forces members and Veterans.
- Following a series of multiple logistic regressions, the odds of experiencing a past-year mental health disorder were 1.97 (95% CI = 1.94–2.01) times greater per unit increase in total Moral Injury Events Scale score.
- This emphasizes the association between morally injurious events and deleterious mental health outcomes in Canadian military personnel, and further

**Resultados:** Al ajustar por factores sociodemográficos y militares seleccionados, la probabilidad de experimentar cualquier trastorno de salud mental en el último año fueron 1.97 veces mayores (IC95%= 1.94-2.01) para cada aumento de una unidad en la puntuación total del MIES. Específicamente, el TEPT tenía 1,91 veces más probabilidades (IC 95%= 1.87-1.96) de ser atribuido por cada aumento de unidad en la puntuación total del MIES, mientras que la probabilidad de trastorno de pánico o ansiedad social del último año fueron 1,86 veces mayores (IC 95%= 1.82-1.90) por cada aumento de unidad en la puntuación total del MIES. Todos los hallazgos reportados fueron estadísticamente significativos ( $p < 0,001$ ).

**Conclusiones:** Estos hallazgos enfatizan que las PMIEs se asocian fuertemente con la presencia de consecuencias de salud mental adversas entre el personal militar Canadiense. Los resultados de este proyecto subrayan aún más la necesidad de abordar el daño moral junto con otros problemas de salud mental dentro de las CAF.

### 与过去一年心理健康障碍几率增加相关的道德伤害：对加拿大武装部队的考查

**背景:** 潜在的道德伤害经历 (PMIE) 在服役期间很常见。然而, PMIE 在多大程度上与公认的不良心理健康结果相关仍不清楚。

**目的:** 本研究旨在使用基于人群调查来确定加拿大武装部队 (CAF) 人员和退伍军人的道德伤害认可与过去一年心理健康障碍之间的关联。

**方法:** 数据来自 2018 年加拿大武装部队成员和退伍军人心理健康随访调查 (CAFVMHS)。样本为 2,941 名受访者, 加权调查样本代表了 18,120 名现役人员和 34,380 名退役 CAF 人员。使用多元逻辑回归评估社会人口特征 (例如性别)、军事因素 (例如军衔)、道德伤害 (使用道德伤害事件量表 [MIES]) 和特定心理健康障碍 (重性抑郁发作、广泛性焦虑障碍、惊恐发作、社交焦虑障碍、创伤后应激障碍和自杀倾向) 之间的关联。

**结果:** 在针对选定的社会人口学和军事因素进行调整时, MIES 总分每增加一个单位, 过去一年经历任何精神健康障碍的几率就会增加 1.97 倍 (95% CI = 1.94-2.01)。具体而言, MIES 总分每增加一个单位, PTSD 发生几率高 1.91 倍 (95% CI = 1.87-1.96), 而 MIES 总分每增加一个单位, 过去一年恐慌障碍或社交焦虑障碍的几率分别高 1.86 倍 (95% CI = 1.82-1.90)。报告的所有结果均统计显著 ( $p < .001$ )。

**结论:** 这些研究结果强调, PMIE 与加拿大军人中不良心理健康结果的存在密切相关。本项目的结果进一步强调了在 CAF 内解决道德伤害以及其他心理健康问题的必要性。

highlights the importance of addressing moral injury in this population.

## 1. Introduction

Military service is well established as a risk factor associated with future adverse mental health outcomes such as posttraumatic stress disorder (PTSD), anxiety disorders such as panic disorder, substance use, major depressive disorder (MDD), and suicidality, including suicidal ideation (Arenson et al., 2018; Boulos & Zamorski, 2013; Fikretoglu et al., 2016; Norman et al., 2018; Ramchand et al., 2015; Rusu et al., 2016; Van Til et al., 2017 June 23). For example, in 2018, Canadian Armed Forces (CAF) survey respondents reported a cumulative lifetime prevalence of 54% for at least one mood or anxiety disorder (Sareen et al., 2021). Furthermore, between 2002 and 2018, 44% of CAF members endorsed experiencing anxiety or depression (Sareen et al., 2021), much higher than the Canadian civilian population endorsement of 5.4% for major depression and 4.6% for any anxiety disorder reported between 2000 and 2016 (Sareen et al., 2021). Studies have also previously shown increased risk of mental health disorders in both American and United Kingdom military samples (Finnegan and Randles 2022; Goodwin et al., 2015; Kessler et al., 2014; Ramchand et al., 2015), with odds of probable mental health disorder being nearly double that of the United Kingdom general population (Goodwin et al., 2015). Finnegan and Randles (2022) recently

found that 38% of veterans in their British Armed Forces cohort had been diagnosed (in their medical record) with at least one mental health disorder, similar to previous Canadian military findings (Finnegan and Randles 2022). Numerous factors may account for the high prevalence of adverse mental health outcomes in military populations, including pre-enlistment demographic variables (e.g. sex, age, adverse childhood events), stressful deployment experiences, personality-related considerations, and exposure to potentially morally injurious experiences (PMIEs) (Sareen et al., 2021; Thompson et al., 2016).

