

Original Contribution

Are Canadian Soldiers More Likely to Have Suicidal Ideation and Suicide Attempts Than Canadian Civilians?

Shay-Lee Belik*, Murray B. Stein, Gordon J. G. Asmundson, and Jitender Sareen

* Correspondence to S. Belik, PZ432-771 Bannatyne Avenue, Winnipeg, Manitoba, Canada R3E 3N4 (e-mail: sbelik@hsc.mb.ca).

Initially submitted March 17, 2010; accepted for publication August 4, 2010.

Significant controversy exists as to whether soldiers are at increased risk for suicide and suicidal behaviors compared with civilians. Furthermore, little is known about whether risk factors for suicidal behaviors in civilian populations are generalizable to soldiers. The aim of the current study is to determine whether the prevalence and correlates of past-year suicidal ideation and suicide attempts differ in Canadian soldiers when compared with Canadian civilians. The current study utilized data from the Canadian Community Health Survey Cycle 1.2-Canadian Forces Supplement in conjunction with the 2001–2002 Canadian Community Health Survey Cycle 1.2. Logistic regression interaction models were used to explore differences between correlates of suicidal ideation and suicide attempts comparing Canadian soldiers with civilians. Although there was no significant difference between the 2 samples on prevalence of past-year suicidal ideation, the prevalence of past-year suicide attempts was significantly lower in the Canadian forces sample compared with the civilian population (odds ratio = 0.41, 95% confidence interval: 0.25, 0.67). Findings suggest that suicide attempts are less common in Canadian active military personnel than in the civilian population. Possible mechanisms for these differences are discussed.

Canada; military personnel; psychology, military; risk factors; social problems; suicide

Abbreviations: AOR, adjusted odds ratio; CCHS 1.2, Canadian Community Health Survey Cycle 1.2; CCHS-CFS, Canadian Community Health Survey Cycle 1.2-Canadian Forces Supplement; CI, confidence interval; CIDI, Composite International Diagnostic Interview; DSM-IV, *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*; OR, odds ratio (unadjusted); PTSD, posttraumatic stress disorder; UK, United Kingdom.

Suicide is among the most common causes of death in the military (1, 2) and has increasingly become the focus of research in military groups because of its public health impact. A recent report denotes suicide as the third leading cause of death in Canadian forces members over the past 25 years (2). Research suggests that the suicide rate in soldiers has been increasing (3) and that veterans are 1.4–4 times as likely to die by suicide compared with nonveteran civilians (4–7). However, numerous other studies have either failed to find differences in suicide rates or have found lower rates among soldiers (8–13). To date, there remains significant controversy as to whether soldiers are at increased risk for suicide compared with civilians.

Careful examination of the aforementioned studies reveals that suicide rates in soldiers and their comparability to civilian population rates may differ depending on the

subpopulation examined. Kapur et al. (9) noted no overall difference in rates when comparing former United Kingdom (UK) armed forces personnel with the UK civilian population; however, men aged 24 years or younger who had left the UK armed forces had a rate of suicide 2–3 times higher than the rate of the same age group in the civilian population. Fear et al. (8) noted a similar increased risk of suicide among young military men in their sample, in contrast to the lower rate of suicide in all regular UK armed forces personnel when compared with the UK civilian population. Importantly, many of the studies indicating higher suicide rates in soldiers compared with the general population are often conducted in veteran populations (6, 7). In contrast, the majority of studies suggesting lower suicide rates are those done in active duty forces (8, 11, 12, 14). It is important to recognize that veteran populations (i.e., those who have

separated from active military service) are a distinct population from soldiers who are actively serving.

Considering evidence that a prior suicide attempt is among the best predictors of subsequent completed suicide (15, 16) and that suicide attempts are prevalent (17), suicide attempts can be seen as an important point of intervention for suicide prevention strategies. In civilian populations, a range of factors have been shown to be associated with suicidal behavior (17–19). Suicidal ideation and attempts are most common among females, whites, individuals with lower levels of educational attainment, and younger age (17). As well, psychiatric disorders are identified in more than 90% of suicide attempters, the majority of which are mood disorders (around 60%) (19, 20). However, little is known about the extent to which risk factors for suicidal behavior in the civilian population are generalizable to soldiers.

A recent study by Hawton et al. (21) examined self-harm behaviors in UK armed forces personnel, comparing them with civilians who had self-harmed. Employment difficulties and partner relationship problems were more common in armed forces personnel who self-harmed than in self-harming controls. However, the work of Hawton et al. was limited in that it explored only a limited array of factors known to be associated with self-harm behaviors (e.g., age, sex, mental disorder diagnosis, marital status, income) (17–19, 22) and included only armed forces personnel who presented to a hospital for their self-harm behavior.

The present study addresses these limitations by utilizing the Canadian Community Health Survey Cycle 1.2-Canadian Forces Supplement (CCHS-CFS) in conjunction with the Canadian Community Health Survey Cycle 1.2 (CCHS 1.2), both of which comprise comprehensive data on correlates of self-harm behavior derived from population-based samples. To the best of our knowledge, this study is the first to compare the prevalence and correlates of suicidal behavior in active duty military personnel directly with those in the civilian population in the same data set using the same methodology.

