Impact of Violence

Violent crime among Swedish military veterans after deployment to Afghanistan: a population-based matched cohort study

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Abstract

Objective: To investigate the incidence of violent crime conviction among Swedish military veterans after deployment to Afghanistan versus non-deployed comparators. The main outcome was first conviction of a violent crime, retrieved from the Swedish National Council for Crime Prevention Register until December 31, 2013.

Methods: This was a cohort study of military veterans identified through personnel registers regarding deployment to Afghanistan between 2002 and 2013 ($n = 5894$). To each military veteran, up to five non-deployed comparators identified via the Military Service Conscription Register were matched by age, sex, conscription year, cognitive ability, psychological assessment, self-reported mental health, body mass index, antidepressants/anxiolytics prescriptions and self-harm (fully matched comparators; $n = 28\,895$). Multivariable adjustment was made for substance abuse and previous health care visits with psychiatric diagnoses. An additional comparator group matched only for age, sex and conscription year was also used (age-sex-matched comparators; $n = 29\,410$).

Results: During 21 898 person-years of follow-up (median = 3.6 years) there were 26 events among deployed military veterans compared with 98 in non-deployed fully matched comparators [12 vs 9 per 10 000 person-years, adjusted hazard ratio (aHR) 1.36; 95% confidence interval (CI) 0.88–2.10]. Among non-deployed age-sex-matched comparators there were 170 violent crime convictions (16 per 10 000 person-years; aHR 0.85; 95% CI 0.56–1.29). Factors associated with greater risk of violent crime convictions were younger age, lower scores on cognitive ability tests and psychological assessment, and convictions preceding deployment.

Conclusion: The violent crime conviction rate after returning from military deployment to Afghanistan was not different compared with non-deployed comparators in individuals without history of violent crime convictions.

Key Messages

- This is the first large cohort study to investigate the incidence of violent crime conviction after military deployment while accounting for individual characteristics such as cognitive ability, psychological capacity and previous mental health problems.
- There is no difference in risk of violent crime conviction between Swedish military veterans deployed to Afghanistan and matched non-deployed comparators over a median 3.6 years of follow-up.
- Risk factors for a violent crime conviction among deployed Swedish military veterans are similar to risk factors for a violent crime conviction in the civilian population, including male sex, young age, lower cognitive ability, lower score on psychological evaluation and history of violent crime.

Introduction

Combat exposure and traumatic events during military deployment have been reported to be associated with increased risk of violent behaviour after deployment.[1–3] In addition, it has been suggested that individuals trained in military combat might be more prone to use violence in environments where violence is not appropriate.[4] There may therefore be reason to be concerned about violent behaviour among military veterans returning from war zones. In fact, dramatic violence was one of the criteria of malignant post-Vietnam syndrome, a precursor of post-traumatic stress disorder (PTSD).[5]

A meta-analysis of aggressive and violent behaviour among American and British veterans from the recent wars in Iraq and Afghanistan estimated that one in 10 of the veterans engaged in physical assault during the past month and one in three engaged in some type of physical aggression.[1] However, a study using American data from the Health Care for Reentry Veterans programme (an outreach programme within the Veterans Health Administration) examined the risk of incarceration after deployment to Afghanistan or Iraq and found that veterans who served in Iraq and/or Afghanistan were less likely to be incarcerated than veterans from other war zones, but they were more likely to suffer from PTSD symptoms[6]. The lack of a relevant non-deployed carefully matched comparison group makes it difficult to interpret these results (Supplementary Table 1, available as Supplementary data at *IJE* online).

Sweden deployed military personnel to Afghanistan within the International Security Assistance Force (ISAF) between 2002 and 2014. There have been reported cases of violent behaviour among veterans, such as the Swedish daily press reporting on a double homicide committed by a Swedish military veteran who claimed to have suffered from traumatic experiences during his deployment to Afghanistan.[7] No study has investigated the incidence of violent behaviour among the complete cohort of Swedish veterans deployed to Afghanistan.

Therefore we aimed to investigate the risk of a violent crime conviction among Swedish military veterans after returning from military deployment to Afghanistan, in comparison with non-deployed matched controls. In addition, predictors of violent crime after deployment were investigated.

Methods

This is a population-based matched cohort study of the risk of violent crime convictions after military deployment to Afghanistan versus matched comparators without deployment history. The same cohort of military veterans, but with different cohort restrictions and matching factors, has been used for analysis of suicide (including deployments since 1990) as well as divorce and marriage after military deployment (Afghanistan veterans only).[8,9]

The study uses register-linkage methodology, linking military veterans and their matched comparators to nationwide registers including covariates and outcomes, based on the unique personal identity number assigned to all Swedish residents (overview and timeline in Supplementary Figure 1, available as Supplementary data at *IJE* online and cohort description in Supplementary Table 2, available as Supplementary data at *IJE* online).

