

# Violent offending by UK military personnel deployed to Iraq and Afghanistan: a data linkage cohort study



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## Summary

**Background** Violent offending by veterans of the Iraq and Afghanistan conflicts is a cause for concern and there is much public debate about the proportion of ex-military personnel in the criminal justice system for violent offences. Although the psychological effects of conflict are well documented, the potential legacy of violent offending has yet to be ascertained. We describe our use of criminal records to investigate the effect of deployment, combat, and post-deployment mental health problems on violent offending among military personnel relative to pre-existing risk factors.

**Methods** In this cohort study, we linked data from 13 856 randomly selected, serving and ex-serving UK military personnel with national criminal records stored on the Ministry of Justice Police National Computer database. We describe offending during the lifetime of the participants and assess the risk factors for violent offending.

**Findings** 2139 (weighted 17·0%) of 12 359 male UK military personnel had a criminal record for any offence during their lifetime. Violent offenders (1369 [11·0%]) were the most prevalent offender types; prevalence was highest in men aged 30 years or younger (521 [20·6%] of 2728) and fell with age (164 [4·7%] of 3027 at age >45 years). Deployment was not independently associated with increased risk of violent offending, but serving in a combat role conferred an additional risk, even after adjustment for confounders (violent offending in 137 [6·3%] of 2178 men deployed in a combat role *vs* 140 (2·4%) of 5797 deployed in a non-combat role; adjusted hazard ratio 1·53, 95% CI 1·15–2·03;  $p=0\cdot003$ ). Increased exposure to traumatic events during deployment also increased risk of violent offending (violent offending in 104 [4·1%] of 2753 men with exposure to two to four traumatic events *vs* 56 [1·6%] of 2944 with zero to one traumatic event, 1·77, 1·21–2·58,  $p=0\cdot003$ ; and violent offending in 122 [5·1%] of 2582 men with exposure to five to 16 traumatic events, 1·65, 1·12–2·40,  $p=0\cdot01$ ; test for trend,  $p=0\cdot032$ ). Violent offending was strongly associated with post-deployment alcohol misuse (violent offending in 120 [9·0%] of 1363 men with alcohol misuse *vs* 155 [2·3%] of 6768 with no alcohol misuse; 2·16, 1·62–2·90;  $p<0\cdot0001$ ), post-traumatic stress disorder (violent offending in 25 [8·6%] of 344 men with post-traumatic stress disorder *vs* 221 [3·0%] of 7256 with no symptoms of post-traumatic stress disorder; 2·20, 1·36–3·55;  $p=0\cdot001$ ), and high levels of self-reported aggressive behaviour (violent offending in 56 [6·7%] of 856 men with an aggression score of six to 16 *vs* 22 [1·2%] of 1685 with an aggression score of zero; 2·47, 1·37–4·46;  $p=0\cdot003$ ). Of the post-traumatic stress disorder symptoms, the hyperarousal cluster was most strongly associated with violent offending (2·01, 1·50–2·70;  $p<0\cdot0001$ ).

**Interpretation** Alcohol misuse and aggressive behaviour might be appropriate targets for interventions, but any action must be evidence based. Post-traumatic stress disorder, though less prevalent, is also a risk factor for violence, especially hyperarousal symptoms, so if diagnosed it should be appropriately treated and associated risk monitored.

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## Introduction

Reporting of high profile cases of violence committed by veterans of the Iraq and Afghanistan conflicts within their home communities and families has intensified concerns about the consequences of deployment in this population of veterans and the wider society.<sup>1–3</sup> The US Institute of Medicine reported that criminal justice involvement is one of the most significant problems for veterans of the Iraq and Afghanistan conflicts.<sup>4</sup> There has been much public debate in both the USA and the UK about the proportion of prisoners in the criminal justice system, many with convictions for violent offending, who have served in the military, especially in operations in Iraq or Afghanistan.<sup>5–7</sup> Violent behaviour is often assumed to directly result from the deployment experiences of military personnel. However, robust research into the

pathways that might lead to military personnel committing violent offences and the effect of pre-military risk factors, deployment experiences, particularly combat exposure, and post-deployment mental health problems, are lacking.<sup>7</sup>

Substantial evidence over the past 10 years of the conflicts in Iraq and Afghanistan has suggested adverse effects of combat on the mental health of military personnel.<sup>8–10</sup> In addition to increased risks of post-traumatic stress disorder,<sup>8</sup> anxiety, depression,<sup>11</sup> and alcohol misuse,<sup>8</sup> there is evidence to suggest that some military personnel are at increased risk of engaging in risky and violent behaviour on return from deployment.<sup>12–15</sup> The results of some studies have also shown that the risk of violence might be partly related to pre-existing risk factors, including early antisocial behaviour and social

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adversity.<sup>16–18</sup> Mental health problems after deployment, such as post-traumatic stress disorder, alcohol misuse, and anger management problems are often cited as potential mediators of the link between combat and subsequent violence.<sup>19,20</sup> However, much of this research has been limited by self-report measures of violence and

cross-sectional study design. A recent attempt to investigate involvement of US veterans with the criminal justice system relied on self-report of arrests.<sup>18</sup>

In our study, we link data from an established cohort of UK military personnel with lifetime official criminal records to describe life-course offending in a sample of the UK Armed Forces; describe the sociodemographic and military factors associated with violent offending; assess the effect on violent offending of deployment, serving in a combat role, and exposure to traumatic events on deployment; and assess the role of mental health and behaviour problems and alcohol misuse in post-deployment violent offending.