Moral injury (MI) is defined as the psychological, spiritual, and social distress that occurs following situations where individuals have witnessed, failed to prevent, or perpetrated acts that are appraised as violating personal moral beliefs (Lewis, 1971; Litz et al., 2009; Thompson et al., 2016). Recent evidence suggests that PMIEs are commonly encountered during military service. In a representative survey of previously deployed CAF members, Nazarov et al. (2018) found that over half of respondents experienced one or more PMIEs. Similarly, Wisco et al. (2017) found that in United States combat Veterans, 10% reported transgressing their personal morals, 25% endorsed experiencing betrayal from other military members, and 25% reported witnessing transgressions of others.

Previous studies have also found that exposure to PMIEs increased the likelihood of experiencing negative mental health outcomes, including PTSD and MDD (Nazarov et al., 2018). The subscale facets of PMIEs (personal transgressions, betrayal, and transgressions of others) may also have potential implications regarding negative mental health outcomes (Nazarov et al., 2018). Although these studies provide evidence that PMIEs are frequently encountered during military service, it remains unclear to what extent MI is related to well-established adverse mental health outcomes among Canadian military members with and without previous deployment experience. Understanding how MI may be associated with mental health disorders is crucial for developing targeted interventions to ameliorate the burden of mental health disorders within this population.

The aim of this study was to determine the association between MI endorsement and the presence of specified past-year mental health disorders in a nationally representative sample of CAF personnel and Veterans. We hypothesized that MI would incrementally predict increased odds of past-year mental health conditions, including PTSD, suicidal ideation, major depressive episode, social anxiety disorder, generalized anxiety disorder, and panic disorder over and above relevant included demographic and military-related variables, such as rank, force type and sex. We further hypothesized that transgressions by others would have a larger impact on the increased odds of past-year mental health conditions, when compared to transgressions by self, due to the inability to control the actions of other people, and the moral implications of such.

## 2. Material and methods

### 2.1. Participants and data collection

Data were obtained from the 2018 Canadian Armed Forces Members and Veterans Mental Health Follow-up Survey (CAFVMHS) (Afifi et al., 2021). The target sampling population for the CAFVMHS was individuals who had completed the 2002 Canadian Community Mental Health Survey – Mental Health and Well-Being – Canadian Forces (CCHS-CF) (Sareen et al., 2007), and who were full-time Regular or Reserve Force members at that time. At the time of the 2018 administration, personnel could be Veterans or could be actively serving in the CAF.

Regular force members of the CAF who participated in the 2002 CCHS-CF ( $n = 4,299$ ) were eligible for the CAFVMHS follow-up survey, of whom 2,941 participated. Longitudinal weights were applied by Statistics Canada to produce representative estimates of the target CCHS-CF population in 2002. Therefore, the weighted CAFVMHS sample represented 34,380

released and 18,120 active-duty CAF personnel from the 2002 survey. Between January and May 2018, Statistics Canada collected and scored data using computer-assisted personal interviews. All data were collected in accordance with Statistics Canada procedures and approved by relevant review boards. Data were then accessed through Statistics Canada Research Data Centres. For more information regarding the CAFVMHS rationale and methodology, please refer to Afifi et al. (2021)

### 2.2. Measures

#### 2.2.1. Mental health outcomes

Mental health disorders were measured in the 2018 CAFVMHS using the World Health Organization Composite International Diagnostic Interview (WHO-CIDI), which is a structured diagnostic interview developed in accordance with the Diagnostic and Statistical Manual of Mental Health Disorders, fourth edition (DSM-IV) (Kessler et al., 2003; Robins et al., 1988; Sareen et al., 2007; Wittchen, 1994). The outcomes of interest from the WHO-CIDI were past-year prevalence of major depressive episode (MDE), generalized anxiety disorder (GAD), panic disorder (PD), and social anxiety disorder (SAD). The WHO-CIDI was used for continuity between the 2002 CCHS-CAF and 2018 CAFVMHS datasets. For more information regarding the methodology of the surveys, please see Afifi et al. (2021).

Past-year PTSD was determined by assessing the presence of a CIDI-based PTSD diagnosis during the 16-year follow-up period, experiencing PTSD-related symptoms, and having at least three of seven PTSD symptoms that were assessed in the past-year time frame. This algorithm for PTSD diagnosis was created and validated by Statistics Canada based on previous surveys (Afifi et al., 2021). Suicidal ideation (SI) was self-reported based on the question, ‘in the past 12 months, did you seriously think about attempting suicide or taking your own life?’.

#### 2.2.2. Moral injury

MI was evaluated using the Moral Injury Events Scale (MIES) (Nash et al., 2013), which uses a 6-point Likert scale to assess event experiences. Participants were presented with a series of nine statements (e.g. ‘I saw things that were morally wrong’) and were asked to indicate their level of agreement (1 = *strongly disagree*, 6 = *strongly agree*), with possible scores ranging from 9 to 54. The transgressions other subscale (items 1 and 2) has possible scores ranging from 2 to 12, transgressions by self (items 3–6) has scores that range from 4 to 24, and betrayal subscale (items 7–9) has possible scores ranging from 3 to 18. Importantly, Statistics Canada implemented logic skipping during administration, wherein a participant selecting ‘*strongly*

*disagree* for certain items automatically had *strongly disagree* imputed for a subsequent item (e.g. *strongly disagree* for item one, 'I saw things that were morally wrong', automatically imputed *strongly disagree* for item two, 'I am troubled by having witnessed others' immoral acts'). Research has examined the psychometric properties of this measure in United States and Canadian military samples (Nash et al., 2013; Plouffe et al., 2023). Based on past studies (Plouffe et al., 2023), MIES total scores and two subscale scores (Transgressions by Self and Transgressions by Others) were calculated using mean values.