Ethical approval for the study was granted by the regional ethics committee in Stockholm, Sweden. All analyses were performed on de-identified data.

Setting

In Sweden, military conscription was mandatory for men until 2010. The details regarding the Swedish conscription

procedure have been described elsewhere.[9] Beginning in the year 2000, the Swedish Armed Forces transitioned from an anti-invasion force to a mission-oriented force with international deployments as the main focus. From the years 2000 to 2008, the number of individuals undergoing conscription testing decreased from 42 000 to 25 000. The formal grounds for an exemption from military conscription remained the same (previous conviction of a felony, serious mental or physical illness). However, a lack of motivation has been described as the most important factor for getting an exemption during this period, indicating that potential conscripts themselves had a greater influence than previously on the decision to enrol.[10] Sweden began a transition to professional armed forces in 2010.

The International Security Assistance Force (ISAF) Mission in Afghanistan (ISAF) was created in 2001 with the mission to improve security in Afghanistan.[11] ISAF was led by NATO and Sweden participated with more than 8000 deployed soldiers from 2002 until 2014.[12]

Study population

Three cohorts of men and women without previous violent crime convictions were identified for this study from the Military Service Conscription Register.

Deployed military veterans

Swedish military personnel who were deployed to Afghanistan at some time between 1 January 2002 and 31 December 2013, were identified from the Swedish Military Information Personnel (SWIP) and PRIO registers (PRIO is not an acronym and carries no specific meaning; it replaced the SWIP register in 2012). The SWIP and PRIO personnel registers provided individual-level deployment details for deployments between 2002 and 2013, excluding Special Forces and classified personnel. These groups represent <1% of individuals (personal communication from Anders Claréus, PhD, Swedish Armed Forces Research coordinator). Military veterans who had been deployed before 2002, or to another country between 2002 and 2013, were also identified in SWIP and PRIO and excluded from the pool of eligible comparators.

Fully matched non-deployed comparators

Up to five non-deployed comparators were selected by an exact matching procedure from individuals who underwent conscription. The matching factors were sex, deployment factors [age (±1 year)], conscription data [conscription year, cognitive ability (1–9), psychological assessment (1–9), self-reported mental health problems (yes/no), body mass index (BMI) (<18.5/18.5-<25/25-<30/≥30 kg/m^2), history of self-harm (yes/no) and one or

more prescription fillings of antidepressants or anxiolytics (yes/no/or deployment before 2006 when prescription data were lacking). The matching date was set to each veterans' day of return to Sweden after deployment, at which time the comparators had to be alive and living in Sweden.

Age- and sex-matched non-deployed comparators

The same matching procedure was applied as for the fully matched non-deployed comparators, using only age, sex and conscription year as matching variables. The purpose of this comparator cohort was to provide a general population benchmark for violent crime conviction based on the whole group of individuals going through military conscription testing. The two non-deployed matched comparator groups were sampled from the same pool of 1.8 million potential comparators, which means that it is possible for the same individual to be present in the age- and sex-matched as well as the fully matched comparator group.

Prediction analysis cohort of deployed veterans

A separate analysis was conducted to identify predictors of violent crime within the military veteran cohort. For this analysis, all Swedish military veterans who had served abroad since 1990 were included ($n = 21\,608$), in order to gain statistical power, including veterans with history of violent crime convictions.

Conscript cohort

Another separate analysis was performed to examine the association between violent crime and cognitive ability, psychological assessment, mental health problems and sex, where we used all available conscripts who had gone through testing since 1969 ($n = 1.8$ million).

Covariates

Covariates were retrieved from the Military Service Conscription Register, the National Patient Register, and the Prescribed Drug Register.

The Military Service Conscription Register

From this register we obtained information collected at the time of conscription testing including: test scores from a psychological assessment and an intelligence test; self-reported history of mental health problems; and height and weight. The purpose of the psychological assessment was to assess the ability of conscripts to cope with stress, their leadership skills and overall suitability for military service. The assessment consisted of a questionnaire and an individual semi-structured interview with a psychologist.[13] The cognitive ability test consisted of assessments of verbal, spatial, logic inductive and technical ability, where the

test scores for each component were combined into a single *g*-factor.[14] A Stanine scale was used for both the psychological and cognitive ability assessments to convert test scores into values ranging from 1 to 9 with a Gaussian distribution. Measured weight (kg) and height (cm) were used for calculation of the body mass index (BMI; kg/m^2). The World Health Organization categories for BMI were used [underweight (<18.5), normal weight (18.5-<25), overweight (25-<30) and obese ($\geq$30 kg/m^2)].