MATERIALS AND METHODS

Sample

The CCHS 1.2 is a nationally representative sample of 36,984 individuals aged 15 years or older (response rate = 77%). The CCHS 1.2 was conducted in 2001–2002 and was designed by Statistics Canada to collect information related to mental health status, mental health care utilization, and mental health determinants of the Canadian population. A detailed description of the method of selection for household interviews is reported elsewhere (23). In brief, the target population was persons living in private dwellings in the 10 Canadian provinces. Residents of the 3 territories, persons living on Indian reserves or Crown lands, clientele of institutions, full-time members of the Canadian armed forces, and residents of certain remote regions were excluded from this survey. A multistage, stratified cluster design was utilized to ensure that the sample would be representative of the Canadian civilian population. Statistics

Canada relied on professional interviewers who received additional training to increase their sensitivity to mental health issues.

The CCHS-CFS is a representative sample of active Canadian armed forces personnel ($N = 8,441$). Data for the CCHS-CFS were collected in a joint collaboration by Statistics Canada and the Department of National Defense. The survey used a multistage sampling framework to ensure the representativeness of the sample in relation to the Canadian military. Details of the sampling frame and methodology have been described previously (24). Data were collected by using face-to-face interviews by trained Statistics Canada interviewers in private on-base rooms between May and December of 2002. The sample consisted of 5,155 regular force members (response rate, 79.5%) and 3,286 reserve force members (response rate, 83.5%) between the ages of 16 and 64 years.

Data for the CCHS 1.2 and the CCHS-CFS were collected by using nearly identical methodologies based on the CCHS 1.2 questionnaire, enabling direct comparison of measures between the 2 samples. Both samples were restricted to the age range of the CCHS-CFS (ages 16–64) and then merged together to create one data set with identical measures. The total sample size across the 2 samples in the merged data set was $N = 37,129$.

Measures

Sociodemographic factors. Sex, age (16–24, 25–34, 35–44, 45–64 years), level of formal educational attainment (some education above high school compared with high school/general equivalency diploma or less), marital status (separated/widowed/divorced or never married (classified as single) compared with married/common law), and income (\$29,999 or less, \$30,000–\$49,999, \$50,000–\$79,999, \$80,000 or higher) were examined as possible correlates of suicidal behavior. All variables were categorized according to previous work using these data sets (24).

Additional variables were examined in the CCHS-CFS sample pertaining specifically to features of the Canadian armed forces environment, including military rank (junior, senior, officer), type of service (regular vs. reserve), type of environment (land, air, sea, or communications), number of deployments, and exposure to combat. These measures have been described in detail elsewhere (25).

Mental disorders. The World Health Organization Composite International Diagnostic Interview (CIDI), version 2.1, was used to generate a selection of diagnoses according to the definitions and criteria of both the *International Classification of Diseases*, Tenth Revision (ICD-10), and the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV) (26). The CIDI is a fully structured instrument for use by lay interviewers without clinical experience and has been shown to have high levels of reliability and consistency with clinician-based diagnoses of the DSM-IV disorders assessed in this survey. The interviewers were trained according to World Health Organization standards (27).

Past 12-month prevalences of DSM-IV major depressive disorder, panic attacks, and social phobia were assessed in

both surveys. Additional measurements of generalized anxiety disorder and posttraumatic stress disorder (PTSD) were conducted only in the CCHS-CFS. The diagnosis of PTSD was based on assessment of symptoms and functional disability stemming from exposure to one (or more) of 28 possible traumatic events. If respondents endorsed multiple traumatic events, they were asked to identify the event that was most upsetting to them.

Past-year alcohol dependence was assessed by using the CIDI Short Form based on DSM-IV criteria, wherein 3 or more symptoms indicated alcohol dependence. Because past-year alcohol abuse was not measured in these surveys, we created a 3-level alcohol use variable. Past-year alcohol use was identified by using the following question: "How often in the past 12 months have you had 5 or more drinks on one occasion?" Respondents were able to choose from the following: 1) never, 2) less than once a month, 3) once a month, 4) 2–3 times a month, 5) once a week, or 6) more than once a week. Those respondents endorsing "never" or "less than once a month" were classified as *low use*, those endorsing "once a month" or "2–3 times a month" were classified as *moderate use*, and those endorsing "once a week" or "more than once a week" were classified as *heavy use*.

Suicidal ideation and suicide attempts. Past-year suicidal ideation was assessed with the following question: "In the past 12 months, did you seriously think about committing suicide or taking your own life?" Past-year suicide attempts were assessed by using a question about whether the individual had "attempted suicide or tried to take [their] own life" in the past 12 months.

Statistical analyses

In accordance with Statistics Canada recommendations (28), proper estimation procedures were followed for all data analyses based on the CCHS-CFS. We used the appropriate bootstrapping method of error estimation that included the statistical bootstrapping weights provided by Statistics Canada to ensure that the data were representative of the Canadian forces and the Canadian civilian population. SUDAAN, version 9.0.1 (29), was used to conduct all analyses.