### 2.2.3. Covariates

Military variables, including force type (Regular or Reserve Force), service environment (Army, Navy, or Air Force), and rank (junior non-commissioned member, senior non-commissioned officer, junior officer, senior officer) were included as covariates in the model. Due to evidence that there may be age- and sex-related differences in the endorsement of mental health disorders (Nazarov et al., 2018), age (categorized as 33–44, 45–60, 61–75 years) and sex (male and female) were also included in analysis.

### 2.3. Statistical methods

First, means, standard deviations, and Cronbach's alphas were assessed for the MIES, and percentages of individuals endorsing mental health outcomes were reported. MIES total score mean was 2.57 (SE = .023; standardized Cronbach's alpha = .867), transgressions by self mean was 1.92 (SE = .026; Cronbach's alpha = .913), and transgressions by others mean was 3.09 (SE = .028; Cronbach's alpha = .801). Next, simple logistic regressions were conducted to

evaluate the bivariate associations between individual predictors (sociodemographic, military, and MIES variables) with past-year mental health disorders and SI. Finally, hierarchical multiple logistic regression models were conducted to assess the adjusted associations between MIES scores, sociodemographic characteristics, specific military factors and the presence of past-year mental health disorders and SI. Military and demographic covariates were included in a single block to control for the impact of these factors on outcomes of interest. Multicollinearity was assessed for, with no indication of the presence of these problems in the models and model significance was assessed using Wald chi-square tests. Survey sample weights and 500 bootstrapped weights calculated by Statistics Canada were used in all analyses to ensure survey sample representativeness and to calculate standard errors. Statistical analyses were conducted using SAS Version 9.4 (SAS Institute Inc., Cary, NC, USA).

### 3. Results

The weighted sample for this study represented 34,380 retired and 18,120 active-duty CAF members from the original 2002 CCHS-CF study (unweighted data is available upon request). Over 87% ( $N = 15,860$ ) of the active-duty sample and 88% ( $N = 30,260$ ) of the released sample were male. Just over half of respondents (57%,  $N = 29,880$ ) had completed postsecondary education (Table 1). A total of 87% ( $N = 45,960$ ) were Regular Force CAF members and 48% ( $N = 25,120$ ) of survey respondents were senior non-commissioned members. When asked about the number of traumatic experiences they endured while deployed with the CAF, 82% of both active duty ( $N = 13,100$ ) and

**Table 1.** Sociodemographic characteristics of the 2018 CAFVMHS sample by enrolment status.

	Active		Released	
	<i>N</i>	Percentage % (95%CI)	<i>N</i>	Percentage % (95%CI)
<i>Age</i>				
33–44	6640	36.64 (33.10–40.19)	4400	12.8 (10.96–14.64)
45–60	11480*	63.36 (59.81–66.90)*	24380	70.91 (68.65–73.18)
61–75			5600	16.29 (14.91–17.66)
<i>Sex</i>				
Male	15860	87.53 (86.27–88.78)	30260	88.02 (87.39–88.64)
Female	2260	12.47 (11.22–13.73)	4120	11.98 (11.36–12.61)
<i>Marital status</i>				
Married	12080	66.96 (63.66–70.27)	23900	69.80 (67.57–72.03)
Common law	3200	17.74 (14.94–20.54)	4080	11.92 (10.33–13.50)
Separated/widowed/divorced	1720	9.53 (7.38–11.69)	4020	11.74 (10.13–13.35)
Single	1040	5.76 (4.04–7.49)	2240	6.54 (5.31–7.78)
<i>Education</i>				
Secondary or lower	7900	43.79 (40.18–47.41)	14480	42.31 (39.95–44.68)
Postsecondary or higher	10140	56.21 (52.59–59.82)	19740	57.69 (55.32–60.05)
<i>Any mental health disorders since 2002</i>				
Yes	7460	41.40 (38.02–44.78)	15800	46.42 (43.95–48.88)
No	10540	58.49 (55.11–61.87)	18260	53.64 (51.18–56.11)
<i>Past-year mental health disorder</i>				
Yes	4600	25.58 (22.31–28.86)	11000	32.72 (30.40–35.04)
No	13380	74.42 (71.14–77.69)	22640	67.34 (65.02–69.66)

Note. CI = confidence interval. \*Calculated by collapsing the two age groups (45–60 and 61–75) to avoid small cells (unweighted frequency <15).