The National Patient Register

We retrieved data regarding mental health problems defined as any visit with a recorded psychiatric diagnosis before deployment (ICD9: 290–315; ICD10: F00-F99) including substance abuse (ICD9: 293, 303, 305; ICD10: F10-F18) as well as any visit listing a self-harm diagnosis (ICD9: E950-E959, E980-E989; ICD10: X60-X84, Y10-Y34) since 1987 for inpatient care and since 2001 for hospital-based outpatient care.

The Prescribed Drug Register

From this nationwide register we retrieved data on filled prescriptions for antidepressants [Anatomic Therapeutic Chemical classification system code (ATC) N06A] or anxiolytics (ATC N05B) at any time before deployment for individuals with deployment or matching date after 1 January 2006. The register was started on 1 July 2005, and we wanted at least 6 months of prescription history for analyses.

Outcome and follow-up

Data regarding violent crime conviction were retrieved from the Register of Criminal Convictions until 31 December 2013, including information regarding convictions from all lower courts in Sweden since 1973. Data include date, criminal offence and sentence with close to complete coverage. Violent crime was defined as conviction of any of the following crimes: homicide, assault, kidnapping/illegal confinement, gross violation of a person's/woman's integrity, intimidation, sexual offending, robbery or threats and/or violence against an officer (see Supplementary eMethods, available as Supplementary data at *IJE* online).

Start of follow-up was the day of return to Sweden after deployment, for each deployed military veteran and their matched non-deployed comparators. Participants were followed until first violent crime conviction, emigration, death or end of follow-up, whichever came first. Data on death and emigration dates were retrieved from the Total Population Register.[15]

As additional outcomes, we analysed first event of psychiatric inpatient care in the National Patient Register, and first prescription filling for anxiolytics or antidepressants in the Prescribed Drug Register, from the day of return to

Sweden after deployment. The analyses of anxiolytics and antidepressants were restricted to participants without history of such prescriptions before deployment (or before index date in comparators). As the Prescribed Drug Register was started in July 2005, these analyses included participants with index dates from 1 January 2007, to allow for at least 1.5 years of prescription history.

Statistics

Participant conscription and pre-deployment characteristics were compared between deployed military veterans and non-deployed comparators, using analysis of variance (ANOVA) for continuous variables and logistic regression for categorical variables, accounting for the matched design by conditioning the analyses on the matching set where each set consisted of one deployed military veteran and up to five matched non-deployed comparators.

For the main outcome violent crime conviction and the additional psychiatric outcomes, event rates were illustrated using Kaplan-Meier failure functions. Hazard ratios were estimated using Cox regression with models conditioned on the matching set. Additional adjustment for health care contacts due to substance abuse or psychiatric causes was made when comparing deployed military veterans with the fully matched non-deployed comparators. We also repeated the analyses with additional adjustment for marital status, in response to reviewer comments.

In a prediction analysis, age at deployment, sex, cognitive ability test score, score on psychological assessment and history of violent crime were examined as predictors of violent crime convictions. Association analyses were also performed on the whole conscript population for the relation between violent crime convictions and cognitive ability, psychological assessment, self-reported mental health and sex. Data were analysed using SAS (version 9.4, SAS Institute, Cary, NC) and Stata (version 13.0, College Station, TX). All tests were two-sided.

Results

Participant characteristics

We identified 6105 military veterans with deployment to Afghanistan between 1 January 2002 and 31 December 2013. Of those, 107 were not eligible for matching due to missing data in the Military Service Conscription Register. An additional 104 individuals were removed due to violent crime conviction preceding deployment, which resulted in a cohort of 5894 military veterans

Table 1. Characteristics of military veterans and matched comparators without history of violent crime conviction before deployment (or matching date)

	Not convicted pre-deployment		
	Deployed Military Veterans	Age-sex-matched Non-deployed Comparators	Fully matched Non-deployed Comparators
N	5894	29 410	28 895
Men, *n* (%)	5616 (95%)	28 036 (95%)	27 780 (96%)
Women, *n* (%)	278 (4.7%)	1374 (4.7%)	1115 (3.9%)
At conscription; mean (SD)			
Age (years)	18.4 (0.9)	18.2 (0.5)	18.2 (0.6)
Psychological assessment (1 lowest; 9 highest)	6.5 (1.3)	5.4 (1.6)**	6.5 (1.3)
Cognitive ability (1 lowest; 9 highest)	6.0 (1.5)	5.2 (1.9)**	6.0 (1.5)
Self-reported history of mental health problems, *n* (%)	20 (0.32%)	661 (2.2%)**	92 (0.32%)
Body mass index (kg/m^2)	22.5 (2.7)	22.4 (3.3)	22.4 (2.8)
Pre-deployment			
Age at deployment (years), mean (SD)	30.4 (8.6)	30.4 (8.6)	30.7 (8.6)
Previous health care contact with psychiatric diagnosis, *n* (%)	395 (6.7%)	3586 (12%)**	1817 (6.3%)
Previous substance abuse, *n* (%)	90 (1.5%)	681 (2.3%)*	418 (1.4%)
Previous use of anxiolytics,[a] *n* (%)	108 (2.0%)	1241 (4.5%)**	467 (1.8%)
Previous use of antidepressants,[b] *n* (%)	119 (2.2%)	1762 (6.5%)**	606 (2.3%)
Previous self-harm, *n* (%)	79 (1.3%)	450 (1.5%)	293 (1.5%)