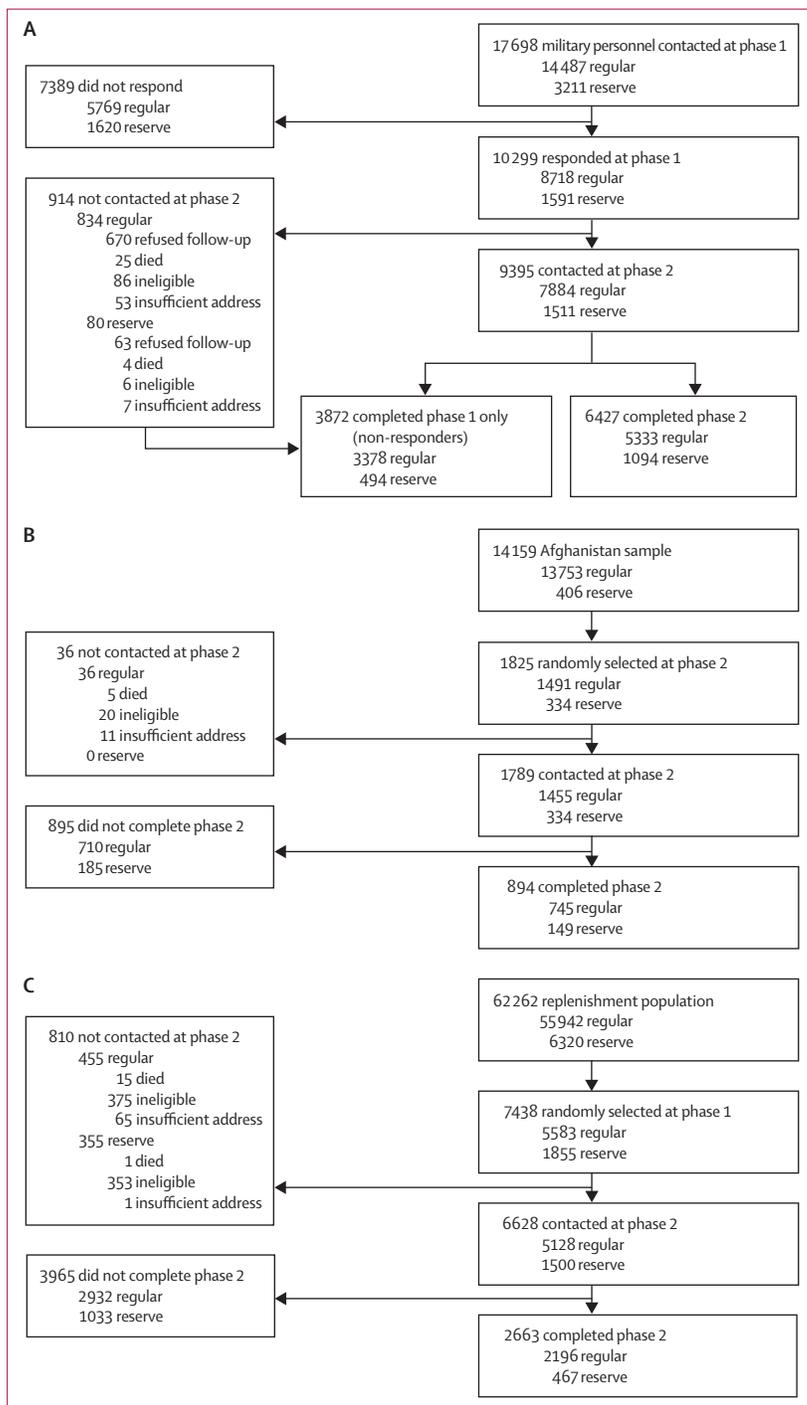
## Methods

### Study design and participants

In our data linkage cohort study, we used a randomly selected sample of 13 856 UK military personnel who were actively serving in the UK Armed Forces at the time of recruitment into the study. The Defence Analytical Services and Advice, UK Ministry of Defence, did the sampling. The sampling was done by assigning each individual to a stratum with a random number, sorting them into ascending order, and selecting the first X individuals (X was the sample size for the stratum). The stratification variables were service and enlistment type (regular or reserve). Recruitment and data gathering were undertaken in two phases (figure 1).<sup>8,9</sup> The randomly selected sample of 17 689 participants in phase 1 (June, 2004, to March, 2005) were personnel who had been deployed to Iraq between Jan 18, and June 28, 2003, and those who had been trained but had not yet been deployed.<sup>9</sup> In phase 2 (November, 2007, to September, 2009), an additional random sample of 6628 personnel, who were newly recruited to the military after the beginning of the study (the replenishment sample) and thus had a chance of being deployed, was added to the sample to ensure that the demographic characteristics of the current UK Armed Forces were represented in the study. A further random sample of 1789 personnel, who had been deployed to Afghanistan, was added in response to the UK commitment to the military operation in Afghanistan. Special Forces personnel were excluded. Full details of recruitment have been published previously.<sup>8,9</sup>

13 856 participants completed a questionnaire at phase 1, phase 2, or both phases: 3872 participants who responded at phase 1 (overall, 10 299 [58%] responded at phase 1) were not followed up at phase 2; 6427 (68%) of 9395 participants contacted at phase 2 completed a questionnaire at both phase 1 and phase 2; 2663 (40%) of 6628 respondents from the replenishment sample and 894 (50%) of 1789 respondents from the Afghanistan sample completed a questionnaire at phase 2 only.

Ethics approval was provided by the National Research Ethics Service, King's College Hospital Research Ethics Committee, UK Ministry of Justice, UK Ministry of Defence, and the UK Criminal Records Office.



**Figure 1: Flow chart of sampling and response of military personnel**  
 (A) Main follow-up sample. (B) Afghanistan sample. (C) Replenishment sample.

## Procedures

Information was gathered by use of a self-report questionnaire (appendix 1) about sociodemographics, experiences and behaviour before joining the military, experiences since joining the military (including deployments and combat exposure), and health and behaviour after deployment.<sup>8,9</sup> The list of publications with data from this questionnaire can be accessed at the King's Centre for Military Health Research. Personnel were classed as deployed if they reported having served in Iraq or Afghanistan since the beginning of the Iraq conflict in 2003. Deployment was defined as combat or non-combat (eg, explosive ordnance disposal, signals, medical, and logistics) based on the reported main role in deployment. Questions were asked about a range of traumatic events during deployment (including, seeing personnel wounded or killed, landmine attacks, and coming under mortar or artillery fire), adapted from the combat experience scale.<sup>21</sup>