**Table 2.** Military-related characteristics of the 2018 CAFVMHS sample by current enrolment status.

	Active		Released	
	<i>n</i>	Percentage % (95%CI)	<i>n</i>	Percentage % (95%CI)
<i>Force type</i>				
Regular	15440	85.21 (82.95–87.47)	30520	88.88 (87.54–90.21)
Reserve	2680	14.79 (12.53–17.05)	3820	11.12 (9.79–12.46)
<i>Rank</i>				
Junior Non-Commissioned Member	2220	12.25 (9.73–14.77)	11680	33.97 (31.72–36.22)
Senior Non-Commissioned Member	9800	54.08 (50.71–57.46)	15320	44.56 (42.35–46.78)
Junior Officer	1600	8.83 (6.98–10.68)	2800	8.14 (6.98–9.31)
Senior Officer	4500	24.83 (22.43–27.24)	4580	13.32 (12.30–14.34)
<i>Year released</i>				
2001–2005	–	–	7820	22.77 (20.63–24.92)
2006–2010	–	–	11960	34.83 (32.41–37.25)
2011–2015	–	–	10520	30.63 (28.31–32.96)
2016–2018	–	–	4020	11.71 (10.11–13.30)
<i>Years of service</i>				
1–21	5420	29.94 (26.53–33.36)	9840	28.65 (26.34–30.96)
22–27	4200	23.20 (20.19–26.22)	10640	30.98 (28.61–33.36)
28–33	5540	30.61 (27.35–33.87)	7180	20.91 (19.13–22.68)
34–47	2920	16.13 (13.94–18.33)	6680	19.45 (17.96–20.95)
<i>Ever deployed outside of Canada</i>				
Yes	16080	88.74 (86.6–90.89)	27600	80.28 (78.47–82.08)
No	2020	11.15 (9.00–13.29)	6780	19.72 (17.92–21.53)
<i>Deployment timing</i>				
Before 2002	1880	11.69 (9.53–13.86)	12900	46.81 (43.94–49.67)
After 2002	5800	36.07 (32.28–39.86)	4060	14.73 (12.56–16.90)
Before and after 2002	8400	52.24 (48.44–56.04)	10600	38.46 (35.65–41.27)
<i>Number of traumatic experiences while deployed with CAF</i>				
0	2900	18.10 (15.13–21.08)	5020	18.25 (16.25–20.26)
1	2600	16.23 (13.46–19.00)	4800	17.45 (15.37–19.54)
2+	10500	65.54 (61.82–69.26)	17680	64.29 (61.72–66.86)

Note. CI = confidence interval.

**Table 3.** Descriptive statistics of past-year mental health disorders.

Past-year mental health disorder	Ever deployed		Never deployed	
	<i>n</i>	Percentage (95%CI)	<i>n</i>	Percentage (95%CI)
Any disorder*	13740	31.98% (29.87% – 34.09%)	1840	21.35% (17.74% – 24.96%)
Alcohol abuse	720	1.67% (1.04% – 2.30%)	60	0.69% (0.01% – 1.36%)
MDE	8940	20.6% (18.78% – 22.41%)	1240	14.19% (10.94% – 17.44%)
Suicidal Ideation	280	0.64% (0.22% – 1.06%)	0	0
PD	5220	12.07% (10.52% – 13.61%)	480	5.48% (3.29% – 7.67%)
GAD	4660	10.75% (9.24% – 12.26%)	460	5.29% (3.43% – 7.15%)
PTSD	7020	16.39% (14.66% – 18.11%)	640	7.32% (5.01% – 9.64%)
SAD	6240	14.36% (12.73% – 16.00%)	840	9.59% (6.93% – 12.25%)

Note. \*Any disorder including PTSD, GAD, MDE, PD, SAD. Reported frequencies were weighted on sample weight and rounded on the base of 20. Percentages were calculated based on weighted frequency after rounding. 95%CI were calculated using 500 bootstrapped weights provided by Statistics Canada. CI = confidence interval; MDE = major depressive episode; PD = panic disorder; GAD = generalized anxiety disorder; PTSD = posttraumatic stress disorder; SAD = social anxiety disorder.

released ( $N = 22,480$ ) members endorsed at least one traumatic deployment experience (Table 2). Presence of at least one past-year mental health disorder was seen in 26% ( $N = 4,600$ ) of active duty and 33% ( $N = 11,000$ ) of released CAF members (Table 3). For MIES total scores, as well as subscale scores representing Transgressions by Self and Transgressions by Others, Cronbach's alphas were high ( $\alpha = .801 - .913$ ).

Simple logistic regressions showed that MIES scores, as well as all sociodemographic and military variables, significantly predicted odds of experiencing past-year mental health disorders, except for sex in the prediction of PD and SAD, which were non-significant (Table 4).

Multiple logistic regression models evaluating associations between MIES scores and past-year mental health disorders are reported in Tables 5 and 6. Following the inclusion of all demographic

and military-related variables, the concordance value (c-statistic) for the past-year mental health disorder logistic regression model was .666. The addition of MIES total scores in this model increased the c-statistic from .666 to .764. When examined in multiple logistic regression models, the odds of experiencing any past-year mental health disorder were 1.97 (95% CI = 1.94–2.01) times greater for each one-unit increase in total MIES score (Table 5). Specifically, for every one-unit increase in MIES total scores, there were 1.91 (95% CI = 1.87–1.96) times greater odds of experiencing PTSD. For every one unit increase in MIES total scores, the odds of experiencing past-year PD or SAD were each 1.86 (95% CI = 1.82–1.90) times greater. In addition, for each one-unit increase in MIES total scores, the odds of experiencing MDE were 1.79 (95%CI = 1.76–1.82) times greater, the odds of SI

**Table 4.** Odds ratios (95% CIs) from simple logistic regressions assessing the bivariate associations between sociodemographic/military and MIES variables and past-year mental health outcomes.