First, bivariate logistic regression analyses explored the relation between each correlate (sociodemographics and mental disorders) and suicidal behavior in each sample independently. Interaction models were subsequently conducted to establish whether the relation between each correlate and suicidal behavior differed when comparing soldiers with the civilian population. Models of mental disorder correlates were adjusted for sociodemographic factors (sex, age, marital status, educational attainment, household income). Second, bivariate logistic regression analyses explored military-specific demographic correlates of suicidal behavior. Third, logistic regression analyses were used to determine whether the prevalence of suicidal ideation and suicide attempts differed between the 2 populations in both unadjusted and adjusted models (for sociodemographic factors alone and for both sociodemographic factors and mental disorders). All analyses, including interaction analyses,

Table 1. Prevalence of Past-Year Suicidal Ideation and Suicide Attempts in the 2 Populations, Canadian Community Health Survey Cycle 1.2, 2001–2002, and Canadian Community Health Survey Cycle 1.2-Canadian Forces Supplement, 2002^a

	CCHS 1.2		CCHS-CFS		OR	95% CI
	No.	%	No.	%		
Suicidal ideation	1,305	4.0 ^b	308	3.8	0.97	0.83, 1.12
Suicide attempt	212	0.6	25	0.2	0.41*	0.25, 0.67

Abbreviations: CCHS 1.2, Canadian Community Health Survey Cycle 1.2 civilian population sample; CCHS-CFS, Canadian Community Health Survey Cycle 1.2-Canadian Forces Supplement; CI, confidence interval; OR, unadjusted odds ratio.

* $P < 0.01$.

^a All number values are unweighted values; all percentages are weighted.

^b In the past year, 4% of the CCHS 1.2 sample had suicidal ideation.

were conducted in the merged data set, with the exception of the military-only correlates, which relied exclusively on the CCHS-CFS data set.

RESULTS

The prevalences of past-year suicidal ideation and suicide attempts in the 2 samples are shown in Table 1. The past-year prevalence of suicidal ideation was 4.0% and 3.8% in the CCHS 1.2 and CCHS-CFS, respectively, and did not differ significantly between samples. Past-year suicide attempts were significantly more common in the civilian population (0.6%) than in the military population (0.2%).

Tables 2 and 3 illustrate sociodemographic correlates of past-year suicidal ideation and suicide attempts, respectively, in the 2 samples. Females in the Canadian forces were significantly more likely to endorse suicidal ideation and attempts than were their male counterparts. Females in the civilian population were also significantly more likely to endorse suicide attempts than were civilian males, but not suicidal ideation. As well, those that were single, of younger age, and of lower income were more likely to think about and attempt suicide in both samples, although some relations did not reach significance because of small sample sizes. Significant interaction effects were found for the relations between marital status and suicidal ideation (interaction odds ratio (OR) = 0.63, 95% confidence interval (CI): 0.45, 0.88) and between income (for the lowest income group, \$29,999 or less) and suicidal ideation (OR = 0.45, 95% CI: 0.25, 0.83), indicating a weaker relation between these variables in the military population. As well, a significant interaction effect was noted between sex and suicide attempts (interaction OR = 3.86, 95% CI: 1.27, 11.74), indicating that females in the military population were significantly more likely to report suicide attempts than were females in the civilian population.

Tables 4 and 5 display mental disorder correlates of suicidal ideation and suicide attempts, respectively, in the CCHS-CFS and the CCHS 1.2 samples. After adjustment for sociodemographic factors, nearly all measured mental

Table 2. Sociodemographic Correlates of Past-Year Suicidal Ideation, Canadian Community Health Survey Cycle 1.2, 2001–2002, and Canadian Community Health Survey Cycle 1.2–Canadian Forces Supplement, 2002^a

	CCHS 1.2				CCHS-CFS			
	No.	%	OR	95% CI	No.	%	OR	95% CI
Sex								
Male	589	3.9 ^b	1.00	1.00, 1.00	193	3.7	1.00	1.00, 1.00
Female	716	4.0	1.02	0.86, 1.22	115	4.8	1.32*	1.04, 1.67
Age, years								
16–24	331	5.8	1.75**	1.39, 2.20	62	4.2	1.27	0.83, 1.95
25–34	252	3.3	0.98	0.76, 1.27	95	4.2	1.29	0.85, 1.95
35–44	319	4.0	1.17	0.90, 1.52	109	3.5	1.07	0.72, 1.59
45–64	403	3.4	1.00	1.00, 1.00	42	3.3	1.00	1.00, 1.00
Marital status								
Married/common law	417	2.6	1.00	1.00, 1.00	165	3.2	1.00	1.00, 1.00
Single	888	6.3	2.47**	2.04, 3.00	143	4.9	1.55**	1.19, 2.03
Education								
High school or less	604	4.7	1.00	1.00, 1.00	100	4.2	1.00	1.00, 1.00
More than high school	698	3.5	0.75**	0.64, 0.87	208	3.7	0.87	0.66, 1.15
Household income								
\$80,000 or higher	142	2.3	1.00	1.00, 1.00	112	3.1	1.00	1.00, 1.00
\$50,000–\$79,999	243	3.4	1.49**	1.10, 2.02	105	4.1	1.33*	1.00, 1.78
\$30,000–\$49,999	252	4.1	1.82**	1.35, 2.47	58	4.7	1.53*	1.05, 2.23
\$29,999 or less	547	7.0	3.23**	2.44, 4.29	25	4.5	1.46	0.87, 2.48

Abbreviations: CCHS 1.2, Canadian Community Health Survey Cycle 1.2 civilian population sample; CCHS-CFS, Canadian Community Health Survey Cycle 1.2–Canadian Forces Supplement; CI, confidence interval; OR, unadjusted odds ratio.