Post-deployment mental health variables were defined as symptoms of common mental disorder in the past month with a cutoff score of four or above on the General Health Questionnaire-12 (GHQ-12);<sup>22</sup> cases of post-traumatic stress disorder in the last month using a cutoff score of 50 or greater on the 17-item National Centre for Posttraumatic Stress Disorder Checklist (PCL-C) and 30–49 for subthreshold post-traumatic stress disorder;<sup>23</sup> alcohol misuse in the past year with a score of 16 or greater on WHO's Alcohol Use Disorders Identification Test (AUDIT).<sup>24,25</sup> Additionally, the symptoms reported on the PCL-C<sup>23</sup> were used to ascertain if an individual met the criteria for the four post-traumatic stress disorder symptom clusters according to the operationalised criteria to be set out in the new Diagnostic and Statistical Manual, fifth edition (DSM-5):<sup>26</sup> re-experiencing symptom cluster (one of five potential re-experiencing phenomena [B1–5 in DSM-IV]); avoidance symptom cluster (one of two potential active avoidance symptoms [C1–2 in DSM-IV]); emotional numbing cluster (two of five potential symptoms of emotional numbing [C3–7 in DSM-IV]); and hyperarousal symptom cluster (two of five potential hyperarousal symptoms [D1–5 in DSM-IV]).<sup>27</sup>

At phase 2, a validated measure of aggressive behaviour<sup>28</sup> was used to score frequency of reported verbal, property, or physical aggression or number of threats of violence in the past month (never, once, two to four, five or more) based on the stem "In the past month, how often did you": get angry at someone and yell or shout at them; get angry with someone and kick or smash something, slam the door, or punch the wall; get into a fight with someone and hit the person; and threaten someone with physical violence. The total of these scores for the responses was the aggression score for the past month.<sup>28</sup>

The cohort data were linked to the Ministry of Justice Police National Computer (PNC) database, which is the UK national criminal offence database for recording the

standard offences. Offences that are dealt with by military police are recorded in military criminal records and should be transferred to the PNC database if they are recordable offences—ie, any offence punishable by imprisonment and some non-imprisonable offences.<sup>29</sup>

We linked the cohort database with the PNC database by using a matching process based on surnames, forenames, initials, sex, and date of birth. Only automatic matches were accepted. Linkage provided the date of charge for the offence, type of offence, and the outcome of the offence for each individual with a criminal record. Convictions, cautions, reprimands, and warnings were all deemed offences. The offences were classified according to their legal descriptions: interpersonal violence (further categorised into non-physical interpersonal violence such as threats, verbal abuse, and harassment; less serious physical interpersonal violence including common assault, battery, and affray; more serious physical interpersonal violence including actual bodily harm, grievous bodily harm, and homicide); other aggressive behaviours (including dangerous driving, criminal damage); sexual offences (violent, non-violent); drug-related and alcohol-related offences; and other offences (not included in other aggressive behaviours—eg, motoring offences). Sentencing was classified as custodial or non-custodial.

## Statistical analyses

Participants' offences are described from birth until the end of the follow-up (July 31, 2011). The observation period for the analyses began at the start of the study (Jan 23, 2003) or date of entry into the military if later and continued until the participant committed a violent offence, died, or follow-up ended (right censored). Variation in time at risk was accounted for with Cox regression modelling.<sup>30</sup> Nelson Aalen plots were used to confirm that the data conformed to the assumption of proportional hazards. A number of potential confounding factors, such as sociodemographic and military characteristics and pre-military violent offending, were identified a priori. Factors independently associated with both exposure and outcome (at the 5% level) were included in the adjusted multivariable Cox regression models.

Because of the low numbers of women (n=1497) and the military policy that women should be deployed in non-combat roles mostly, they were included only in the initial descriptive analyses and analyses of the sociodemographic factors associated with violence but not subsequent analyses of the association between deployment, combat and combat-related trauma, and violent offending. The effect of deployment (as a time-varying exposure variable) on violent offending was analysed with multivariable Cox regression models to adjust for confounders simultaneously. Deployed participants were then followed up from completion of the study questionnaire until first subsequent violent offence, death by any cause, or end of follow-up. The effects of combat role, exposure to

See Online for appendix 1

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	Full sample	Any offence (2139 [17.0%])	Violent offence (1369 [11.0%])
Age (years)			
<30	2728	769 (29.8%)	521 (20.6%)
30–34	2376	506 (22.3%)	336 (15.0%)
35–39	2072	345 (17.1%)	212 (10.6%)
40–45	2156	256 (11.7%)	136 (6.4%)
>45	3027	263 (7.4%)	164 (4.7%)

Data are number or number (%). Numbers are unweighted counts and percentages are weighted to account for sample and response weights.

**Table 1: Proportion of the male sample (n=12 359) with a lifetime record of any offence and a lifetime record of a violent offence by age group at the time of data linkage**

traumatic events on deployment and post-deployment mental health, and behaviour problems on the risk of violent offending were analysed. Potential confounders were included simultaneously in adjusted multivariable Cox regression models. The mediating role of each of the post-deployment mental health problems in the association between combat role and violent offending and traumatic experiences and violent offending was estimated by adding these variables to the unadjusted and adjusted Cox regression models.

Hazard ratios (HRs), 95% CIs, and two-sided p values are presented (significance defined as  $p < 0.05$ ). Weights were created to account for sampling fractions and response rates. All analyses were done in STATA MP (version 10.0) with survey commands.

### Role of funding source

The UK Medical Research Council funded this project. The UK Ministry of Defence funded the data gathering. The authors' work was independent of the UK Ministry of Defence, which had no role in the analysis, interpretation, or decision to submit this report. We disclosed the contents of the report to the Ministry of Defence at the point we submitted it for publication.

### Results

The sample population consisted of 13 856 participants of predominantly regular (full-time military personnel) status (11 652 [weighted 92.7%] of 13 856), with a median age of 37 years (IQR 30.6–44.5) by the end of the follow-up. The sample was representative (ascertained by comparison with data from the UK Defence Statistics<sup>31</sup>) of the deployable UK Armed Forces at the time of selection: predominantly men (12 359 [89.7%]), serving in the army (9049 [63.5%]) as opposed to the Royal Air Force (2644 [20.1%]) or the Royal Naval Service (including Royal Navy and Royal Marines, 2163 [16.5%]), and of non-officer rank (11 086 [80.3%]). 5980 (46.0%) participants had achieved an education level of up to high school equivalent. Median age of enlistment was 19.7 years (17.6–23.7) and median time spent in service

was 12.2 years (7.5–21.3). 8443 (59.0%) participants were still in service by the end of the follow-up.

