

## **Risk and protective factors for suicide-related outcomes among serving military personnel: A systematic review of cohort studies**

Luke T. Bayliss<sup>1</sup>, Jacinta Hawgood<sup>1</sup>, Zoe Jenkins<sup>2</sup>, Nikki Jamieson<sup>1,3</sup>, Ed Heffernan<sup>4,5,6</sup>, Jennifer Wild<sup>2,7,8</sup>, & Kairi Kõlves<sup>1</sup>

<sup>1</sup>Australian Institute for Suicide Research and Prevention, WHO Collaborating Centre for Research and Training in Suicide Prevention, School of Applied Psychology, Griffith University, QLD, Brisbane, Australia

<sup>2</sup>Directorate of Health Research, Joint Health Command, Department of Defence, Australia

<sup>3</sup>Mental Health and Wellbeing Branch, Deputy People Group, Department of Defence, Australia

<sup>4</sup>Queensland Centre for Mental Health Research, Wacol, QLD, Australia

<sup>5</sup>School of Public Health, The University of Queensland, Brisbane, QLD, Australia

<sup>6</sup>Queensland Forensic Mental Health Service, Metro North Mental Health Service, Brisbane, QLD, Australia

<sup>7</sup>Phoenix Australia Centre for Posttraumatic Mental Health, Department of Psychiatry, University of Melbourne, Australia

<sup>8</sup>Department of Experimental Psychology, University of Oxford, the UK

### **Corresponding author**

Dr Luke T. Bayliss

Australian Institute for Suicide Research and Prevention, WHO Collaborating Centre for Research and Training in Suicide Prevention, School of Applied Psychology, Griffith University

Email: [l.bayliss@griffith.edu.au](mailto:l.bayliss@griffith.edu.au)

### **Declarations**

Any views expressed in this review are that of the authors, not the Department of Defence.

### **Competing interests**

ZJ, NJ, EH, JW are employed by the Department of Defence. No other competing interests are declared.

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## ABSTRACT

**Introduction:** Understanding risk and protective factors for suicide-related outcomes (suicidal ideation, attempts, and deaths) among military personnel is key to the development and design of suicide prevention initiatives. Current literature has predominantly focused on ex-serving or a combination of ex- and serving-personnel. Therefore, factors that may be pertinent for serving personnel are less understood. This review aims to identify risk and protective factors for suicide-related outcomes comprising serving military personnel.

**Methods:** The review adhered to PRISMA guidelines and was registered on PROSPERO. A systematic literature search of academic databases on military personnel and suicide from 2004 was conducted. Two independent reviewers conducted study selection. Inclusion criteria included serving personnel, cohort study design, and suicide-related outcomes. Exclusion criteria were National Guard or reservists, and studies not in English. Data on study and participant characteristics, military-specific variables, and suicide-related outcomes were extracted. All studies were critically appraised.

**Results:** A total of 53 studies were included. Most studies were published in the past ten years, comprised Army personnel from the United States, and focused on suicide attempt. Overarching risk factor categories included adverse military experiences, deployment, repeated help seeking and support, junior rank, occupation, and time in service, and vulnerability factors within the military context. Since many of these risk factors are inherent to military service, they may potentially be considered non-modifiable. Despite a limited number of studies on protective factors, several studies found that unit cohesion reduced the likelihood of suicidal ideation and suicide attempts.

**Conclusions:** Suicide prevention strategies within military may be enhanced by targeting risk factors that are potentially modifiable. Less modifiable risk factors could potentially be targeted through improved personnel management practices, particularly in preparation for and after deployment among first-year personnel. Longitudinal research programs that identify and examine risk and protective factors for serving military personnel is needed.

### Key messages

What is already known on this topic

Risk and protective factors for suicide among military veterans have been explored in several literature reviews, yet no such review has been conducted for serving military personnel.

What this study adds

This review provides a summary of identified risk and protective factors for suicide-related outcomes within the military context.

How this study might affect research, practice or policy

Results indicate that some risk factors are potentially less modifiable than others and therefore targeting more modifiable risk factors may be a promising approach for reducing suicidal outcomes, yet evaluation of such an approach is needed.

## **INTRODUCTION**

Suicide-related outcomes (i.e., suicidal ideation, suicide attempt, and deaths) among military personnel are a worldwide concern. From a global perspective, serving personnel have lower pooled prevalence of suicidal ideation (10% vs 14%) and suicide attempts (8% vs 15%) than ex-serving personnel<sup>(1)</sup>. This difference also extends to suicide deaths in countries such as Australia<sup>(2)</sup> and the United States of America (U.S.A.)<sup>(3)</sup>. Given this difference in suicide-related outcomes between current and ex-serving military personnel, it is understandable that most military suicide research has focused on ex-serving personnel or a combination of both<sup>(4, 5)</sup>. However, the combination of population groups may conflate risk and protective factors between the two populations.

