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Age at entry to UK military service and long-term mental health

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ABSTRACT

Introduction It has been suggested that 'junior entry' to the UK Armed Forces (prior to age 17.5 years) increases the risk of adverse mental health outcomes. We used data from a large cohort of veterans to examine long-term mental health outcomes in veterans by age at entry to the UK Armed Forces, compared with non-veterans.

Methods Retrospective cohort study of 78 157 veterans in Scotland, born between 1945 and 1995 and 252 637 matched non-veterans, with up to 37 years follow-up, using Cox proportional hazard models to examine the association between veteran status and cumulative risk of major mental health disorder, stratified by birth cohort, and age at recruitment for the veterans.

Results The risk of mental health disorder in the veterans increased with age at entry, ranging from HR 1.12, 95% CI 1.06 to 1.18, $p < 0.001$ for junior entrants to HR 1.37, 95% CI 1.27 to 1.80, $p < 0.001$ for those aged 20–25 years at entry. The pattern was most marked for veterans born before 1960, and age at recruitment had little impact in recent birth cohorts. Post-traumatic stress disorder accounted for most of the observed differences. Younger age at recruitment was associated with longer service, median 7.4 years (IQR 3.0–14.7) compared with 5.6 years (IQR 2.1–11.7) for entrants aged 20–25 years.

Conclusion We found no evidence that early recruitment is associated with adverse impact on long-term mental health. Paradoxically, it was veterans who entered service at age 20–25 years who demonstrated increased risk, although this attenuated in more recent birth cohorts.

INTRODUCTION

It has been suggested that entry to the armed forces at an early age is disproportionately associated with poor mental health outcomes.^{1–5} This appears to be predominantly based on an extrapolation of studies on former child soldiers,^{6,7} and there is a paucity of research on UK personnel, where stringent legal controls restrict the age at which active military service can commence. Entry to the UK Armed Forces has been voluntary since the end of National Service (compulsory conscription) in 1962.⁸ The minimum age to join the UK Armed Forces today is 16 years as a junior entrant or 17.5 years as an adult entrant, although applications may be accepted in advance of the 16th birthday. Junior service is predominantly educational, to develop basic and trade-related skills, and operational deployment is not undertaken under the age of 18 years in accordance with international law.⁹ Commitment to service has been for a minimum term of 4 years since 1999, when it was increased from 3 years, but premature discharge is possible on

Key messages

- ▶ Although operational deployment is not permitted until age 18 years, young people can enter the UK Armed Forces as 'juniors' at age 16 or 17 years.
- ▶ Junior service focuses on education, physical fitness and trade and skills training.
- ▶ There is a perception that junior entry is associated with poor long-term mental health.
- ▶ This study looked at long-term mental health outcomes leading to specialist care in over 28 000 veterans who were junior entrants, in comparison with veterans recruited when older, and with people having no record of military service.
- ▶ Paradoxically, we found that people who were recruited when older had the poorest mental health outcomes, especially in relation to post-traumatic stress disorder.
- ▶ The differences are strongest in veterans born before 1960, and there is little difference in more recent generations irrespective of age at entry.

specific grounds,¹⁰ including at any time up to the 18th birthday if recruited under the age of 18 years.

BACKGROUND

Service in the UK Armed Forces prior to adulthood has a long history, going back many centuries. Even as late as World War II, 'boy buglers' could join at age 14 years; although as musicians rather than combatants, they accompanied the fighting troops into battle or served aboard warships, and many gave their lives in the service of their country.¹¹ The age at which entry to the armed forces could commence has been closely linked to the mandatory school leaving age, which in England and Wales was designated as 10 years of age at the introduction of compulsory education in 1870, rising progressively through various Acts of Parliament until 1918, when it was raised to 14 years. Employment of children, especially in the lower socioeconomic groups, was widespread and economically essential; it was not until 1933 that legislation restricted the employment of children under 14 years of age, and the armed forces would have been widely regarded as a legitimate or even desirable occupation for young people, bringing security of pay, food and clothing, and relieving the family of the need to maintain a child. Following World War II, in 1947 the school leaving age was raised to 15 years, and subsequently



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the first Junior Leaders' Regiments, the forerunners of today's units, were established. The school leaving age was raised to 16 years in 1972 and with it, the age at which young people could enter the armed forces as juniors. Since 2015, young people have had to remain in education or training until the age of 18 years,¹² and the designation of modern junior service as training meets this requirement. The Army Foundation College is regularly inspected by the Office for Standards in Education.¹³

The role of junior entrants today therefore differs markedly from the 'boy service' of the early 20th century and before. Furthermore, youth cadet units are entirely different and should not be confused with junior entry. Although they wear uniform while training, cadets remain civilians and are not members of the armed forces. The units fulfil a valuable role in teaching resilience and life skills to young people, but there is no obligation, or even encouragement, to join the armed forces subsequently.