2197 (weighted 15.7%) of 13 856 participants—2139 (17.0%) of 12 359 men and 58 (3.9%) of 1497 women—committed one or more offences during their lifetime. 8753 (98.5%) of 8887 offences were committed by men. 1875 (85.3%) offences resulted in a conviction and 322 (14.6%) a caution, reprimand, or warning. Violent offenders (n=1398) were the most common type of offenders—64% of 2197 offenders in the sample and 10.1% (1369 [11.0%] men and 29 [1.9%] women) of the entire sample. 423 (29.9%) of 1398 violent offenders had committed an offence of more serious interpersonal violence—ie, of a severity of at least actual bodily harm. When the prevalence of men who had committed any offence in their lifetime and the prevalence of men who had committed a violent offence in their lifetime was measured in the sample by age group (table 1), the prevalences of all offender types and violent offenders (29.8% and 20.6%, respectively) were much higher in men younger than 30 years than in the older age groups and fell with increasing age. 891 (6.4%) of the total study sample had committed an alcohol-related or drug-related offence and 834 (6.0%) had committed an offence classed as other. There were 72 (0.5%) sex offenders in the total sample. The peak (modal) age for first offence was 19 years (median 21 years, IQR 18–26). 214 (1.7%) of 13 856 participants and 139 (1.6%) of 9017 individuals deployed to Iraq or Afghanistan had a recorded custodial sentence at some point in their lifetime.

Table 2 shows the sociodemographic and military factors associated with violent offending. Following adjustment, the strongest predictors of violent offending, after sex and age, were rank and pre-service violent offending (table 2). By phase 2 of data gathering, 9095 participants (weighted 53.0%) had been deployed to Iraq or Afghanistan. More participants offended per 1000 person years at risk in the post-deployment period than in the pre-military and in-service pre-deployment periods for all types of offending (figure 2). The number of participants who committed a violent or drug-related or alcohol-related offence per 1000 person years at risk increased from the pre-service to in-service periods and then increased further in the post-deployment period. By contrast, the number of participants who had committed other types of offences (eg, fraud and theft) per 1000 person years at risk decreased from the pre-service period to the in-service period and then increased after deployment (figure 2).

Deployment of men to Iraq or Afghanistan was associated with an increase in subsequent violent offending compared with men who had not been deployed (553 [weighted 7.0%] of 8280 vs 220 [5.4%] of 4080); HR 1.21, 95% CI 1.03–1.42;  $p = 0.018$ ), but this association did not remain after adjustment for age, educational level, pre-service violent offending, rank, service, engagement status, and serving status

(1.01, 0.85–1.20;  $p=0.893$ ). However, for men who had been deployed in a combat role the risk of violent offending was significantly greater than the risk for those deployed in a non-combat role (violent offending in 137 [6.3%] of 2178 men deployed in a combat role vs 140 [2.4%] of 5797 deployed in a non-combat role; figure 3; table 3). Pre-military violent offending was associated with being deployed in a combat role (160 [46.6%] of 373 men who had a history of pre-military violent offending were deployed in a combat role vs 2018 [27.5%] of 7602 men who did not have a history of pre-military violence; odds ratio 2.31, 95% CI 1.81–2.93,  $p<0.0001$ ; adjusted odds ratio 1.79, 1.34–2.39,  $p<0.0001$ ) and accounted for some of the association between combat role and violent offending. With adjustment for this and the other confounders in

the multivariable analyses, a reduced but significant association between combat role and subsequent violent offending remained (adjusted HR 1.53, 95% CI 1.15–2.03;  $p=0.003$ ; table 3). In the deployed group, exposure to two or more traumatic events was associated with a significantly increased risk of violent offending after adjustment for confounders (violent offending in 104 [4.1%] of 2753 men with exposure to two to four traumatic events vs 56 [1.6%] of 2944 with none to one traumatic event, 1.77, 1.21–2.58,  $p=0.003$ ; and violent offending in 122 [5.1%] of 2582 men with exposure to five to 16 traumatic events, 1.65, 1.12–2.40,  $p=0.01$ ; table 3) and the risk increased with increasing number of traumatic events (test for trend,  $p=0.032$ ).

In the analysis of the post-deployment mental health and behaviour problems, alcohol misuse, post-

	No violent offending	Violent offending	Hazard ratio (95% CI)	p value	Adjusted hazard ratio* (95% CI)	p value
Full sample	13 065 (94.2%)	791 (5.8%)	..	..	..	..
Age at end of follow-up (years)						
<30	2731 (18.4%)	384 (46.4%)	1.00	..	1.00	..
30–34	2568 (18.9%)	221 (29.1%)	0.59 (0.49–0.71)	<0.0001	0.75 (0.62–0.91)	0.032
35–39	2249 (17.6%)	90 (12.3%)	0.28 (0.21–0.36)	<0.0001	0.36 (0.27–0.47)	<0.0001
40–44	2328 (19.1%)	46 (6.1%)	0.13 (0.09–0.18)	<0.0001	0.16 (0.11–0.23)	<0.0001
>45	3188 (26.0%)	50 (6.0%)	0.09 (0.07–0.13)	<0.0001	0.18 (0.12–0.26)	<0.0001
Sex						
Female	1478 (10.8%)	18 (2.2%)	0.19 (0.11–0.33)	<0.0001	0.17 (0.09–0.32)	<0.0001
Male	11587 (89.2%)	773 (97.8%)	1.00	..	1.00	..
Education level						
Low (achieved GCSE or O-level equivalent or less)	5467 (44.6%)	513 (69.2%)	2.70 (2.27–3.22)	<0.0001	1.32 (1.09–1.58)	0.043
High (achieved A-level equivalent or higher)	6982 (55.4%)	234 (30.8%)	1.00	..	1.00	..
Pre-service violent offending						
Yes	389 (2.8%)	149 (18.8%)	7.07 (5.77–8.67)	<0.0001	3.85 (3.07–4.82)	<0.0001
No	12 676 (97.2%)	642 (81.2%)	1.00	..	1.00	..
Service						
Royal Navy and Royal Marines	2058 (16.7%)	105 (12.7%)	0.90 (0.47–0.75)	<0.0001	0.84 (0.67–1.07)	0.161
Army	8410 (62.4%)	639 (81.2%)	1.00	..	1.00	..
Royal Air Force	2597 (20.9%)	47 (6.1%)	0.23 (0.17–0.32)	<0.0001	0.39 (0.28–0.55)	<0.0001
Rank						
Officer	2645 (20.8%)	13 (1.7%)	0.07 (0.04–0.13)	<0.0001	0.20 (0.11–0.37)	<0.0001
Non-commissioned officer or other ranks	10 328 (79.2%)	758 (98.3%)	1.00	..	1.00	..
Engagement type						
Reservist	2136 (7.6%)	68 (3.8%)	0.50 (0.32–0.66)	<0.0001	0.98 (0.72–1.33)	0.899
Regular	10 929 (92.4%)	723 (96.2%)	1.00	..	1.00	..
Serving status						
Still serving	8026 (49.9%)	417 (40.1%)	1.00	..	1.00	..
Ex-serving	7463 (50.1%)	522 (59.1%)	1.30 (1.06–1.59)	0.013	1.49 (1.19–1.87)	<0.0001