SD, standard deviation.

[a]Matching factors were sex, deployment factors (age), conscription data [conscription year, cognitive ability, psychological assessment, self-reported mental health problems (yes/no) and BMI], pre-deployment history of violent crime convictions, deliberate self-harm and one or more prescription fillings of antidepressants or of anxiolytics [data available for individuals with deployment (matching) after 1 January 2006].

[b]Data retrieved from mandatory conscription.

*P-value $\leq$0.05 vs deployed military veterans.

**P-value $\leq$0.01 vs deployed military veterans.

deployed to Afghanistan. Non-deployed comparators underwent the same restriction regarding violent crime conviction before the matching date. Due to the matching procedure, characteristics were similar between deployed military veterans and the fully matched non-deployed comparator cohort.
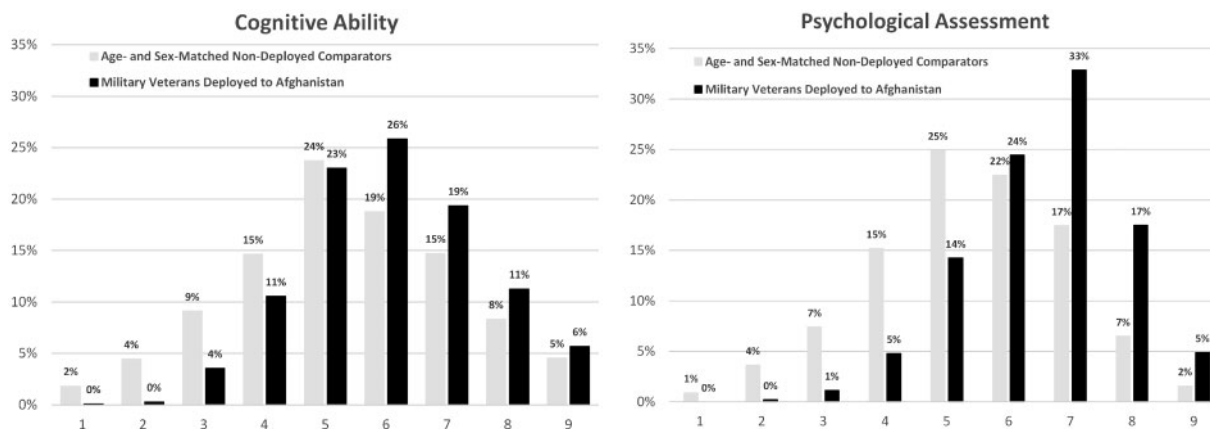
Deployed military veterans had higher scores on the cognitive ability test and psychological assessment at conscription than age- and sex-matched non-deployed comparators (Table 1, Figure 1). Before deployment, deployed military veterans had a lower proportion of health care contacts with a psychiatric diagnosis, use of antidepressants or anxiolytics, history of self-harm and substance abuse, in comparison with age- and sex-matched non-deployed comparators (Table 1).

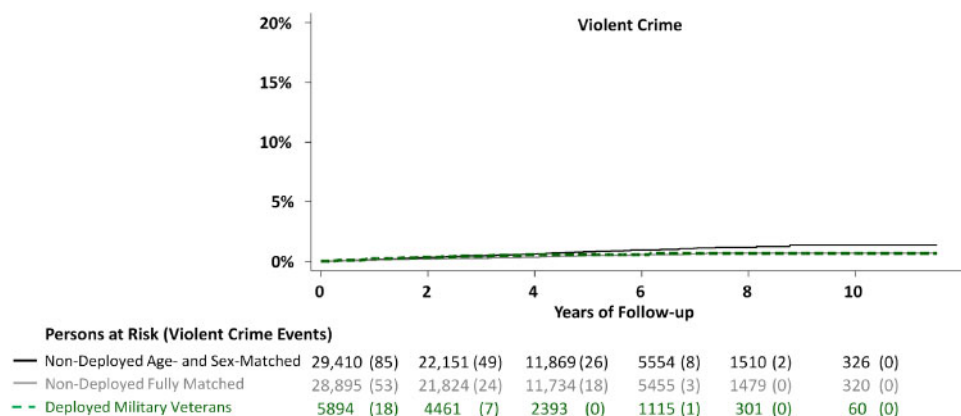## Violent crime after deployment to Afghanistan