Epidemiological studies examining mental health outcomes in relation to age at entry to military service are rare. The existence of a large linked Scottish dataset covering long-term health outcomes in personnel who served in the UK Armed Forces between 1960 and 2017, comprising the Scottish Veterans Health Study¹⁴ and its follow-on study, Trends in Scottish Veterans' Health, enabled us to examine long-term major mental health outcomes in veterans by age at recruitment, comparing their risk with age- and sex-matched people having no record of military service.

METHODS

Trends in Scottish Veterans' Health is a retrospective cohort study of 78 395 military veterans in Scotland who were born between 1945 and 1995, and who served in the UK Armed Forces between 1960 and 2017. The veterans were all resident in Scotland and were registered with the NHS Scotland both before and after service. A comparison group of 252 637 individuals with no record of service ('non-veterans') was selected, matched 3:1 for age, sex and postcode sector of residence (mean population 5000). The dataset includes all data from the Scottish Veterans Health Study. The follow-on study uses the same methodology, extending the birth cohort range by 10 years and the follow-up outcome data by 5 years. Participants were identified from their electronic NHS registration records, which provided demographic information as well as the dates of entering and leaving military service. The records were linked, at the individual level, to routine acute hospital admissions data and mental health day care and admissions data (Scottish Morbidity Record SMR01 and SMR04), to provide information on incidence of mental health disorder. The maximum period of follow-up was from 1 January 1981 to 31 December 2017; veterans were followed up from the point of leaving military service if later than 1 January 1981. The data extract was pseudo-anonymised.

Socioeconomic status (SES) was derived from the most recent registered postcode of residence, using the Scottish Index of Multiple Deprivation (SIMD), in quintiles ranging from 1 (most deprived) to 5 (least deprived). SIMD is calculated on a regional basis, in data zones having a mean population of 800, and is based on income, employment, health, education (including skills and training), housing, crime and access to services.¹⁵

'Any mental health disorder' was defined as the first occurrence of mood disorder (International Classification of Diseases (ICD)10 F30-F39 and ICD9 296), anxiety including stress reaction and post-traumatic stress disorder (PTSD) (ICD10 F40-F48, ICD9 300 and 308-309), or psychosis (ICD10 F20-F29 and ICD9 295), at any position in the record, while stress reaction

or PTSD (analysed together in order to accommodate diagnostic uncertainty, but referred to as 'PTSD' in this paper for conciseness) was defined as ICD10 F43 and ICD9 308-309.

'Early service leavers' (ESL) were defined as veterans who had left with <3 years' service. Although shorter than the current 4-year minimum, this ensured that veterans who completed the earlier minimum of 3 years' service were not incorrectly classified as ESL.¹⁶ Veterans having 0.4 years' service (20 weeks) or less were categorised as not having completed initial training. Veterans were stratified by age at recruitment into three groups comprising junior entrants (under 17.5 years), 17.5 to <20 years and 20 to <25 years. People recruited at age 25 and over were excluded from the analysis as professionally qualified graduate officers such as doctors are over-represented in this group.

Cox proportional hazard models, which take into account differing lengths of follow-up¹⁷ were used to examine the association between veteran status, age at recruitment and cumulative risk of any mental health disorder leading to secondary care admission or mental health admission or day care, using age as the time-dependent variable,¹⁷ age at first diagnosis of mental health disorder as the failure time and age at death (if no mental health diagnosis) as the censor time. The analyses were repeated to examine PTSD separately, and mental health disorder excluding PTSD. Cox proportionality assumptions were tested using methodology based on Schoenfeld residuals.¹⁸ The *a priori* rejection level was set at 0.05. The models were run univariably and after adjusting for SES. The analyses were repeated stratifying by grouped year of birth to examine potential birth cohort effects. A kernel density plot was used to compare age at entry for veterans with mental health diagnoses against age at entry for all veterans. All analyses were performed using Stata V.16.