Data are number (%), unless otherwise indicated. Numbers are unweighted counts and percentages and hazard ratios are adjusted to take account of sample and response weights. Sum of cells might differ from the total because of missing data. GCSE=General Certificate of Secondary Education. O=Ordinary. A=Advanced. \*Adjusted for age, education level, pre-service violent offending, rank, service, engagement status, and serving status.

**Table 2: Sociodemographic and military factors associated with violent offending since the beginning of the study in 13 856 military personnel**

traumatic stress disorder, and high levels of self-reported aggressive behaviour were all strong predictors of subsequent violent offending among those who had been deployed (violent offending in 120 [weighted 9.0%] of 1363 men with alcohol misuse vs 155 [2.3%] of 6768 men with no alcohol misuse, adjusted HR 2.16,

1.62–2.90,  $p < 0.0001$ ; violent offending in 25 [8.6%] of 344 men with clinical post-traumatic stress disorder vs 221 (3.0%) of 7256 with no symptoms of post-traumatic stress disorder, 2.20, 1.36–3.55,  $p = 0.001$ ; violent offending in 56 [6.7%] of 856 men with an aggression score of six to 16 vs 22 [1.2%] of 1685 with an aggression score of zero, 2.47, 1.37–4.46,  $p = 0.003$ ; table 4). Symptoms of post-traumatic stress disorder showed a dose–response relation with risk for violent offending; the risk increased with increased burden of symptoms of post-traumatic stress disorder (table 4). We undertook further similar multivariable Cox regression analyses to assess each of the four post-traumatic stress disorder symptom clusters for prediction of violent offending after return from deployment and noted that the association with violent offending was stronger for the hyperarousal symptom cluster (96 [6.9%] of 1554 men with hyperarousal symptoms were convicted of a violent offence vs 177 [2.7%] of 6619 without hyperarousal symptoms; adjusted HR 2.01, 95% CI 1.50–2.70;  $p < 0.0001$ ) than symptoms of avoidance (65 [6.3%] of 1069 men with avoidance symptoms were convicted of a violent offence vs 209 [3.1%] of 7108 without avoidance symptoms; 1.49, 1.07–2.07;  $p = 0.018$ ), symptoms of emotional numbing (57 [5.7%] of 1046 men with symptoms of emotional numbing were convicted of a violent offence vs 217 [3.2%] of men without symptoms of emotional numbing; 1.50, 1.06–2.13;  $p = 0.023$ ), or re-experiencing symptoms (75 [5.6%] of 1450 men with re-experiencing symptoms were convicted of a violent offence vs 199 [3.0%] of 6727 without re-experiencing symptoms; 1.34, 0.98–1.83;  $p = 0.065$ ).

Each post-deployment mental health problem was added to the regression models for risk of violent offending associated with serving in a combat role and exposure to traumatic events to assess its role as a mediator (appendix 2). Addition of alcohol misuse to the unadjusted model slightly reduced the strength of the association between serving in a combat role and violent offending from an HR of 2.86 (95% CI 2.19–3.73;

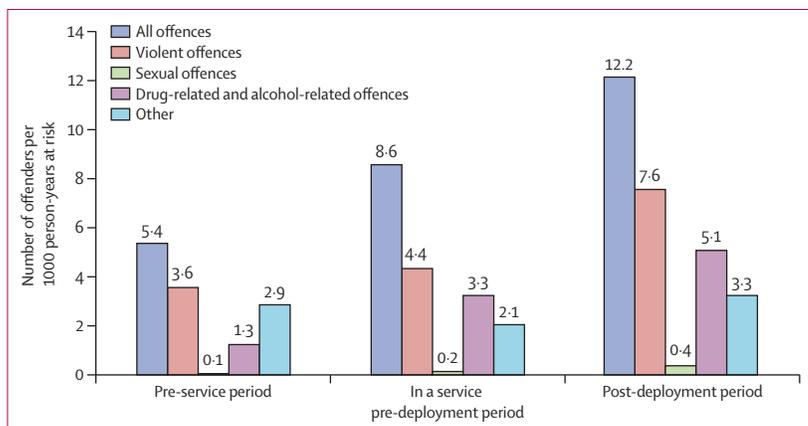


Figure 2: Offending by deployed participants during the pre-military, in-service pre-deployment, and post-deployment periods

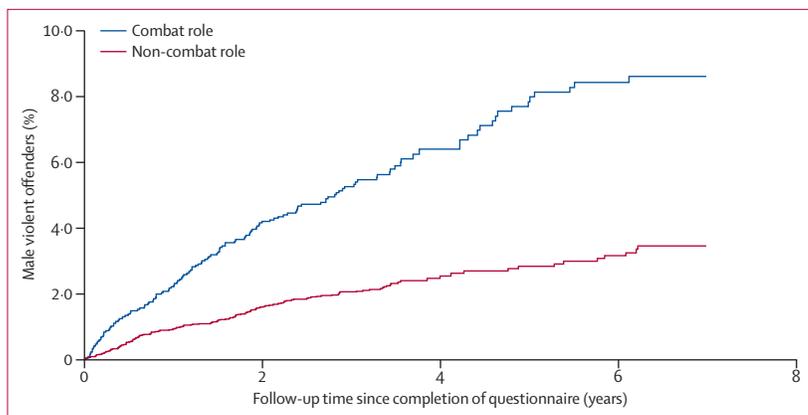


Figure 3: Cumulative proportion of male violent offenders after deployment in combat and non-combat roles