During follow-up, 239 of the deployed military veterans emigrated and eight died. The corresponding numbers for the non-deployed age- and sex-matched comparators were 553 and 94, as well as 647 and 50 for the fully matched comparator cohort. There were 26 violent crime

convictions in the deployed military veteran cohort with a total follow-up time of 21 898 person-years (median 3.6 years) in comparison with 98 violent crime convictions in the non-deployed fully matched comparator cohort [12 vs nine per 10 000 person-years; adjusted hazard ratio [aHR] 1.36; 95% confidence interval (CI) 0.88–2.09; $P = 0.16$; Figure 2]. In the non-deployed age- and sex-matched comparator cohort, there were 170 violent crime convictions (16 per 10 000 person-years; aHR 0.85; 95% CI 0.56–1.29; $P = 0.45$; Figure 2). These results imply that the rate of violent crime convictions among deployed military veterans was numerically lower compared with the age- and sex-matched cohort and numerically higher than in the fully matched cohort.

In a comparison of the fully matched and age-sex-matched comparators, the fully matched comparators had a lower rate of violent crime (9 vs 16 per 10 000 person-years; aHR 0.59; 95% CI 0.46–0.75; $P < 0.0001$). Adjusting for marital status resulted in adjusted hazard ratios of 1.31 (95% CI 0.85–2.02; $P = 0.23$) versus fully matched comparators and 0.77 (95% CI 0.51–1.16; $P = 0.21$) versus the age- and sex-matched comparators.

Figure 1. Cognitive ability and psychological assessment (x-axis shows a standard nine [stanine] scale where 1 = lowest and 9 = highest) score for deployed military veterans (black bars) and age- and sex- matched non-deployed comparators (grey bars) without history of violent crime conviction.

Persons at Risk (Violent Crime Events)

Non-Deployed Age- and Sex-Matched	29,410 (85)	22,151 (49)	11,869 (26)	5554 (8)	1510 (2)	326 (0)
Non-Deployed Fully Matched	28,895 (53)	21,824 (24)	11,734 (18)	5455 (3)	1479 (0)	320 (0)
Deployed Military Veterans	5894 (18)	4461 (7)	2393 (0)	1115 (1)	301 (0)	60 (0)

Figure 2. Cumulative incidence of violent crime convictions among deployed military veterans, fully matched non-deployed comparators and non-deployed age- and sex-matched comparators without history of violent crime conviction preceding deployment or matching. Participants were followed until first violent crime conviction, emigration, death or end of follow-up, whichever came first. Matching factors were sex, deployment factors (age), conscription data [conscription year, cognitive ability, psychological assessment, self-reported mental health problems (yes/no) and BMI], pre-deployment history of violent crime convictions, deliberate self-harm and one or more prescription fillings of antidepressants or of anxiolytics [data available for individuals with deployment (matching) after 1 January 2006].

Predictor analysis within the cohort of military veterans deployed between 1990 and 2013

The predictor analysis was confined to men only since no women were convicted of a violent crime during follow-up. Within the military veteran cohort, risk factors for being convicted of a violent crime were lower age at deployment and lower psychological assessment and cognitive ability test scores, as well as pre-deployment violent crime convictions (Figure 3).

Sex and psychological and psychiatric factors as predictors of violent crime

In the conscript population ($n = 1.8$ million) with up to 40 years of follow-up, the cumulative incidence of violent crime was close to 15% in conscripts scoring 3 or less on the cognitive ability test compared with less than 2% in

conscripts scoring 7 or higher (Figure 4). The corresponding cumulative incidences for psychological assessment were about 15% compared with 4%. In conscripts reporting having mental health problems, the cumulative incidence was about 15% and in conscripts not reporting such problems, the cumulative incidence was about 3%. Men had a cumulative incidence of around 7% and women had a cumulative incidence of less than 1%.