Psychiatric disorders (e.g., posttraumatic stress disorder, depression, anxiety) are a risk factor for suicide-related outcomes commonly observed across populations (i.e., military and general population)<sup>(5)</sup>. The unique nature of military service is distinctly different from civilian employment and includes the relinquishment of personal freedoms, submission to military law and system of discipline as well as exposure to a range of environmental conditions that may be regarded as hazardous<sup>(6)</sup>. The importance of understanding military culture has been previously described<sup>(7-9)</sup> and as such, the specific context and obligations of military service warrant consideration when investigating factors that may increase or decrease the likelihood of engaging in suicide-related outcomes in serving military personnel. Social support has been found to reduce the risk of suicide-related outcomes among serving personnel<sup>(10)</sup>. However, given the prevalence of suicidal ideation and attempts are less compared to ex-serving personnel<sup>(1)</sup>, there are potentially additional protective factors for serving personnel.

Recent systematic reviews on suicide-related outcomes among military personnel have combined serving and ex-serving personnel<sup>(5)</sup>, or considered specific psychiatric disorders only (e.g., adjustment disorders)<sup>(11)</sup> or combat exposures<sup>(12)</sup>. As such, a review on risk and protective factors for suicide-related outcomes for serving military personnel is pertinent to inform suicide prevention initiatives and strategies for Defence Forces. The aim of this review was to understand military-specific risk and protective factors for suicide-related outcomes among serving personnel.

## **METHOD**

### **Literature search**

The review was pre-registered on Prospero (CRD42024558183) and followed the PRISMA guidelines (see Appendix 1). On 19 August 2024, we conducted a systematic search of the literature across four databases (i.e., PubMed, Scopus, APA PsycINFO, and PTSDubs) using a combination of database terms (e.g., MeSH terms) and keywords<sup>(13)</sup> for two main elements in our search: 'military' and 'suicide' (Appendix 2). We applied a date restriction of 20-years (i.e., from 2004). All search results were exported to Endnote V21, and duplicates removed. The remaining results were uploaded to Covidence for screening.

## **Study selection**

Two reviewers (LTB and KK) independently screened all articles by title and abstract, with eligible articles further screened by full text. Discrepancies in decisions were resolved through discussion between reviewers. Inclusion criteria were: (1) Serving military personnel including Army, Air Force, and Navy, including specialised units such as Marines; (2) cohort or nested case-control study designs to identify and facilitate inferences based on exposure before outcome; and (3) suicide-related outcomes. Exclusion criteria were: (1) Ex-serving military personnel, National Guard, and reservists; (2) other study designs such as cross-sectional and qualitative studies, opinion pieces, commentaries, and grey literature; and language other than English.

## **Critical appraisal**

All eligible studies were independently critically appraised by LTB with a second reviewer (KK) randomly auditing 20% of studies. The critical appraisal tools used were the case control and cohort checklists from the Joanna Briggs Institute<sup>(14)</sup>.

## **Data extraction**

Study and participant characteristics, military branch, measures, military-related predictors, and suicide-related outcomes were extracted. Both total sample and number of participants with suicide-related outcomes were extracted.

## **Data analysis and synthesis**

Included studies were clinically and methodologically heterogeneous and therefore not appropriate for a meta-analysis. Findings were analysed and grouped by similarities within broad overarching risk factors with a narrative overview applied to present the results. A caveat for interpretation of results is that some risk factors for suicide deaths (e.g., exposure to injury and death<sup>(15)</sup>) may also be risk factors for suicidal ideation and/or suicide attempts. However, many studies only focused on one suicide-related outcome and therefore results reflect singular outcomes despite the potential for risk factors to influence more than one outcome.

## **RESULTS**

A total of 7,439 papers were identified from initial searches that resulted in 53 studies after eligibility criteria was applied (see Figure 1). As seen in Appendix 3, most studies only included suicide attempt as the outcome (n = 24), were published between 2015 and 2020 (n = 31), only comprised Army participants (n = 40), and were from the United States of America (U.S.A.; n = 46). The Army Study to Assess Risk and Resilience in Service members (STARRS) dataset was used in 33 studies.