Variables	Any disorder	Suicide Ideation	MDE	PD	GAD	PTSD	SAD
Age (ref: 61–75)							
33–44	2.98 (2.75–3.23)	2.39 (2.08–2.76)	2.69 (2.44–2.96)	3.02 (2.63–3.47)	3.62 (3.12–4.21)	4.83 (4.25–5.50)	2.77 (2.45–3.13)
45–60	2.15 (2.00–2.32)	2.11 (1.85–2.41)	2.07 (1.89–2.26)	2.81 (2.47–3.21)	2.93 (2.54–3.37)	3.24 (2.86–3.66)	2.69 (2.40–3.02)
Rank (ref: Senior Officer)							
Junior NCM	3.91 (3.65–4.19)	8.98 (7.55–10.66)	4.15 (3.80–4.52)	6.86 (6.01–7.84)	4.04 (3.59–4.55)	4.67 (4.20–5.20)	4.38 (3.94–4.88)
Junior NCO	2.69 (2.52–2.88)	5.24 (4.42–6.23)	2.76 (2.53–3.00)	4.02 (3.52–4.59)	2.43 (2.17–2.73)	3.61 (3.25–4.00)	3.32 (2.99–3.68)
Junior officer	1.95 (1.78–2.14)	3.53 (2.86–4.36)	2.26 (2.02–2.53)	1.63 (1.35–1.97)	1.81 (1.54–2.12)	2.09 (1.82–2.41)	1.43 (1.23–1.67)
Sex (ref: male)							
Female	1.28 (1.21–1.35)	1.12 (1.02–1.22)*	1.34 (1.26–1.43)	0.96 (0.89–1.05) <sup>ns</sup>	1.50 (1.39–1.63)	1.14 (1.06–1.23)*	1.06 (0.99–1.15) <sup>ns</sup>
Force type (ref: Reservists)							
Regular	2.22 (2.08–2.38)	1.31 (1.18–1.45)	2.63 (2.41–2.87)	2.92 (2.59–3.30)	2.23 (1.99–2.51)	1.90 (1.73–2.07)	1.82 (1.66–1.99)
Military element (ref: Army)							
Air	0.47 (0.45–0.49)	0.49 (0.46–0.53)	0.47 (0.45–0.49)	0.46 (0.43–0.49)	0.56 (0.52–0.60)	0.39 (0.36–0.41)	0.60 (0.56–0.63)
Navy	0.58 (0.55–0.62)	0.45 (0.41–0.50)	0.56 (0.52–0.59)	0.54 (0.50–0.59)	0.62 (0.57–0.68)	0.45 (0.42–0.48)	0.56 (0.52–0.60)
MIES subscales							
Transgressions by Self	1.45 (1.43–1.47)	1.47 (1.44–1.50)	1.42 (1.40–1.44)	1.47 (1.44–1.49)	1.41 (1.38–1.43)	1.49 (1.47–1.52)	1.48 (1.46–1.50)
Transgressions by Others	1.92 (1.89–1.95)	1.90 (1.86–1.95)	1.79 (1.76–1.83)	1.88 (1.84–1.93)	1.91 (1.86–1.95)	1.87 (1.83–1.91)	1.80 (1.76–1.84)
MIES total score	2.05 (2.01–2.08)	1.97 (1.93–2.02)	1.88 (1.85–1.92)	1.98 (1.93–2.02)	1.90 (1.86–1.95)	1.99 (1.95–2.03)	1.95 (1.91–1.99)

Note. Unless noted as <sup>ns</sup> ( $p$  value  $> .05$ ), \* ( $.0001 \leq p$  value  $< .05$ ), all the  $p$  values are  $< .0001$ . 95% CIs were calculated using 500 bootstrapped weights provided by Statistics Canada. Junior NCM = junior non-commissioned member; Junior NCO = junior non-commissioned officer; MDE = major depressive episode; PD = panic disorder; GAD = generalized anxiety disorder; PTSD = posttraumatic stress disorder; SAD = social anxiety disorder. CI = confidence interval.

**Table 5.** Odds ratios (95% CIs) from multiple logistic regressions assessing the associations between MIES total scores and past-year mental health outcomes with the adjustment for sociodemographic and military factors.