* $P < 0.05$; ** $P < 0.01$.

^a All number values are unweighted values; all percentages are weighted.

^b In the past year, 3.9% of males in the CCHS 1.2 had suicidal ideation.

disorders were significantly related to suicidal ideation and suicide attempt in both populations (adjusted odds ratios (AORs) ranging from 2.23 for panic attack in the civilian population to 80.73 for depressive episode in the military). A high level of alcohol use was significantly associated with suicidal ideation and attempts in the civilian population, with a trend level effect for suicide attempts only in the military population. In contrast, alcohol dependence was associated with suicide attempts in both populations and with suicidal ideation in civilians. Significant interaction effects were found for the relation between depressive disorders and suicide attempts (interaction AOR = 4.27, 95% CI: 1.24, 14.70), indicating a higher likelihood of suicide attempts among depressed military personnel compared with depressed civilians. As well, significant interaction effects were present for alcohol dependence (interaction AOR = 0.40, 95% CI: 0.22, 0.73) and moderate or high alcohol use (interaction AOR = 0.52 and 0.46, respectively) with suicidal ideation, denoting a lesser association between these variables in the military population.

Table 6 demonstrates the association between military-specific correlates of suicidal behavior in the CCHS-CFS

only. Suicidal ideation was less likely among those ranked as officer and those in the reserve force but more likely among those who had been deployed 3 or more times and those who had been exposed to combat. Suicide attempts were significantly less likely among reserve force members.

DISCUSSION

This study is the first to demonstrate, within representative population-based samples of both Canadian forces personnel and the Canadian civilians, that the likelihood of past-year suicide attempts is lower among military personnel than in the rest of the population. Importantly, there were no differences in the rates of past-year suicidal thoughts or attempts between the 2 groups. This finding adds another dimension to the ongoing controversy around whether suicidality is more likely in soldiers. As noted previously, much work in this area has focused on completed suicide in soldiers, often indicating a higher rate in active soldiers and veteran populations compared with civilians (4–7, 30–32). Our findings are consistent with those from a number of other studies illustrating that soldiers are at lower risk of

Table 3. Sociodemographic Correlates of Past-Year Suicide Attempts, Canadian Community Health Survey Cycle 1.2, 2001–2002, and Canadian Community Health Survey Cycle 1.2–Canadian Forces Supplement, 2002^a

	CCHS 1.2				CCHS-CFS			
	No.	%	OR	95% CI	No.	%	OR	95% CI
Sex								
Male	81	0.5 ^b	1.00	1.00, 1.00	— ^c		1.00	1.00, 1.00
Female	131	0.7	1.55*	1.04, 2.29			5.97**	2.14, 16.63
Age, years								
16–24	69	1.1	3.62**	2.15, 6.07			1.71	0.18, 15.98
25–34	35	0.4	1.27	0.66, 2.43			1.94	0.20, 19.21
35–44	58	0.7	2.35**	1.40, 3.95			1.43	0.15, 13.69
45–64	50	0.3	1.00	1.00, 1.00			1.00	1.00, 1.00
Marital status								
Married/common law	49	0.3	1.00	1.00, 1.00			1.00	1.00, 1.00
Single	163	1.0	3.46**	2.23, 5.35			1.76	0.73, 4.25
Education								
High school or less	129	0.9	1.00	1.00, 1.00			1.00	1.00, 1.00
More than high school	83	0.3	0.37**	0.25, 0.55			0.36*	0.15, 0.89
Household income								
\$80,000 or higher			1.00	1.00, 1.00			1.00	1.00, 1.00
\$50,000–\$79,999			1.76	0.69, 4.53			1.16	0.43, 3.14
\$30,000–\$49,999			1.60	0.65, 3.95			1.34	0.19, 9.40
\$29,999 or less			5.54**	2.38, 12.86			3.63	0.69, 19.11

Abbreviations: CCHS 1.2, Canadian Community Health Survey Cycle 1.2 civilian population sample; CCHS-CFS, Canadian Community Health Survey Cycle 1.2–Canadian Forces Supplement; CI, confidence interval; OR, unadjusted odds ratio.

* $P < 0.05$; ** $P < 0.01$.

^a All number values are unweighted values; all percentages are weighted.

^b In the past year, 0.5% of males in the CCHS 1.2 made a suicide attempt.

^c Cell size too small to be reported as per Statistics Canada guidelines.

completed suicide (8, 11, 12, 14, 33, 34). Only one other study to date has suggested a lower rate of suicidal behavior (i.e., suicidal ideation, self-harm, or suicide attempts) among armed forces personnel (21). It is hypothesized that lower suicide rates among military personnel may be a result of the “healthy soldier effect” (35–37). Military personnel are generally physically and mentally healthier at enlistment than the general civilian population, a natural consequence of the selection procedures for military service along with requirements to maintain that standard of well-being (35). As well, some evidence suggests that the contribution of the exclusion criteria of military organizations may confer benefit on morbidity and mortality over and above the expected increases due to war service (35).