See Online for appendix 2

	No violent offending	Violent offending	Hazard ratio (95% CI)	p value	Adjusted hazard ratio* (95% CI)	p value
Full sample	7998 (96.5%)	282 (3.5%)	..	..	..	..
Deployment role						
Non-combat	5657 (72.5%)	140 (46.5%)	1.00	..	1.00	..
Combat	2041 (27.5%)	137 (53.6%)	2.86 (2.19–3.73)	<0.0001	1.53 (1.15–2.03)	0.003
Number of traumatic events						
0–1	2888 (36.1%)	56 (16.3%)	1.00	..	1.00	..
2–4	2649 (32.8%)	104 (38.3%)	2.61 (1.81–3.77)	<0.0001	1.77 (1.21–2.58)	0.003
5–16	2460 (31.1%)	122 (45.4%)	3.34 (2.33–4.77)	<0.0001	1.65 (1.12–2.40)	0.01

Data are number or number (%), unless otherwise indicated. Numbers are unweighted counts and percentages and hazard ratios are adjusted to take account of the sample and response weights. Sum of cells might differ from the total because of missing data. \*Adjusted for age, educational level, pre-service violent offending, rank, service, engagement status, and serving status.

**Table 3: Effect of combat role and traumatic experiences during deployment on risk of violent offending in 8280 male military personnel on return from deployment**

	No violent offending	Violent offending	Hazard ratio (95% CI)	p value	Adjusted hazard ratio* (95% CI)	p value
Full sample	7998 (96.5%)	282 (3.5%)	..	..	..	..
Alcohol misuse						
No	6613 (83.8%)	155 (55.6%)	1.00	..	1.00	..
Yes	1243 (16.2%)	120 (44.4%)	3.86 (2.94–5.07)	<0.0001	2.16 (1.62–2.90)	<0.0001
Symptoms of post-traumatic stress disorder						
None (0–39)	7256 (92.1%)	221 (79.6%)	1.0	..	1.0	..
Subclinical (40–49)	326 (4.1%)	27 (10.5%)	2.74 (1.73–4.32)	<0.0001	1.64 (1.02–2.54)	0.042
Clinical (>49)	319 (3.8%)	25 (11.0%)	2.95 (1.83–4.76)	<0.0001	2.20 (1.36–3.55)	0.001
Common mental disorder						
Non-GHQ-12 case	6411 (81.8%)	198 (71.5%)	1.0	..	1.0	..
GHQ-12 case	1451 (18.2%)	76 (28.5%)	1.78 (1.31–2.41)	<0.0001	1.39 (1.00–1.94)	0.022
Reduced sample	6622 (97.9%)	141 (2.2%)	..	..	..	..
Aggression score						
0	1663 (28.1%)	22 (14.2%)	1.00	..	1.00	..
1–2	1890 (31.8%)	30 (23.8%)	1.49 (0.82–2.71)	0.191	1.25 (0.69–2.27)	0.466
3–5	1550 (26.2%)	32 (21.0%)	1.59 (0.82–2.71)	0.119	1.11 (0.62–2.02)	0.720
6–16	800 (13.8%)	56 (41.0%)	6.26 (3.66–10.71)	<0.0001	2.47 (1.37–4.46)	0.003

Data are number (%), unless otherwise indicated. Numbers are unweighted counts and percentages and hazard ratios are adjusted to take account of sample and response weights. Sum of cells might not equal the total because of missing data. GHQ-12=General Health Questionnaire-12. \*Adjusted for age, education level, pre-service violent offending, rank, service, engagement status, serving status, and deployment role.

**Table 4: Post-deployment mental health and behaviour problems and violent offending**

$p < 0.0001$ ) to 2.52 (1.92–3.29;  $p < 0.0001$ ). Adjustment for post-traumatic stress disorder alone had less effect, reducing the unadjusted HR to 2.74 (2.09–3.61;  $p < 0.0001$ ); adjustment for symptoms of common mental disorder had a minimal effect (2.84, 2.16–3.72;  $p < 0.0001$ ). Adjustment for all three problems in the Cox regression model and all the confounding variables reduced the adjusted risk slightly from an HR of 1.53 (1.15–2.03,  $p = 0.003$ ; adjusted for confounders only) to 1.43 (1.07–1.91,  $p = 0.017$ ; adjusted for confounders and all three mental health problems). Post-deployment mental health problems seemed to have a greater mediating role in the association between exposure to traumatic events and violent offending. Addition of alcohol misuse to the unadjusted model reduced the HR for the risk associated with exposure to six or more traumatic events from 3.34 (2.33–4.77;  $p < 0.0001$ ) to 2.83 (CI 1.93–4.13;  $p < 0.0001$ ). Addition of post-traumatic stress disorder in the unadjusted model reduced the HR to 2.98 (2.05–4.43;  $p = 0.001$ ), and symptoms of common mental disorder again had less effect, reducing the HR to 3.26 (2.33–4.77;  $p < 0.0001$ ). When the model was adjusted for all three mental health problems and the other confounders, the association was reduced from 1.65 (1.12–2.40,  $p < 0.0001$ ; adjusted for confounders only) to 1.48 (0.99–2.22,  $p = 0.057$ ; adjusted for confounders and all three mental health problems).

## Discussion

The results of our analyses show that violent offenders were the most common types of offenders and the rate of offending in the post-deployment period was greater than

in the in-service pre-deployment and pre-military periods for all types of offending including violent offending. Pre-military violent offending and lower military rank were some of the strongest predictors of violence (table 2). Deployment was not independently associated with increased risk of violent offending, but, among deployed personnel, serving in a combat role conferred an additional risk of violent offending after adjustment for pre-military violent offending and sociodemographic and military factors for violence (rank, service, engagement status, and serving status). More frequent exposure to traumatic events during deployment also increased the risk of violent offending (table 3). Post-deployment mental health problems and high levels of self-reported aggressive behaviours were important risk factors (panel).