Variables	Any disorder	Suicide Ideation	MDE	PD	GAD	PTSD	SAD
Age (ref: 61–75)							
33–44	2.36 (2.16–2.58)	1.53 (1.32–1.79)	1.90 (1.71–2.11)	1.85 (1.60–2.15)	2.64 (2.26–3.09)	3.89 (3.40–4.46)	2.10 (1.85–2.40)
45–60	1.64 (1.51–1.77)	1.43 (1.24–1.64)	1.51 (1.37–1.66)	1.85 (1.61–2.12)	2.17 (1.87–2.52)	2.40 (2.11–2.73)	1.99 (1.76–2.24)
Rank (ref: Senior officer)							
Junior NCM	2.38 (2.2–2.56)	5.63 (4.72–6.71)	2.49 (2.28–2.73)	4.05 (3.53–4.65)	2.32 (2.05–2.62)	2.58 (2.31–2.88)	2.64 (2.36–2.95)
Junior NCO	2.06 (1.92–2.21)	3.95 (3.32–4.70)	2.08 (1.90–2.27)	2.84 (2.48–3.26)	1.75 (1.55–1.97)	2.66 (2.39–2.96)	2.45 (2.20–2.73)
Junior officer	1.72 (1.56–1.90)	3.06 (2.47–3.79)	1.99 (1.77–2.25)	1.38 (1.13–1.67)*	1.53 (1.29–1.80)	1.79 (1.55–2.08)	1.20 (1.02–1.40)*
Sex (ref: male)							
Female	1.25 (1.17–1.33)	0.98 <sub>ns</sub> (0.89–1.07)	1.32 (1.23–1.41)	0.89 (0.81–0.98)*	1.42 (1.31–1.55)	1.09 (1.01–1.18)*	0.96 (0.88–1.04) <sup>ns</sup>
Force type (ref: Reservists)							
Regular	1.70 (1.58–1.83)	0.88 (0.79–0.98) *	2.08 (1.90–2.29)	2.19 (1.93–2.50)	1.73 (1.53–1.95)	1.29 (1.17–1.42)	1.40 (1.27–1.54)
Military element (ref: Army)							
Air	0.58 (0.56–0.61)	0.65 (0.60–0.70)	0.58 (0.55–0.62)	0.61 (0.57–0.66)	0.72 (0.67–0.78)	0.49 (0.46–0.52)	0.80 (0.75–0.85)
Navy	0.68 (0.64–0.72)	0.56 (0.51–0.62)	0.65 (0.61–0.70)	0.66 (0.60–0.71)	0.77 (0.71–0.84)	0.51 (0.47–0.55)	0.65 (0.60–0.71)
<b>MIES total score</b>	<b>1.97 (1.94–2.01)</b>	<b>1.85 (1.81–1.90)</b>	<b>1.79 (1.76–1.82)</b>	<b>1.86 (1.81–1.90)</b>	<b>1.80 (1.76–1.85)</b>	<b>1.91 (1.87–1.96)</b>	<b>1.86 (1.82–1.90)</b>

Note. Unless noted as <sup>ns</sup> ( $p$  value  $> .05$ ) or \* ( $.0001 \leq p$  value  $< .05$ ), all the  $p$  values are  $< .0001$ ; Junior NCM = junior non-commissioned member; Junior NCO = junior non-commissioned officer; MDE = major depressive episode; PD = panic disorder; GAD = generalized anxiety disorder; PTSD = posttraumatic stress disorder; SAD = social anxiety disorder. CI = confidence interval.

were 1.85 (95% CI = 1.82–1.90) times greater, and the odds of experiencing GAD were 1.80 (95% CI = 1.76–1.85) times greater.

When MIES was separated into subscales representing Transgressions by Others and Transgressions by Self, the odds of any past-year mental health disorder were 1.78 (95% CI = 1.75–1.82) times greater for each unit increase in Transgressions by Others, and 1.11 (95% CI = 1.09–1.13) times greater for each unit increase in Transgressions by Self (Table 6).

#### 4. Discussion

This is the first study to quantify the extent to which MI was associated with the presence of well-

established adverse mental health outcomes in CAF members and Veterans using a nationally representative survey. These findings underscore that the distress which occurs following PMIEs has a significant impact on the endorsement of adverse mental health outcomes in this population.

Our results indicated that MIES total score significantly increased the odds of experiencing past-year MDE, PD, SAD, GAD, PTSD and SI. Importantly, the  $c$ -statistic increase with the addition of MIES total score (from .666 to .764) indicated that the addition of MIES total score increased the probability of correctly discerning CAF members who experienced past-year mental health disorders from those who did not, when compared to the model including only socio-demographic and military-related variables.



**Table 6.** Odds ratios (95%CI) from multiple logistic regressions assessing the associations between MIES subscale scores and past-year mental health outcomes with the adjustment for sociodemographic and military factors.