RESULTS

After data cleansing to remove incomplete or invalid records, 78 157 (99.7%) veterans and 252 637 (100%) non-veterans were included in the analysis. There were 70 581 (90.3%) male veterans and 7573 (9.7%) female veterans, reflecting the gender balance of the UK Armed Forces. The mean period of follow-up was 32.5 years (SD=8.4), and there was a total of 10.6 million person-years of follow-up among veterans and non-veterans combined. A total of 28 621 veterans (36.6%) were recruited as junior entrants, 26 906 (34.4%) were aged between 17.5 and 20 years at entry and 16 195 (20.7%) were between 20 and 25 years of age (Figure 1). A small number of recruits commenced service before age 16 years; these are older veterans who entered Junior Leaders Regiments at age 15 years, prior to the raising of the UK school leaving age to 16 years in 1972.

Mental health outcomes

When all mental health outcomes were examined together, stratified by age at recruitment and compared with age, sex and geographically matched non-veterans, there was a statistically significant positive gradient of increasing risk of mental health disorder in the veterans with age at entry, with an HR 1.12, 95% CI 1.06 to 1.18, $p < 0.001$ for junior entrants (<17.5 years), HR 1.30, 95% CI 1.23 to 1.38, $p < 0.001$ for entrants aged from 17.5 to 20 years and HR 1.37, 95% CI 1.27 to 1.80, $p < 0.001$ for those aged from 20 to 25 years. When junior entrant veterans were compared against all veterans who joined as adults, the junior entrants were at 16% lower risk of mental health disorder overall than the adult entrants, HR 0.84, 95% CI 0.78 to 0.90, $p < 0.001$. Figure 1 shows that the distribution of age at entry for veterans developing mental health conditions closely

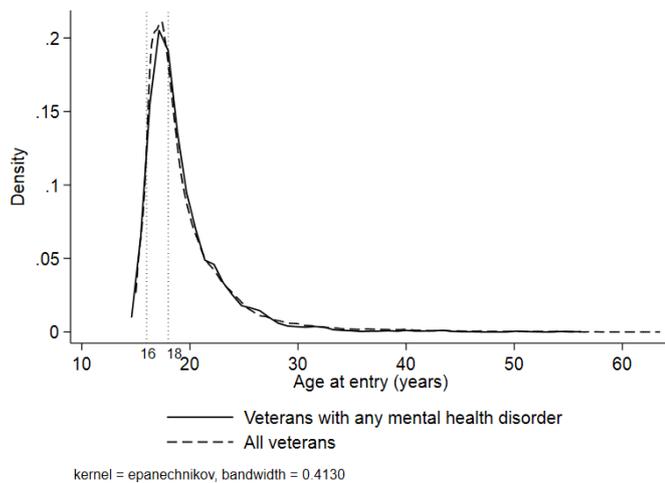


Figure 1 Kernel density plot by age at entry—all veterans and veterans with mental health disorder.

follows the recruitment age for all veterans, with no evidence of greater risk in those who are younger at entry. The difference was only statistically significant for men; women veterans showed no significant difference in risk from the non-veteran reference population for any age at recruitment. Breakdown by birth cohort (in 5-year bands) showed that although the overall pattern remained similar, the increasing risk with age at recruitment was most marked in veterans born prior to 1960. After this date, many of the differences from the reference population became non-significant irrespective of age at entry, except for the 1975–1984 birth cohorts where there is a substantial increase in risk in all veterans compared with non-veterans (Table 1).

Subgroup analysis by diagnosis showed that the overall gradient of increasing risk with age at entry was most marked for PTSD, HR 1.84, 95% CI 1.64 to 2.07, $p < 0.001$ for junior entrants, HR 2.17, 95% CI 1.93 to 2.43, $p < 0.001$ for entrants aged 17.5–20 years and HR 2.35, 95% CI 2.03 to 2.73, $p < 0.001$ for entrants aged 20–25 years. Analysis of PTSD risk by birth cohort revealed a changing pattern over time with a peak in increased risk in the 1975–1984 birth cohorts, and less evidence of difference in risk by age at entry beyond that point. There was also little change in the pattern of risk between pre-1960 and post-1960 birth cohorts (Table 2), in contrast to the risk of mental health disorder excluding PTSD, which showed a positive association with age at entry for those born prior to 1960 but no significant

increase in risk for any birth cohort from 1965, irrespective of age at recruitment (Table 3).