17.0% of male military personnel had a criminal record. According to the Ministry of Justice data, an estimated 28.3% of men in England and Wales aged between 18 years and 52 years in 2006 had a criminal conviction.<sup>33</sup> The lower prevalence of lifetime criminal records in the military population might be partly attributed to the time spent in military service (median 12.2 years). The peak age of both offending by men in the general population<sup>34</sup> and enlistment in the military is 19 years. So the men are enlisting at an age when they are at highest risk of offending. Indeed in men aged 40–45 years in this sample who were still serving at the time of recruitment into the study, the prevalence of lifetime offending had fallen to 11.7% compared with 29.8% for those younger than 30 years (table 1). The prevalence of lifetime offending should by definition rise with increasing age (although more slowly in the older age groups); therefore, the data

**Panel: Research in context****Systematic review**

We searched PsycINFO, PubMed, and Google Scholar for published articles using a combination of terms: "combat", "deployment", "Iraq", "Afghanistan", "military", "aggression", "violence", "criminal", "offending", "posttraumatic stress disorder", "alcohol misuse", "anger", and "aggression". No date or language restrictions were applied. One author (DM) downloaded and read abstracts and identified the 40 most relevant studies. Additionally, we searched Google and Google Scholar and the UK Ministry of Justice website for reports and data about offending, incarceration, and criminal justice involvement in the military and general population. Much of the research literature is based on US military samples. Evidence suggests that some military personnel are at increased risk of engaging in risky and violent behaviour on return from deployment.<sup>12-14</sup> Results of some studies have shown that the risk of offending in military populations is related more to pre-existing risk factors, including previous offending, than to combat exposure.<sup>18,32</sup> Mental health problems, such as post-traumatic stress disorder, alcohol misuse, and anger have been shown to be associated with post-deployment violence.<sup>19,20,22</sup> Only one UK study has been published in which the results suggested that serving in a combat role, deployment-related traumatic experiences, and post-deployment post-traumatic stress disorder, and alcohol misuse were associated with interpersonal violence on return home.<sup>15</sup> Research so far has been restricted by cross-sectional data and the lack of an objective outcome measure of violence.

**Interpretation**

In this study, our analyses of objective data confirm findings based on self-reported data for violence by the UK military.<sup>15</sup> Through the use of an objective measure of pre-military and post-deployment violent offending and longitudinal data, this study improves on the methods previously used to investigate pathways to violent behaviour in a military population. The findings provide information that can enable better violence risk assessment in serving and ex-serving military personnel. They draw attention to the role of mental health problems and the potential effect that appropriate management of alcohol misuse, post-traumatic stress disorder, especially hyperarousal symptoms, and aggressive behaviour could have in reducing the risk of violence.

suggests that many of the offenders in the younger age group leave the military earlier than do those in the older age groups, who have served longer in the military and offend less than do the younger groups. We also know that offending in service is recorded on a military police database and, until recent years, offences were less likely to be transferred to the national PNC database unless they were greater than a certain threshold of severity (eg, violent offences). This recording might explain the drop in the number of non-violent offences during the in-service period. Other interpretations could be that the military instils more ordered behaviour or is more tolerant of low-grade crime. The proportion of this sample (median age 37 years) who had served a custodial sentence (1.7%) was also less than in a similarly aged general population birth cohort (7.0%).<sup>34</sup> However, the period of greatest risk of incarceration is after military service and in this study we only followed up ex-serving personnel for a restricted period. Further follow-up is necessary to investigate the issue of custodial sentences in ex-serving personnel.

Unlike the general population, which has a lower prevalence of male violent offenders than other types of

offenders such as acquisitive-type offenders (ie, those with a record of offences such as theft),<sup>34</sup> lifetime male violent offenders were the most common type of offenders in this sample of military personnel.<sup>34</sup> Overall, 11.0% of men in the military sample had committed a violent offence in their lifetime (table 1) compared with 8.7% of the general male population in England and Wales aged 46 years in 2001.<sup>34</sup> The difference in the prevalence of lifetime violent offenders in the military compared with the general population is more striking in men younger than 30 years (20.6% in the military sample vs 6.7% of those aged up to 30 years in England and Wales in 2001).<sup>34</sup> Similar to the pattern of change in prevalence of overall lifetime offenders in the military sample, the prevalence of lifetime violent offenders is lower in the older age groups—ie, those who have served longer in the military (6.4% in men aged 40–45 years). This pattern contrasts with that of the prevalence of lifetime violent offenders in the general population, rising with age (from 6.7% in men up to age 30 years to 8.7% in those up to age 46 years in England and Wales in 2001<sup>34</sup>), suggesting that many of the violent offenders in the younger age group leave the military earlier, thus leaving a lower prevalence of lifetime violent offenders in the older age groups. So, by contrast with the apparent lower prevalence of all offenders in this military population, male violent offenders were more prevalent overall than in the general male population, but particularly so in the younger age groups.

That a greater proportion of the deployed military sample offended in the post-deployment period than in the rest of their in-service or pre-military periods for all types of offending, including violent offending, suggests that deployment or aspects of deployment act to increase offending and violent offending in the military. However, deployment to Iraq or Afghanistan in itself was not noted to be a significant risk factor for subsequent violent offending. This finding is not surprising because deployment to a conflict zone provides different experiences depending on an individual's role while there. Indeed, deployed personnel in combat roles were at increased risk of subsequent violent offending. Much of this risk is attributable to pre-existing risk factors such as pre-military violent offending, lower rank, and younger age, reinforcing the common perception that many of the individuals entering the military already have an excess of risk factors for violence. However, besides these risk factors, serving in a combat role and exposure to an increased number of traumatic events on deployment conferred an additional risk of subsequent violent offending.