Variables	Any disorder	Suicide Ideation	MDE	PD	GAD	PTSD	SAD
Age (ref: 61–75)							
33–44	2.55 (2.33–2.80)	1.55 (1.33–1.8)	1.96 (1.76–2.17)	1.86 (1.61–2.16)	2.68 (2.29–3.14)	3.94 (3.44–4.52)	2.29 (2.01–2.62)
45–60	1.66 (1.53–1.80)	1.35 (1.18–1.56)	1.48 (1.35–1.63)	1.77 (1.54–2.03)	2.08 (1.79–2.41)	2.34 (2.05–2.66)	2.07 (1.83–2.34)
Rank (ref: Senior officer)							
Junior NCM	2.29 (2.12–2.47)	5.40 (4.52–6.45)	2.39 (2.18–2.62)	3.89 (3.39–4.47)	2.23 (1.97–2.52)	2.52 (2.26–2.82)	2.53 (2.26–2.83)
Junior NCO	2.01 (1.87–2.16)	3.95 (3.32–4.70)	2.06 (1.88–2.25)	2.79 (2.44–3.20)	1.70 (1.51–1.92)	2.63 (2.36–2.94)	2.37 (2.12–2.64)
Junior officer	1.61 (1.45–1.78)	2.67 (2.14–3.32)	1.83 (1.62–2.06)	1.32 (1.08–1.60)*	1.40 (1.18–1.65)	1.69 (1.45–1.96)	1.11 (0.94–1.30) <sup>ns</sup>
Sex (ref: male)							
Female	1.18 (1.11–1.26)	0.96 (0.87–1.06) <sup>ns</sup>	1.26 (1.17–1.35)	0.88 (0.81–0.97)*	1.36 (1.25–1.48)	1.05 (0.97–1.13) <sup>ns</sup>	0.93 (0.85–1.01) <sup>ns</sup>
Force type (ref: Reservists)							
Regular	1.64 (1.53–1.77)	0.85 (0.76–0.94)*	2.01 (1.84–2.21)	2.13 (1.87–2.42)	1.66 (1.46–1.87)	1.27 (1.15–1.40)	1.34 (1.21–1.48)
Military element (ref: Army)							
Air	0.57 (0.54–0.60)	0.61 (0.57–0.67)	0.57 (0.54–0.60)	0.58 (0.54–0.63)	0.72 (0.67–0.78)	0.49 (0.46–0.52)	0.78 (0.73–0.83)
Navy	0.68 (0.64–0.72)	0.55 (0.50–0.61)	0.65 (0.61–0.69)	0.64 (0.59–0.70)	0.77 (0.71–0.85)	0.51 (0.47–0.55)	0.65 (0.60–0.71)
<b>MIES subscales</b>							
<b>Transgressions by Self</b>	<b>1.11 (1.09–1.13)</b>	<b>1.16 (1.13–1.18)</b>	<b>1.12 (1.10–1.14)</b>	<b>1.15 (1.13–1.17)</b>	<b>1.09 (1.07–1.11)</b>	<b>1.16 (1.14–1.18)</b>	<b>1.19 (1.17–1.21)</b>
<b>Transgressions by Others</b>	<b>1.78 (1.75–1.82)</b>	<b>1.66 (1.61–1.71)</b>	<b>1.62 (1.59–1.65)</b>	<b>1.65 (1.61–1.69)</b>	<b>1.74 (1.69–1.78)</b>	<b>1.70 (1.66–1.74)</b>	<b>1.57 (1.53–1.61)</b>

Note. Unless noted as <sup>ns</sup> ( $p$  value  $> .05$ ) or \* ( $.0001 \leq p$  value  $< .05$ ), all the  $p$  values are  $< .0001$ ; Junior NCM = junior non-commissioned member; Junior NCO = junior non-commissioned officer; MDE = major depressive episode; PD = panic disorder; GAD = generalized anxiety disorder; PTSD = posttraumatic stress disorder; SAD = social anxiety disorder. CI = confidence interval.

Although there is evidence supporting that MI is a distinct construct from other mental health disorders, it has been previously conceptualized as commonly co-occurring with, for example, PTSD, MDE and SI (Barnes et al., 2019; Bryan et al., 2018; Lancaster, 2018). Our results are consistent with previous research indicating that exposure to PMIEs is associated with an increased likelihood of experiencing adverse mental health outcomes (Nazarov et al., 2018). Novel findings from this research also include the association between PMIEs and other mental health outcomes, such as GAD, PD, and SI. The associations between other mental health disorder experiences alongside MI as captured by the MIES further emphasize the importance of MI as a transdiagnostically-relevant construct to assess during mental health screening and treatment. Importantly, the vast majority (82%) of our sample reported exposure to at least one potentially traumatic experience while deployed with the CAF. Although the specific experiences are not captured herein, previous research has shown that killing in combat and difficulty distinguishing between combatants and non-combatants, encounters which may both be classified as PMIEs, are related to greater likelihood of developing past-year MDD (Maguen et al., 2010; Nazarov et al., 2018), PTSD (Fontana et al., 1992; Nazarov et al., 2018), and SI (Maguen et al., 2012).

Both difficulty with distinguishing combatants and killing in combat are considered PMIEs involving personal or individual responsibility. Events involving individual responsibility (i.e. transgressions by self) are more likely to lead to negative internal perceptions

such as guilt, while PMIEs involving external or other responsibility (i.e. transgressions by others) may be more likely to elicit negative external cognitions and emotion such as anger or inability to trust (Barnes et al., 2019). This difference in symptom presentation between self- and other-related transgressions elucidates the importance of examining whether transgressions by the self and transgressions by others may have differential associations with adverse mental health outcomes. Interestingly, when the MIES subscales (Transgressions by Others and Transgressions by Self) were examined in the same model, Transgressions by Others conferred a greater probability of endorsing all past-year adverse mental health outcomes in this study compared to Transgressions by Self. This indicates that when controlling for transgressions perpetrated by the self, witnessing morally distressing events perpetrated by others may be more strongly related to the future development of negative mental health outcomes. This further emphasizes the need for adequate support for CAF personnel, specifically as it relates to witnessing or being impacted by moral transgressions of others. This is consistent with Bryan et al. (2016), who found that transgressions by others were most strongly associated with posttraumatic stress, whereas transgressions by self was most strongly associated with pessimism, anger, and hopelessness. Future research is required to understand the differential impacts of transgressions perpetrated by the self and others on the development of mental health conditions.

Implementing measures such as confidential disclosure processes, moral-ethical decision-making training, and targeted bystander intervention training

may also have the potential to ameliorate some of the moral distress endorsed herein, leading to a reduction in adverse mental health outcomes within the CAF. However, research on the effectiveness of such interventions is urgently needed.