Length of service

Overall, there was an inverse association between age at recruitment and length of service (Table 4); those who left during basic training had a median age at entry of 19.5 years (IQR 17.5–24.0) while those who completed at least 12 years service had a median age at entry of 17.7 years (IQR 15.0–19.6). The median length of service for all veterans was 6.3 years (IQR 2.4–12.6); for junior entrants it was 7.4 years (IQR 3.0–14.7), compared with 6.3 years (IQR 2.8–12.3) for veterans who had been recruited between ages 17.5 and 20 years, while for those who entered service between the 20th and 25th birthday, the median length of service was 5.6 years (IQR 2.1–11.7). Veterans who subsequently developed any mental health disorder had a median length of service of 4.4 years (IQR 1.4–9.1).

Junior entrants were less likely to leave prematurely. Of the 27 228 veterans who were categorised as ESL, only 7117 (24.9%) were under age 17.5 years at entry, compared with 21 502 (30.5%) of the 55 983 who completed at least the minimum term of service, OR 0.82, 95% CI 0.80 to 0.84, $p < 0.001$.

DISCUSSION

Our findings provide no evidence to support the concerns which have been expressed that junior entry to military service, prior to age 17.5 years, is associated with an increased risk of adverse mental health outcomes. By contrast, it is entry to service at age 20 and above which carries the highest risk, although the overall effect has reduced in more recent generations of veterans. PTSD is a major contributor to the effect, and there is no evidence that this is weakening, in contrast to other mental health conditions where, despite an excess risk in older veterans in our study compared with people who have never served, there is no clear evidence of excess risk in any birth cohort since 1965, irrespective of age at entry to service.

We also found that junior entry was associated with a longer military career. Our findings on length of service and age at entry are supported by a response to a Parliamentary written answer which reported that longer service for those who enlisted in the army below the age of 18, compared with those with those joining at older ages, was seen across all cap badges. Infantry soldiers served on average 3.25 years longer if they had entered below age 18 years, while younger entry was associated with over 5 years additional service for the Intelligence Corps,

Table 1 Cox proportional HRs for risk of any mental health disorder in veterans by age at recruitment, overall and by birth cohort, compared with all matched non-veterans

Age at entry (years)	<17.5			17.5 to <20			20 to <25		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
Birth cohort									
Overall	1.12	1.06 to 1.18	<0.001	1.30	1.23 to 1.38	<0.001	1.37	1.27 to 1.80	<0.001
1945–1949	1.16	0.99 to 1.36	0.061	1.28	1.10 to 1.48	0.001	1.49	1.25 to 1.79	<0.001
1950–1954	1.14	1.00 to 1.30	0.052	1.44	1.27 to 1.64	<0.001	1.50	1.26 to 1.78	<0.001
1955–1959	1.02	0.91 to 1.15	0.707	1.23	1.06 to 1.42	0.006	1.41	1.16 to 1.73	0.001
1960–1964	1.17	1.03 to 1.32	0.015	1.23	1.05 to 1.43	0.009	0.97	0.75 to 1.23	0.777
1965–1969	0.85	0.69 to 1.05	0.140	0.99	0.84 to 1.17	0.915	1.31	1.11 to 1.56	0.001
1970–1974	1.14	0.94 to 1.39	0.196	1.42	1.22 to 1.66	<0.001	1.06	0.81 to 1.38	0.671
1975–1979	1.93	1.48 to 2.52	<0.001	1.51	1.17 to 1.93	0.001	1.81	1.40 to 2.32	<0.001
1980–1984	1.67	1.33 to 2.09	<0.001	1.42	1.12 to 1.81	0.003	1.37	0.93 to 2.02	0.109
1985–1995	1.10	0.71 to 1.71	0.670	1.55	1.10 to 1.21	0.012	1.15	0.68 to 1.94	0.594

Table 2 Cox proportional HRs for risk of PTSD in veterans by age at recruitment, overall and by birth cohort, compared with all matched non-veterans