Our study also noted some key correlates of suicidal ideation and suicide attempts that differentially affected Canadian forces personnel when compared with Canadian civilians. First, we noted that women in the Canadian forces had a higher likelihood of suicide attempts than did women in the civilian population. Work examining the experiences of military women has identified a more negative impact

of combat exposure on women compared with men (38). As well, sexual trauma during deployment, including sexual assault, rape, and sexual harassment, is not only more prevalent among female soldiers than male soldiers (39, 40) but also may exacerbate the negative mental health consequences of combat exposure (41). Additional work has focused on pre- and post-military trauma and homecoming readjustment as other areas of increased stress for women (42, 43). Second, single Canadian forces personnel (never married/widowed/divorced/separated) were found to be at lower risk of suicidal ideation than were single people in the civilian population. This resiliency shown in single soldiers may be a further result of the “healthy soldier effect.” Alternatively, military staff members may be more connected to peers than those in the general population. Many soldiers in the military report that they form a bond or “brotherhood” with their fellow soldiers, increasing their sense of social connectedness. It has been suggested that individuals with social connectedness, whether with peers or family, are at lower risk of suicidal behavior (44). Further work is needed to clarify the reasons for the differences noted.

Table 4. Past-Year Mental Disorder Correlates of Suicidal Ideation, Canadian Community Health Survey Cycle 1.2, 2001–2002, and Canadian Community Health Survey Cycle 1.2–Canadian Forces Supplement, 2002^a

	CCHS 1.2				CCHS-CFS			
	No.	%	AOR	95% CI	No.	%	AOR	95% CI
Depressive episode	533	29.6 ^b	14.58*	11.73, 18.13	128	23.2	11.96*	8.73, 16.39
Panic attack	405	14.2	2.23*	1.60, 3.11	92	14.7	3.43*	2.14, 5.50
Social phobia	251	20.8	6.66*	4.87, 9.10	48	20.6	7.40*	4.89, 11.21
Alcohol use								
Low	681	3.4	1.00	1.00, 1.00	190	3.8	1.00	1.00, 1.00
Moderate	195	5.0	1.30	0.97, 1.75	57	3.2	0.74	0.52, 1.06
High	163	6.7	1.88*	1.34, 2.63	25	4.5	1.03	0.62, 1.70
Alcohol dependence	143	13.1	3.38*	2.56, 4.44	23	6.9	1.66	0.96, 2.88
Generalized anxiety disorder	X ^c	X	X	X	37	28.1	10.95*	6.67, 17.96
Posttraumatic stress disorder	X	X	X	X	45	27.7	11.41*	7.64, 17.04

Abbreviations: AOR, odds ratio adjusted for sex, age, marital status, educational attainment, and household income; CCHS 1.2, Canadian Community Health Survey Cycle 1.2 civilian population sample; CCHS-CFS, Canadian Community Health Survey Cycle 1.2–Canadian Forces Supplement; CI, confidence interval.

* $P < 0.01$.

^a All number values are unweighted values; all percentages are weighted.

^b In the past year, 29.6% of people with a past-year depressive episode in the CCHS 1.2 had suicidal ideation.

^c Variable not available in CCHS 1.2 data set.

Interestingly, we did not note any significant differences between Canadian forces members and the civilian popula-

tion in terms of the relation between age and suicidal behavior. Previous work has indicated a higher likelihood of

Table 5. Past-Year Mental Disorder Correlates of Suicide Attempts, Canadian Community Health Survey Cycle 1.2, 2001–2002, and Canadian Community Health Survey Cycle 1.2–Canadian Forces Supplement, 2002^a

	CCHS 1.2				CCHS-CFS			
	No.	%	AOR	95% CI	No.	%	AOR	95% CI
Depressive episode	126	6.1 ^b	21.33*	13.90, 32.72	— ^c		80.73*	24.78, 262.96
Panic attack	79	2.3	1.97	0.99, 3.92			1.36	0.37, 5.08
Social phobia	50	3.4	6.07*	3.73, 9.87			11.11*	3.65, 33.80
Alcohol use								
Low	99	0.5	1.00	1.00, 1.00			1.00	1.00, 1.00
Moderate	24	0.6	0.96	0.46, 2.02			2.10	0.64, 6.88
High	34	1.3	2.60*	1.39, 4.84			4.34	0.79, 23.83
Alcohol dependence	33	2.6	4.08*	2.18, 7.63			12.51*	4.13, 37.90
Generalized anxiety disorder	X ^d	X	X	X			44.80*	16.12, 124.49
Posttraumatic stress disorder	X	X	X	X			26.76*	9.37, 76.48

Abbreviations: AOR, odds ratio adjusted for sex, age, marital status, educational attainment, and household income; CCHS 1.2, Canadian Community Health Survey Cycle 1.2 civilian population sample; CCHS-CFS, Canadian Community Health Survey Cycle 1.2–Canadian Forces Supplement; CI, confidence interval.

* $P < 0.01$.

^a All number values are unweighted values; all percentages are weighted.

^b In the past year, 6.1% of people with a depressive episode in the CCHS 1.2 made a suicide attempt.

^c Cell size too small to be reported as per Statistics Canada guidelines.

^d Variable not available in the CCHS 1.2 data set.