Several sociodemographic and military-related variables in this study also resulted in increased odds of past-year mental health disorders. For example, being female increased the odds of experiencing any past-year mental health disorder, which is consistent with previous findings that women are at greater risk for the development of PTSD and MDD (Brewin et al., 2000; Bryan et al., 2016; Kessler, 2003; Nazarov et al., 2018; Rogers et al., 2017). When examining specific past-year disorders in the multiple logistic regressions, sex was not significantly associated with SI. This is in opposition to current evidence suggesting that female service members had a higher likelihood of experiencing SI and engaging in suicide attempts (Naifeh et al., 2021; Rogers et al., 2017). However, when predictors were examined separately in the simple logistic regression, female sex was related to greater odds of SI, thus indicating that the overlap between predictor variables included in the multiple logistic regressions may have rendered this association non-significant. Furthermore, junior non-commissioned members (compared to senior officers), and Army service environment (compared to Navy or Air Force), showed increased odds of past-year SI, MDE, PD, GAD, PTSD and SAD. This is consistent with past research that has shown lower rank and land force (i.e. Army) have a higher risk of developing mental health disorders (Rebeira et al., 2017). This increased odds of past-year mental health disorder in lower rank and land force CAF members may be due to a number of potential factors, including rank-related job duties, differences in culture (both at the rank and force-type level) and direct combat exposures.

#### 4.1. Limitations

Although this study provides novel evidence regarding the impact of MI on past-year mental health disorders, it is not without limitations. Although it remains the most widely used MI measure in military research, and at the time of data collection (2018) was the most relevant MI scale to include, the MIES is a less-than-ideal measurement tool. Since the time of data collection, it has been criticized for not differentiating between exposure to and outcomes of MI (Plouffe et al., 2023). This may inadvertently introduce irrelevant model variance when attempting to ascertain severity of MI (Plouffe et al., 2023). Future studies intending to capture MI should consider using more appropriate scales, such as the Moral Injury Outcomes Scale (MIOS) which examines shame related

outcomes and trust violation outcomes, as well as total score and functional impairment (Litz et al., 2022). Another limitation of the MIES is that it exclusively refers to military-related experiences of moral distress, which precludes the possibility of assessing which types (e.g. military vs. non-military) of morally distressing events have an impact on the probability of experiencing other adverse mental health outcomes. As such, the models created herein were not exhaustive, including only demographic and military-related variables. This may limit generalizability, as there is the possibility that non-deployment and non-military related PMIEs may have differentially impacted these findings.

The logic skipping that was used during Statistics Canada administration may also have introduced response biases in the sample. Within the CAFVMHS 2018 MIES scoring logic, when a participant selected '*strongly disagree*' for certain MIES items, '*strongly disagree*' was automatically imputed for a subsequent item. However, following previous research regarding MIES response patterns in the 2018 CAFVMHS (Plouffe et al., 2023), it is unlikely that this logic skipping impacted response patterns. Importantly, as the CAFVMHS is a longitudinal study, the 2018 sample is representative of the original 2002 CAF members who took part in the initial survey and may not be representative of current CAF demographics. As this was a survey conducted to be representative of the initial 2002 survey, another limitation may have been the use of the WHO-CIDI, due to assessment of mental health disorders using DSM-IV criteria. The largest changes between the DSM-IV and DSM-5 (version in use in 2018), were regarding disorder classifications (e.g. PTSD was classified as an anxiety disorder in the DSM-IV and became a trauma- and stressor-related disorder in the DSM-5). The core criterion features for all included disorders remained largely unchanged, or were separated into more distinct categories (e.g. PTSD changing from three to four distinct symptom clusters). Therefore, this was unlikely to have significantly impacted the analysis of mental health variables of interest in this sample. Further, the exclusive use of sex as a binary categorization rather than the use of gender may have oversimplified the impact of sex. Due to this constraint, we were unable to ascertain how gender, rather than sex, may play a role in these experiences. Due to the limited number of females in the sample, we were also unable to run regression models stratified by sex, and therefore, unable to examine whether findings are different between sexes.

Future directions should incorporate a more comprehensive assessment of mental health outcomes and include other disorders not assessed herein using measures with sound psychometric properties. Future research should also implement a scale focusing on expressed outcomes of MI, such as the MIOS

(Litz et al., 2022), while continuing to establish effective screening tools and interventions for the treatment of this clinically useful construct. Lastly, future research should examine MI outcomes as they relate to transgressions of others and betrayal, compared to personal moral violations.

#### 4.2. Concluding remarks

Notwithstanding the previous limitations, this was the first study to ascertain the relations between MI and the presence of past-year mental health disorders in a representative cohort of CAF members and Veterans. The results of this research underscore the importance of screening for exposure to PMIEs, as well as addressing MI and PMIEs alongside other adverse mental health outcomes within the CAF. Explicitly providing preventative interventions and targeted clinical treatments to reduce moral distress may further reduce the prevalence and incidence of adverse mental health outcomes in this population.

#### Disclosure statement

No potential conflict of interest was reported by the author(s).

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#### Data availability statement

The data can be accessed in Canada with permission from Statistics Canada through the Statistics Canada Research Data Centres. Statistics Canada collected and provided the data for academic purposes, but the analyses are the sole responsibility of the authors. The opinions expressed do not represent the views of Statistics Canada.

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