Age at entry (years)	≤17			18–19			≥20		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
Birth cohort									
Overall	1.84	1.64 to 2.07	<0.001	2.17	1.93 to 2.43	<0.001	2.35	2.03 to 2.73	<0.001
1945–1949	1.43	0.94 to 2.18	0.096	1.92	1.32 to 2.78	0.001	2.40	1.66 to 3.48	<0.001
1950–1954	1.59	1.16 to 2.19	0.004	2.14	1.60 to 2.85	<0.001	1.98	1.40 to 2.78	<0.001
1955–1959	1.83	1.41 to 2.38	<0.001	1.54	1.09 to 2.15	0.013	3.15	2.31 to 4.29	<0.001
1960–1964	1.59	1.22 to 2.08	0.001	1.74	1.29 to 2.34	<0.001	1.26	0.84 to 1.88	0.268
1965–1969	1.26	0.82 to 1.94	0.294	1.87	1.33 to 2.62	<0.001	2.07	1.50 to 2.87	<0.001
1970–1974	2.10	1.29 to 3.43	0.003	2.42	1.63 to 3.61	<0.001	1.91	1.16 to 3.16	0.012
1975–1984	2.95	1.24 to 7.04	0.015	2.17	0.91 to 5.24	0.082	2.80	1.22 to 6.42	0.015

1985–1995 cohort: insufficient numbers.

military police and musicians.¹⁹ Our findings are also consistent with our earlier study, which found that longer service was associated with better long-term mental health.¹⁶

A history of exposure to adverse childhood events (ACE) is a risk factor for PTSD and other mental disorders,²⁰ including in a military context.^{21 22} Young people who have a history of ACE may be more likely to join the military as a junior entrant in order to escape adverse circumstances. This is supported by the recent KCMHR study which found that junior entrants had a significantly increased number of such events compared with adult entrants, although adjusting for this had negligible impact on associations with adverse health outcomes.²³ Studies have shown a positive relationship between depression and PTSD and having been a child soldier in other countries,^{6 7} and it is tempting to equate early recruitment into the UK Armed Forces with this group¹ and thence to assume a risk to mental health. However, this fails to take account of the fundamental differences between child soldiers, who operate alongside armed forces and armed groups in war-torn countries and may be both victims and perpetrators of violence and even mass atrocities over many years,⁷ and the tightly regulated educational environment of the UK Armed Forces' junior entrant programme, with its trade training programme and integral welfare support.^{24 25} A causal link between junior entry to the armed forces, in an establishment such as the Army Foundation College, which teaches survival skills, personal qualities such as discipline and respect and life skills such as first aid,²⁵ and an increased risk of ACE, is implausible. The UK is fully compliant with accordance

with international humanitarian law and Article 38 of the UN Convention of the Rights of the Child.^{26 27}

There is evidence of changing patterns of risk over time. We have observed that there is little or no excess risk of mental health disorder other than PTSD in all veterans born in the 1960s and early 1970s, irrespective of age at recruitment, and the reasons underpinning this are likely to be multifactorial. In other studies, we have shown that this group generally experiences better long-term physical health in comparison with veterans from older birth cohorts,^{28 29} and this may be attributable to the introduction of in-service health promotion policies from the late 1970s when the oldest of this group would have commenced their service. Widespread socioeconomic disadvantage consequent on deindustrialisation and the decentralisation of urban populations,^{30 31} resulting in high levels of unemployment³² especially among school-leavers, may also have had an impact; those who joined the armed forces, who were therefore in employment and were provided with food and accommodation, were to some extent insulated from those wider societal issues, with consequent benefit to their mental health. The increased risk of PTSD in the 1975–1984 birth cohorts, irrespective of age at entry, remains unexplained but may be related to the start of operations in Afghanistan (Op HERRICK) when this group would have been aged 18–27 years.

We suggest that the better outcomes overall that we have observed in junior entrants may reflect high levels of motivation and an early determination to pursue a military career, whereas among those who join when older, people who have experienced

Table 3 Cox proportional HRs for risk of mental health disorder excluding PTSD in veterans by age at recruitment, overall and by birth cohort, compared with all matched non-veterans