Table 6. Correlates of Past-Year Suicidal Ideation and Suicide Attempts, Canadian Community Health Survey Cycle 1.2-Canadian Forces Supplement, 2001–2002^a

	Suicidal Ideation				Suicide Attempts			
	No.	%	OR	95% CI	No.	%	OR	95% CI
Rank								
Officer	68	2.2 ^b	0.49**	0.35, 0.68	— ^c		0.71	0.24, 3.15
Senior	77	3.6	0.79	0.59, 1.06			0.93	0.28, 2.08
Junior	163	4.5	1.00	1.00, 1.00			1.00	1.00, 1.00
Type of force								
Regular	213	4.2	1.00	1.00, 1.00			1.00	1.00, 1.00
Reserve	95	3.0	0.70**	0.54, 0.91			0.28*	0.08, 0.97
Environment								
Communications/ air/sea	140	3.7	0.91	0.70, 1.19			1.23	0.49, 3.13
Land	168	4.0	1.00	1.00, 1.00			1.00	1.00, 1.00
No. of deployments								
0	169	3.7	1.00	1.00, 1.00			1.00	1.00, 1.00
1	49	3.6	0.98	0.68, 1.42			0.10	0.01, 2.16
2	28	3.0	0.80	0.50, 1.26			0.61	0.11, 3.41
3 or more	62	5.2	1.44*	1.01, 2.05			0.69	0.06, 8.53
Combat exposure	58	5.1	1.44*	1.02, 2.02			1.83	0.45, 7.53

Abbreviations: CI, confidence interval; OR, unadjusted odds ratio.

* $P < 0.05$; ** $P < 0.01$.^a All number values are unweighted values; all percentages are weighted.^b In the past year, 2.2% of officers had suicidal thoughts.^c Cell size too small to be reported as per Statistics Canada guidelines.

suicide and suicidal behavior among young military men (8, 9). Our study did indicate higher rates of suicidal ideation and suicide attempts (at least at a trend level) among individuals in the younger age groups in both populations. However, the Canadian forces sample did not display a stronger association than did the civilian population. Previous findings in military populations may have been due mostly to the known risk of suicidality among young males (45–47) but not specific to male soldiers.

Canadian forces personnel with depression were found to be more likely to attempt suicide than depressed individuals in the civilian population. In contrast, alcohol dependence and high levels of alcohol use among Canadian forces members were less likely to be associated with suicidal ideation than was misuse of alcohol in the civilian population. Although high levels of alcohol use and alcohol dependence have been noted as risk factors for suicidal behavior (17, 18), in soldiers, these relations manifest differently. Rather than thinking of suicide, soldiers may communicate distress through an increased likelihood of alcohol use. Alcohol use disorders have been shown to be quite prevalent among military populations, at rates 2–3 times those in the civilian population (48). Binge drinking, in particular, is endorsed by nearly half of soldiers in both the United States (49) and the United Kingdom (50). Our measure of heavy alcohol use included people who endorsed binge drinking. Recent work has indicated that soldiers who binge drink do not endorse functional impairments related to their drinking behavior

and, in fact, endorse lower impairment than those who drink less (50). This normalization of drinking behavior in the military, alongside much higher rates of alcohol use, may have created the perception that suicidal behavior appears less common among soldiers with heavy alcohol use or dependence. In contrast, problematic alcohol use in the civilian population may be more strongly related to distress, feeling quite different from their peers, and therefore suicidal behavior is more likely to show an association. Broadly speaking, these findings require replication to elucidate the mechanisms behind these associations.

Limitations

The current work has a number of limitations that warrant attention. First, the CCHS 1.2 and the CCHS-CFS are cross-sectional surveys of these populations. Second, the lack of assessment of generalized anxiety disorder and PTSD in the CCHS 1.2 data set limited our ability to make predictions about the differential relation of these disorders to suicidal behavior in soldiers compared with civilians. Third, personality disorders and non-alcohol substance use disorders, both of which are strong risk factors for suicidal behavior (18, 19), were not assessed in either data set. Fourth, these findings cannot be assumed to reflect those who complete suicide. Completed suicide was not assessed in these data sets; therefore, any conclusions garnered from these data cannot be extrapolated to reflect differences between the civilian

population and soldiers on completed suicide. It is possible that completed suicide rates are higher in soldiers and, as such, these individuals would not have been included in the sample of soldiers in the CCHS-CFS. Fifth, the CCHS-CFS data was collected in 2002. Since that time, the Canadian forces have experienced many changes, including increasing suicide rates and deployment to areas with increasing levels of conflict. These factors could have an impact on the relations noted herein. Sixth, some of the results must be interpreted with caution because some of the cell sizes, particularly for suicide attempt, are quite small. Finally, the CCHS-CFS excludes veteran populations and discharged military personnel, which may have disproportionately biased the associations noted above. Assuming that some discharged military personnel may have experienced mental disorders and suicidal behavior, we may have underestimated rates in the military population, while at the same time failing to note who in the civilian population might be former military. Future studies would ideally include standardized assessment of all Axis I and Axis II mental disorders, completed suicide, and suicidal behavior among all military personnel (including discharged personnel) in an identical way to that conducted in the civilian population.

Conclusion

Despite its limitations, the current study suggests that suicide attempts are less likely in active Canadian forces personnel than in the civilian population, lending support to the “healthy soldier effect” hypothesis. Some key differential correlates were also noted. It is important to be aware of these differential correlates of suicidal behavior in soldiers, as they may be useful in identification of at-risk individuals. The correlates noted here should direct our attention toward understanding the ways in which soldiers communicate their distress and how these may differ from those of the civilian population.