Psychiatric inpatient care, antidepressants and anxiolytics

Deployed military veterans who served in Afghanistan displayed a lower risk of psychiatric inpatient care in comparison with non-deployed age-and sex-matched comparators, but no difference in risk in comparison with non-deployed fully matched comparators (Figure 5). Deployed military
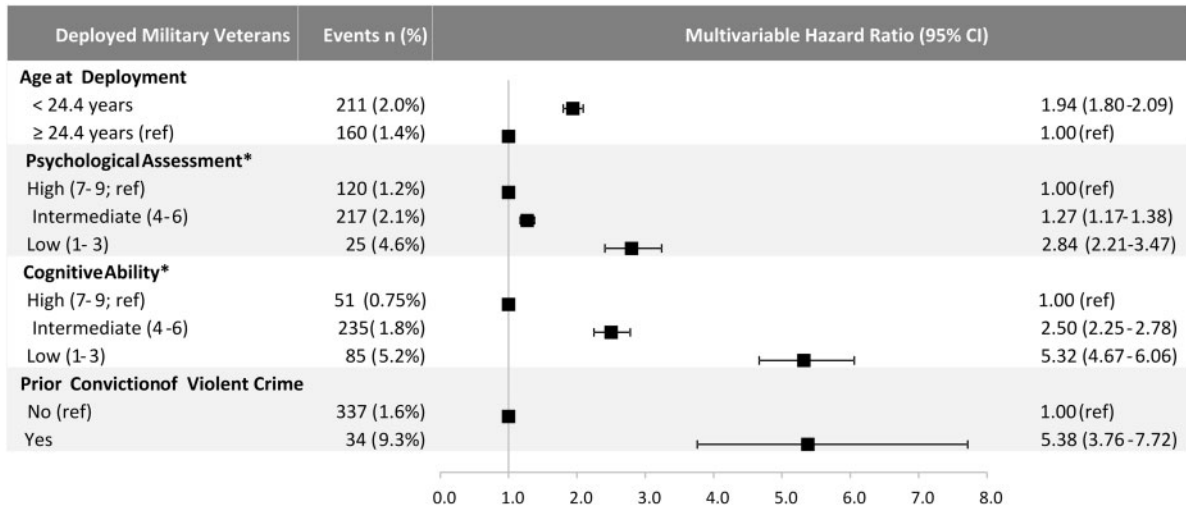
Figure 3. Risk factor analysis among military veterans deployed between 1990 and 2013 ($n = 21\,608$). Data retrieved from mandatory conscription.
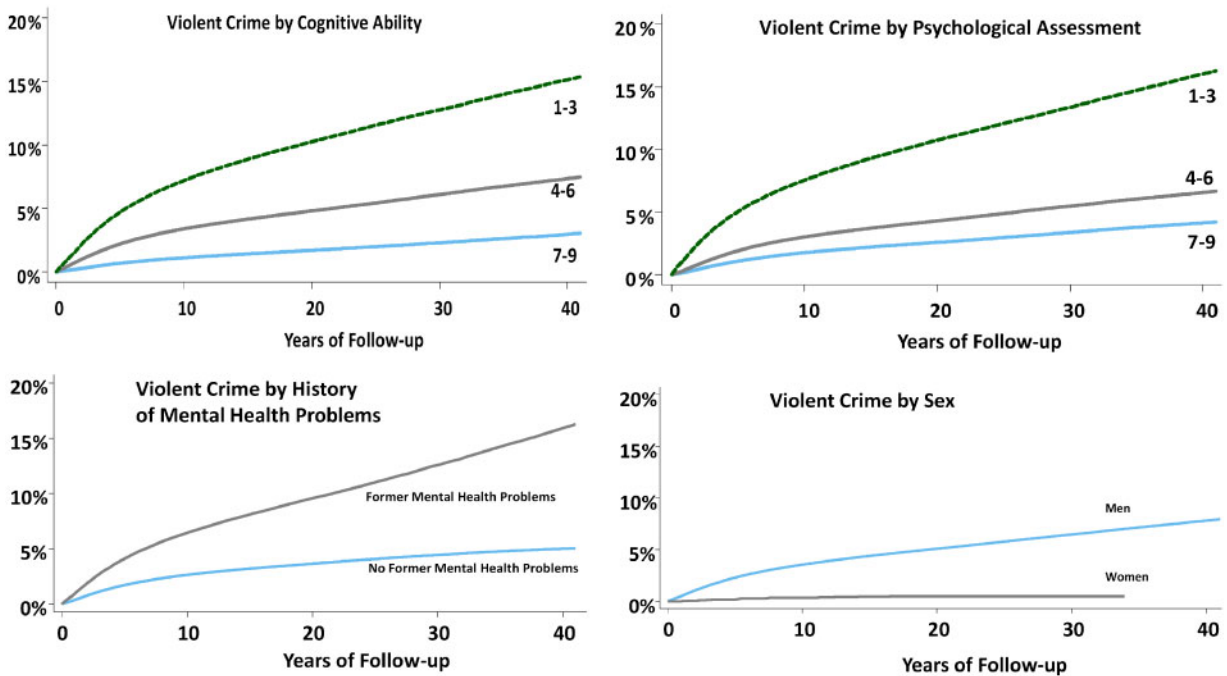

Figure 4. Cumulative incidence of violent crime conviction in association with psychological assessment score, cognitive ability test score, self-reported mental health at conscription testing and sex. Participants were followed until first violent crime conviction, emigration, death or end of follow-up, whichever came first.

veterans were prescribed less anxiolytics compared with both non-deployed comparator groups, and less antidepressants than non-deployed age-sex-matched comparators (Figure 5).