Age at entry (years)	≤17			18–19			≥20		
	HR	95% CI	P value	HR	95% CI	P value	HR	95% CI	P value
Birth cohort									
Overall	0.99	0.93 to 1.06	0.808	1.15	1.08 to 1.23	<0.001	1.21	1.11 to 1.32	<0.001
1945–1949	1.28	1.10 to 1.50	0.002	1.38	1.18 to 1.60	<0.001	1.41	1.20 to 1.66	<0.001
1950–1954	1.14	0.99 to 1.32	0.074	1.39	1.21 to 1.59	<0.001	1.46	1.24 to 1.70	<0.001
1955–1959	0.99	0.87 to 1.13	0.907	1.27	1.10 to 1.48	0.001	1.21	1.00 to 1.47	0.046
1960–1964	1.06	0.91 to 1.23	0.430	1.24	1.06 to 1.46	0.009	0.98	0.79 to 1.21	0.840
1965–1969	0.81	0.63 to 1.03	0.096	0.85	0.68 to 1.06	0.148	1.18	0.98 to 1.44	0.088
1970–1974	0.96	0.69 to 1.33	0.803	1.13	0.88 to 1.45	0.342	0.81	0.58 to 1.15	0.246
1975–1984	1.02	0.61 to 1.72	0.932	1.08	0.69 to 1.69	0.741	0.91	0.54 to 1.51	0.700

1985–1995 cohort: insufficient numbers.

Table 4 Median age at entry and discharge, by length of service

Length of service	Median age at entry (years)		Median age at discharge (years)	
	Median	IQR	Median	IQR
All veterans	18.2	17.0–20.6	26.2	21.8–33.0
Basic training	19.5	17.5–24.0	19.7	17.7–24.1
Trained ESL	18.5	17.2–21.2	20.8	18.8–23.4
4–12 years	18.2	17.0–20.3	26.4	23.8–29.1
Over 12 years	17.7	15.0–19.6	40.1	35.0–43.4

Basic training—left before completing initial training; trained ESL (completed training).

ESL, early service leaver.

multiple job losses or periods of unemployment may be over-represented and may be at increased risk of failing to sustain employment, a known risk factor for mental ill-health.³³

The major strength of this present study is that it was based on a large cohort covering the whole of Scotland, including over 27 000 ESL and over 4200 veterans with a mental health diagnosis, with up to 37 years follow-up. Data were available on both age at recruitment and length of service. Data were obtained from computerised health records and therefore were not dependent on personal recall.

Limitations of the study include possible loss to follow-up of subjects due to migration away from Scotland, for which no data are available, and the lack of any follow-up data prior to 1 January 1981. Mental health conditions diagnosed and treated solely in primary care could not be identified, nor could those managed solely in the private or charitable sectors; therefore, our data reflect the more severe end of the spectrum of mental health disorders managed by the NHS. No information was available on mental health conditions occurring in service as we were unable to link to military health records; conditions persisting into the veteran period would not have been picked up until first presentation to the NHS. We studied regular personnel only as junior entry is not applicable to reservists. We were unable to exclude commissioned officers, for whom junior entry is not applicable; this would have had the effect of weakening any apparent differences between veterans and non-veterans. Data on combat exposure in the veterans, which may have affected their mental health outcomes, were not available. We had no information on the service to which a veteran had belonged (Royal Navy, Army or Royal Air Force), and rates of mental ill-health are known to differ between the services.

CONCLUSION

Analysis of the Scottish veterans dataset provides no evidence to support the assertion that early entry to military service is associated with adverse long-term mental health outcomes. Those who enter service as junior entrants are more likely to follow a longer military career, and have a lower risk of long-term mental health disorder, than those recruited at older ages. Efforts to prevent recruitment in the younger age groups in order to protect mental health are at best misplaced and at worst may paradoxically result in increased risk to mental health.

Contributors BPB conceived the idea and designed the study, with advice from JPP and DFM. BPB carried out the data analysis, which was overseen by DFM, and BPB and NTF interpreted the findings. BPB wrote the first draft of the report, which was critically reviewed and edited by all authors. BPB and NTF revised the draft following feedback from the reviewers, and all authors approved the final article.

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Competing interests BPB is a military veteran and Honorary Civilian Consultant Advisor (Army) in Veterans' Health and Epidemiology. Neither the Army nor the

Ministry of Defence had any input to this paper, and the views and opinions expressed are solely those of the authors. NTF is a trustee (unpaid) of The Warrior Programme and an independent advisor to the Independent Group Advising on the Release of Data (IGARD).

Patient consent for publication Not required.

Ethics approval Approval for this study was granted by the Public Benefit and Privacy Panel of NHS Scotland.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available. The study remains in progress and data are not currently available for sharing.

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