ACKNOWLEDGMENTS

Author affiliations: Department of Psychiatry, University of Manitoba, Winnipeg, Manitoba, Canada (Shay-Lee Belik, Jitender Sareen); Department of Community Health Sciences, University of Manitoba, Winnipeg, Manitoba, Canada (Shay-Lee Belik, Jitender Sareen); Departments of Psychiatry and of Family and Preventive Medicine, University of California, San Diego, California (Murray B. Stein); and Department of Psychology and Anxiety and Illness Behaviours Laboratory, University of Regina, Regina, Saskatchewan, Canada (Gordon J. G. Asmundson).

Preparation of this article was supported by a Canadian Institutes of Health Research (CIHR) Frederick Banting and Charles Best Canada Graduate Scholarship—Doctoral Award to S. B.; New Emerging Team grant PTS-63186 from the CIHR Institute of Neurosciences, Mental Health, and Addiction to G. J. G. A.; CIHR operating grant 184490; CIHR New Investigator grant 152348 awarded to J. S.;

a Manitoba Health Research Council Chair Award to J. S.; and a Career Development (K24) Award from the US National Institutes of Health (MH64122) to M. B. S.

The opinions expressed in this paper do not represent the opinions of Statistics Canada.

Conflict of interest: none declared.

REFERENCES

1. Ritchie EC, Keppler WC, Rothberg JM. Suicidal admissions in the United States military. *Mil Med.* 2003;168(3):177–181.
2. Tien HC, Acharya S, Redelmeier DA. Preventing deaths in the Canadian military. *Am J Prev Med.* 2010;38(3):331–339.
3. Kuehn BM. Soldier suicide rates continue to rise: military, scientists work to stem the tide. *JAMA.* 2009;301(11):1111, 1113.
4. Bullman TA, Kang HK. Posttraumatic stress disorder and the risk of traumatic deaths among Vietnam veterans. *J Nerv Ment Dis.* 1994;182(11):604–610.
5. Thoresen S, Mehlum L, Moller B. Suicide in peacekeepers—a cohort study of mortality from suicide in 22,275 Norwegian veterans from international peacekeeping operations. *Soc Psychiatry Psychiatr Epidemiol.* 2003;38(11):605–610.
6. McCarthy JF, Valenstein M, Kim HM, et al. Suicide mortality among patients receiving care in the Veterans Health Administration health system. *Am J Epidemiol.* 2009;169(8):1033–1038.
7. Kaplan MS, Huguet N, McFarland BH, et al. Suicide among male veterans: a prospective population-based study. *J Epidemiol Community Health.* 2007;61(7):619–624.
8. Fear NT, Ward VR, Harrison K, et al. Suicide among male regular UK armed forces personnel, 1984–2007. *Occup Environ Med.* 2009;66(7):438–441.
9. Kapur N, While D, Blatchley N, et al. Suicide after leaving the UK armed forces—a cohort study [electronic article]. *PLoS Med.* 2009;6(3):e26.
10. Miller M, Barber C, Azrael D, et al. Suicide among US veterans: a prospective study of 500,000 middle-aged and elderly men. *Am J Epidemiol.* 2009;170(4):494–500.
11. Scoville SL, Gubata ME, Potter RN, et al. Deaths attributed to suicide among enlisted U.S. armed forces recruits, 1980–2004. *Mil Med.* 2007;172(10):1024–1031.
12. Michel PO, Lundin T, Larsson G. Suicide rate among former Swedish peacekeeping personnel. *Mil Med.* 2007;172(3):278–282.
13. Mahon MJ, Tobin JP, Cusack DA, et al. Suicide among regular-duty military personnel: a retrospective case-control study of occupation-specific risk factors for workplace suicide. *Am J Psychiatry.* 2005;162(9):1688–1696.
14. Desjeux G, Labarère J, Galois-Guibal L, et al. Suicide in the French armed forces. *Eur J Epidemiol.* 2004;19(9):823–829.
15. Suominen K, Isometsä E, Suokas J, et al. Completed suicide after a suicide attempt: a 37-year follow-up study. *Am J Psychiatry.* 2004;161(3):562–563.
16. Goldstein RB, Black DW, Nasrallah A, et al. The prediction of suicide. Sensitivity, specificity, and predictive value of a multivariate model applied to suicide among 1906 patients with affective disorders. *Arch Gen Psychiatry.* 1991;48(5):418–422.
17. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Arch Gen Psychiatry.* 1999;56(7):617–626.
18. Mann JJ, Waternaux C, Haas GL, et al. Toward a clinical model of suicidal behavior in psychiatric patients. *Am J Psychiatry.* 1999;156(2):181–189.
19. Beautrais AL, Joyce PR, Mulder RT, et al. Prevalence and comorbidity of mental disorders in persons making serious