Discussion

Main findings

Swedish military veterans deployed to Afghanistan did not differ from their non-deployed fully matched comparators regarding violent crime convictions during a follow-up time of up to 12 years after deployment. In comparison with non-deployed general population comparators matched only for age, sex and conscription year, no difference in risk of violent crime conviction was found. Within the military veteran cohort, risk factors for being convicted of a violent crime were lower age at deployment and lower psychological assessment and cognitive ability test scores, as well as no pre-deployment violent crime convictions.
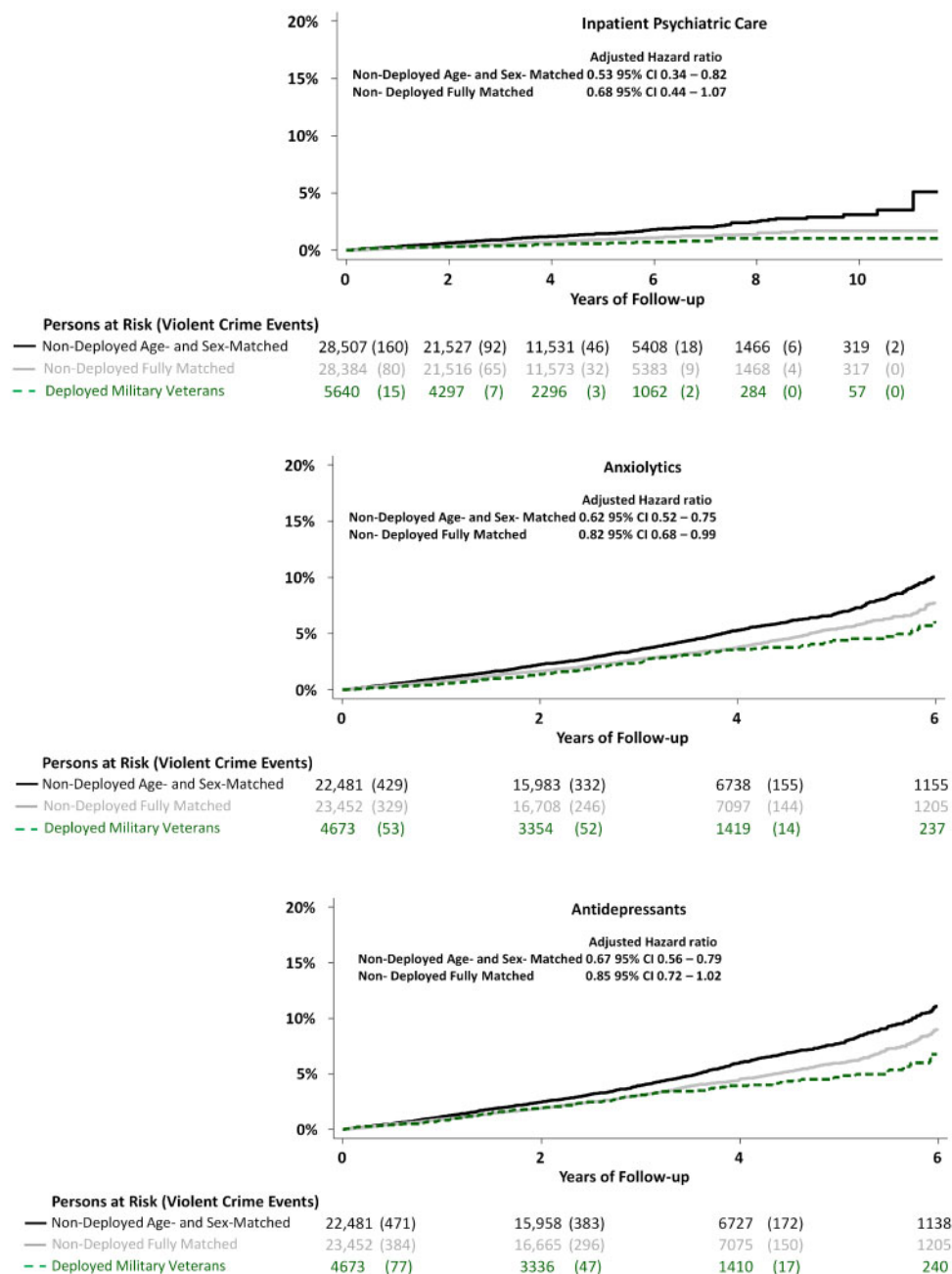
Figure 5. Inpatient psychiatric care (top panel; 2002–13), fillings of anxiolytics (middle panel; 2007–13) and antidepressants (bottom panel; 2007–13) among deployed military veterans and matched comparators. Participants were followed until first event (inpatient care admission/filled prescription), emigration, death or end of follow-up, whichever came first. Analyses of anxiolytics and antidepressants exclude all participants with history of filled prescriptions for these drugs before to the index date.