Numerous studies have found associations between combat exposure and violence, offending and incarceration in military personnel.<sup>12,15,35-37</sup> Many studies so far have been hindered by the use of self-report measures of post-deployment behaviours, retrospective or cross-sectional study design, or the confounding effect of previous antisocial and violent behaviour has not been accounted for. The results from our study reinforce our previous

finding of an association between combat and self-reported violence,<sup>15</sup> provide the temporal link between the exposure events and subsequent violence, and eliminate the potential for recall bias to affect the outcome measure of violence. Combat experiences might affect an individual's propensity to violent behaviour through various mechanisms including preparatory pre-deployment training to instil attitudes that enhance survival and ensure troops are able to commit targeted aggressive acts.<sup>38</sup> However, deployment in a combat role is not a random process. Indeed, individuals who volunteer or are selected for a combat role are likely to have a propensity for risk taking and aggressive behaviour.<sup>17</sup> In the UK, infantry units have traditionally promoted aggression as a desirable trait and such units frequently recruit individuals who are socially disadvantaged and are likely to have low educational attainment.<sup>39</sup> Although in this study we accounted statistically for sociodemographic and military confounders and a previous tendency to violent offending, a residual confounding effect cannot be ruled out.

Most of the individuals who deploy readjust to life successfully after returning home.<sup>40</sup> For individuals who do not, a better understanding is needed of the pathways to violent offending. The results of a longitudinal study of US Marines showed that a post-combat psychiatric diagnosis was one of the strongest predictors of antisocial behaviour by military personnel.<sup>13</sup> We also noted a strong association between post-deployment mental health problems and subsequent violent offending, particularly alcohol misuse and post-traumatic stress disorder. Deployment has been shown to be associated with increased alcohol use.<sup>12,25</sup> Alcohol misuse is a well known risk factor for violence in non-military populations.<sup>41</sup> We noted that alcohol misuse was strongly associated with violent offending in our sample and that it was a mediator of the link between both serving in a combat role and exposure to traumatic events and violent offending.

The findings of several studies have suggested that combat exposure is associated with aggression primarily through its relation with post-traumatic stress disorder symptoms.<sup>19,42</sup> We noted a strong link between post-traumatic stress disorder and violent offending in the deployed group. Post-traumatic stress disorder was shown to be a mediator of the link between traumatic events and violent offending. Individual presentations of post-traumatic stress disorder can vary according to the extent to which an individual presents with symptoms from each of the four clusters (as proposed in the new DSM-5<sup>26</sup>): re-experiencing symptoms such as nightmares and flashbacks; hyperarousal symptoms such as irritability or outbursts of anger and alertness to threat; active avoidance symptoms (ie, avoidance of reminders of the trauma); and passive avoidance or emotional numbing such as diminished interest, restricted affect, and feelings of detachment. The results of recent research have suggested that the hyperarousal symptom cluster is most strongly associated with violent behaviour.<sup>43,44</sup> Our results

add further support to this finding. Combat veterans with post-traumatic stress disorder and other mental health concerns frequently present with comorbid problems of anger and aggression.<sup>18,35</sup> Our results show that high levels of self-reported aggressive behaviour were also predictive of post-deployment violent offending.

To the best of our knowledge, this study is the first large scale epidemiological study in which criminal records were used to investigate offending behaviour in a national cohort of Armed Forces personnel. The use of criminal records eliminates the problem of recall bias associated with self-reported measures. Prospective follow-up allows better investigation of the pathway to post-deployment violence. The limitations inherent in the process of data linkage with official records must, however, be acknowledged. The matching process used only automatic matches to reduce the potential for false positives. This process is likely to have produced a higher rate of false negatives and hence underestimation of offending. The PNC database also underestimates the rate of known offending because it only records offences that come to the attention of the police.<sup>29</sup>

Our results emphasise the importance of pre-existing risk factors for violence in military personnel. A simplistic response would be to suggest that the military cease to recruit young men with low levels of educational attainment or a previous criminal record. However, this suggestion is no more logical than saying that they should only recruit officers in the future. The military is composed of a range of individuals, some of whom have aggressive traits and who are trained to engage in targeted aggression. Screening for violence risk in a population in which the outcome is already prevalent is difficult.<sup>45</sup> More research into the potential value of violence reduction interventions in individuals returning from combat to their home communities is needed because any inputs must be evidence based. Alcohol misuse treatment and interventions to reduce anger and aggressive behaviour might help to reduce violence risk. Although post-traumatic stress disorder is less prevalent than alcohol misuse, importantly, it should be appropriately treated when diagnosed and the risk to the individuals and others should be monitored. These results reinforce the potential benefit of targeting post-traumatic stress disorder hyperarousal symptoms for risk reduction of violent offending.

#### Contributors

DM secured funding for her role in this project; developed the analytical strategy; undertook the data analyses and interpretation; and wrote the report. KD was involved in the development of the analytical strategy, contributed to the interpretation of the results, provided advice about the forensic aspects, and commented on the report at several stages in its preparation. MJ was involved in the design of the study, participated in data gathering and some analyses, and commented on the report. LH was involved in the design and planning of the study, coordinated the project, and commented on the report. NG provided military assistance and advice about the design and undertaking of the study, and commented on the report. RJR is one of the principal investigators for this study; he was involved in the design and planning of the study, developing the analytical

strategy for the report, and the interpretation of the results; and has commented on the report. TF was involved in the development of the analytical strategy for this report, provided advice about the forensic aspects, and commented on the report at several stages in its preparation. SW was the chief investigator for this study; he was responsible for securing funding for this study, led the design and planning of the study, was involved in developing the analytical strategy for the report, and has commented on the report. NTF was one of the principal investigators for this study; she was involved in the design of the study, was the principal adviser about the analytical strategy for the report, and has commented on the report extensively throughout its preparation. All authors have seen and approved the final version of the report.

#### Conflicts of interest

NG is a full-time member of the UK Armed Forces, and is currently seconded to King's College London. NTF and SW are employed by the Academic Centre for Defence Mental Health, based at King's College London, which receives funding from the UK Ministry of Defence. SW is also an honorary civilian consultant adviser in psychiatry to the British Army and a trustee of Combat Stress, a UK charity that provides service and support for veterans with mental health problems. The authors acknowledge financial support from the Department of Health through the National Institute for Health Research Comprehensive Biomedical Research Centre award to Guy's and St Thomas' NHS Foundation Trust in partnership with King's College London and King's College Hospital NHS Foundation Trust. DM is funded by a Medical Research Council Clinical Research Training Fellowship and undertook this project as part of her PhD studies with the King's Centre for Military Health Research. KD and TF are employed by the Institute of Psychiatry and are forensic psychiatrists who provide supervision and advice about the project; they declare that they have no conflicts of interest.

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