- suicide attempts: a case-control study. *Am J Psychiatry*. 1996; 153(8):1009–1014.
20. King RA, Schwab-Stone M, Flisher AJ, et al. Psychosocial and risk behavior correlates of youth suicide attempts and suicidal ideation. *J Am Acad Child Adolesc Psychiatry*. 2001;40(7): 837–846.
 21. Hawton K, Harriss L, Casey D, et al. Self-harm in UK armed forces personnel: descriptive and case-control study of general hospital presentations. *Br J Psychiatry*. 2009;194(3): 266–272.
 22. Bernal M, Haro JM, Bernert S, et al. Risk factors for suicidality in Europe: results from the ESEMED Study. *J Affect Disord*. 2007;101(1–3):27–34.
 23. Bailie L, Dufour J, Hamel M. *Data Quality Assurance for the Canadian Community Health Survey*. Ottawa, Ontario, Canada: Statistics Canada; 2002.
 24. Belik SL, Stein MB, Asmundson GJ, et al. Relation between traumatic events and suicide attempts in Canadian military personnel. *Can J Psychiatry*. 2009;54(2):93–104.
 25. Sareen J, Belik SL, Stein MB, et al. Correlates of perceived need for mental health care among active military personnel. *Psychiatr Serv*. 2010;61(1):50–57.
 26. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders (DSM)*. Washington, DC: American Psychiatric Press, Inc; 2000.
 27. Kessler RC, Üstün TB. The World Mental Health (WMH) Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). *Int J Methods Psychiatr Res*. 2004;13(2):93–121.
 28. Gravel R, Béland Y. The Canadian Community Health Survey: mental health and well-being. *Can J Psychiatry*. 2005;50(10): 573–579.
 29. Research Triangle Institute. Software for Survey Data Analysis (SUDAAN). Release 9.0.1. Research Triangle Park, NC: Research Triangle Institute; 2005.
 30. Hendin H, Haas AP. Suicide and guilt as manifestations of PTSD in Vietnam combat veterans. *Am J Psychiatry*. 1991; 148(5):586–591.
 31. Fontana A, Rosenheck R. An etiological model of attempted suicide among Vietnam theater veterans. Prospective generalization to a treatment-seeking sample. *J Nerv Ment Dis*. 1995;183(6):377–383.
 32. Campion EW. Disease and suspicion after the Persian Gulf War. *N Engl J Med*. 1996;335(20):1525–1527.
 33. Hourani LL, Warrack AG, Coben PA. Suicide in the U.S. Marine Corps, 1990 to 1996. *Mil Med*. 1999;164(8): 551–555.
 34. Wong A, Escobar M, Lesage A, et al. Are UN peacekeepers at risk for suicide? *Suicide Life Threat Behav*. 2001;31(1): 103–112.
 35. McLaughlin R, Nielsen L, Waller M. An evaluation of the effect of military service on mortality: quantifying the healthy soldier effect. *Ann Epidemiol*. 2008;18(12):928–936.
 36. Kang HK, Bullman TA. Mortality among US veterans of the Persian Gulf War: 7-year follow-up. *Am J Epidemiol*. 2001; 154(5):399–405.
 37. Kang HK, Bullman TA. Mortality among U.S. veterans of the Persian Gulf War. *N Engl J Med*. 1996;335(20):1498–1504.
 38. Tolin DF, Foa EB. Sex differences in trauma and posttraumatic stress disorder: a quantitative review of 25 years of research. *Psychol Bull*. 2006;132(6):959–992.
 39. Street AE, Gratus JL, Stafford J, et al. Gender differences in experiences of sexual harassment: data from a male-dominated environment. *J Consult Clin Psychol*. 2007;75(3):464–474.
 40. Murdoch M, Pryor JB, Polusny MA, et al. Functioning and psychiatric symptoms among military men and women exposed to sexual stressors. *Mil Med*. 2007;172(7):718–725.
 41. Smith TC, Wingard DL, Ryan MA, et al. Prior assault and posttraumatic stress disorder after combat deployment. *Epidemiology*. 2008;19(3):505–512.
 42. Vogt DS, Pless AP, King LA, et al. Deployment stressors, gender, and mental health outcomes among Gulf War I veterans. *J Trauma Stress*. 2005;18(3):272–284.
 43. Street AE, Vogt D, Dutra L. A new generation of women veterans: stressors faced by women deployed to Iraq and Afghanistan. *Clin Psychol Rev*. 2009;29(8):685–694.
 44. Fergusson DM, Beautrais AL, Horwood LJ. Vulnerability and resiliency to suicidal behaviours in young people. *Psychol Med*. 2003;33(1):61–73.
 45. Diekstra RF. The epidemiology of suicide and parasuicide. *Acta Psychiatr Scand Suppl*. 1993;371:9–20.
 46. Beautrais AL. Suicides and serious suicide attempts: two populations or one? *Psychol Med*. 2001;31(5):837–845.
 47. Mann JJ. A current perspective of suicide and attempted suicide. *Ann Intern Med*. 2002;136(4):302–311.
 48. Fear NT, Iversen A, Meltzer H, et al. Patterns of drinking in the UK armed forces. *Addiction*. 2007;102(11):1749–1759.
 49. Stahre MA, Brewer RD, Fonseca VP, et al. Binge drinking among U.S. active-duty military personnel. *Am J Prev Med*. 2009;36(3):208–217.
 50. Rona RJ, Jones M, Fear NT, et al. Alcohol misuse and functional impairment in the UK armed forces: a population-based study. *Drug Alcohol Depend*. 2010;108(1–2):37–42.