Previous research

Combat exposure and experienced trauma during military deployment have been linked to increased violent behaviour after deployment,[1–3] but a large register-based study of violent offending among British veterans from Iraq and Afghanistan could not detect any overall increased risk of violent crime related to deployment.[16] The relatively low level of combat exposure and trauma among the Swedish military veterans in this study, predominantly stationed in

Mazar-e-Sharif in northern Afghanistan, may explain the similar finding of no increased risk of violent crime convictions among veterans from Afghanistan. Also, the incidence of violent crime conviction in the Swedish veteran population was several times lower than that in the British veteran population (1.2 vs 7.6 per 1000 person-years).[16] This difference could be due to differences between the veteran population in the two countries. In the Swedish case, a considerable fraction of the deployed individuals were

not soldiers by profession but civilians who had performed mandatory military service and later volunteered for service in Afghanistan after undergoing extensive testing regarding mental and physical health.

We found that young age and low scores on psychological assessment, cognitive ability tests and pre-deployment violent crime convictions were important risk factors for violent crime conviction after deployment among Swedish veterans. These were also the strongest risk factors for violent crime conviction in the non-deployed comparator cohorts. Our results are consistent with findings in the Swedish general population, where young age, male sex, alcohol or substance abuse, mental illness, low cognitive ability and previous violent crime conviction are known risk factors for future violent crime conviction.[17–20]

Mechanism and implications

This study could not find any evidence for military deployment to Afghanistan having resulted in increased levels of violence among Swedish veterans after deployment. Deployed military veterans also did not consume more anxiolytics or antidepressants, or receive more psychiatric inpatient care, than non-deployed fully matched comparators, mirroring previous findings in the same cohort regarding similar risk of suicide, suicide attempts and all-cause mortality.[8] No difference in risk of violent crime conviction could be detected between the veteran cohort and a non-deployed fully matched comparator cohort matched on several variables known as risk factors for violent behaviour, such as sex, age, cognitive ability, psychological capacity and mental health. This resembles the results from our previous study of all Swedish veterans deployed between 1990 and 2013, in which we found no increased risk of suicide among veterans compared with matched non-deployed comparators.[8]

Strengths

A major strength of this study was the use of a nationwide register with close to complete data on violent crime convictions. In a recent published review article, MacManus *et al.* emphasized the importance of investigating violent crime with the use of standardized and objective measurements.[1] We were able to follow a large number of individuals over a long time period with minimal loss to follow-up, and to account for cognitive ability, psychological assessment, pre-deployment violent crime conviction and psychiatric illness. Also, by using nationwide registers from the National Board of Health and Welfare, the Military Archives, the Swedish Defense Recruitment Agency and Statistics Sweden, containing objective and standardized

data on an individual level, it was possible to create a closely matched comparison group of non-deployed individuals, which is crucial in this kind of study.[21]

Limitations

This study had no information on combat exposure or other traumatic events during deployment at the individual level, which previously have been linked to violent offending.[1] Therefore, no analyses of the effect of these exposures on violent crime conviction could be performed within the Swedish veteran cohort. Also, this study only investigated convictions of violent crimes, which means that unreported violent acts or cases of violent acts which did not lead to a conviction were not included. This limitation also applies to the non-deployed comparator cohort.

Violent crime conviction was rare during follow-up, which resulted in insufficient statistical power to investigate different types of violent crimes, although assault was the dominant type in both veterans and matched comparators. As violent crime convictions were rare, we could not determine whether the numerically higher hazard ratio for deployed military veterans represents a truly higher risk or is simply due to chance.

We did not have data on childhood or adult socioeconomic status. However, we matched on psychological capacity, intelligence test scores and multiple health variables. Hereby, several factors usually contributing to socioeconomic differences for other outcomes were accounted for.[22]

Conclusions

Swedish military veterans did not differ in risk of being convicted of a violent crime after deployment to Afghanistan in comparison with non-deployed comparators matched for sex, conscription year, cognitive ability, psychological assessment, self-reported mental health problems, BMI, self-harm and one or more prescription fillings of antidepressants or anxiolytics.

Supplementary Data

Supplementary data are available at *IJE* online.

Funding

Author Contributions

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