Nested case-control (n = 25) and prospective cohort (n = 24) were the most common study designs. Outcome measures for suicidal ideation were mostly self-report (n = 10), whereas most suicide attempts (n = 19), and all deaths were identified mostly through International

## Figure 1 about here please

Classification of Diseases (ICD) codes. Predictors for suicidal ideation primarily used established or modifications of scales (e.g., Acceptance and Action Questionnaire-2<sup>(16)</sup> (n = 9), whereas administrative variables (e.g., service-related characteristics) were mostly used for suicide attempts (n = 16) and deaths (n = 12).

Three common issues were identified from the cohort study critical appraisals. First, a lack of strategies to deal with confounding factors (n = 10). Second, exposures not measured in a reliable way (e.g., probable TBI<sup>(17)</sup>, n = 9). Finally, it was unclear whether participants were free from the outcome at the start of the study (i.e., whether they had history of suicidal ideation and/or suicide attempt; n = 19). Similarly, this unknown history of suicide-related outcome or other comparable differences between groups (e.g., had previously deployed or not) was the key issue with case-control study critical appraisals (n = 19).

### **Risk factors**

A total of ten studies included significant findings for suicidal ideation, 27 for suicide attempts, and 12 for suicide deaths (see Appendix 4 for an overview of findings). Three studies reported no significant findings for military-related variables (i.e., career group and enlisted/officer status<sup>(18)</sup>; i.e., combat-events<sup>(19)</sup>; i.e., deployment-acquired TBI<sup>(17)</sup>). All results are from U.S.A. studies unless otherwise indicated.

#### *Adverse military experiences*

Combat-related experiences were associated with increased risk for all suicide outcomes. More intense combat exposure increased risk for suicidal ideation<sup>(20, 21)</sup>, and specific experiences of combat increased risk of attempting suicide. That is, being exposed to more frequent improvised explosive devices<sup>(22)</sup>, being attacked or ambushed, seeing dead bodies or human remains, and being directly responsible for the death of a noncombatant<sup>(23)</sup> at eight- to nine-months post-deployment<sup>(24)</sup>, or the death of an enemy<sup>(25)</sup>. Those who died by suicide were more likely to have seen wounded, dead, or killed civilians or non-enemy personnel, or to have discharged their weapon<sup>(15)</sup>.

Adjustments to military environment provided mixed findings. Suicidal ideation was more likely if personnel experienced disciplinary problems<sup>(26)</sup>. However, suicide attempt was associated with moderate and severe adjustment difficulties among Israeli personnel<sup>(27)</sup>. Personnel with low adjustment difficulties were more likely to die by suicide among Israeli personnel<sup>(28)</sup>. Similarly, Israeli males with low and average motivations to serve in as combat role were also more likely to die by suicide<sup>(28)</sup>. Other associations with an increased risk of suicide death include were being demoted within the past two years<sup>(29)</sup> and a medical downgrade in the past three months among Irish personnel<sup>(30)</sup>.

Other military experiences were identified as risk factors. Post traumatic stress disorder (PTSD) with late onset or exacerbations of pre-existing PTSD increased the likelihood of suicidal ideation for Danish personnel<sup>(31)</sup>, and a diagnosis of PTSD increased risk of a suicide attempt<sup>(32)</sup>. Similarly, minor traumatic brain injury (TBI)<sup>(33)</sup> and past month TBI symptoms<sup>(34)</sup> was found to be associated with an increased risk of a suicide attempt with TBI more likely to be diagnosed in suicide deaths<sup>(35)</sup>. Further risk factors for suicide attempts included being bullied by the unit<sup>(25)</sup>, assigned to a unit with at least one suicide attempt in the past year<sup>(36)</sup>, and having a capability for suicide (i.e., fearlessness about death)<sup>(37)</sup>.

### *Deployment*

Deployment status was associated with increased risk. Compared to currently deployed enlisted soldiers, never and previously deployed personnel were more likely to experience suicidal ideation<sup>(38)</sup>, attempt suicide<sup>(39-43)</sup>, and never-deployed personnel who previously served under a stop-loss order (i.e., involuntary extension of a service member's active duty service) were more likely to die by suicide<sup>(29)</sup>. During deployment, high stress contributed to suicidal ideation<sup>(44)</sup>. Similarly, unmet mental health treatment and support, identified as needed at pre-deployment, were associated with increased risk for both suicidal ideation and suicide attempt<sup>(45)</sup>. Further, more deployments were also associated with an increased risk for suicide attempts<sup>(25)</sup> and being deployed in the first year of service increased the likelihood of attempts<sup>(34, 46)</sup> and death<sup>(47)</sup>. Likewise, currently deployed women were more likely to die by suicide than men<sup>(48)</sup>.

The risk of when a suicide attempt was more likely varied according to deployment status. Risk for suicide attempts was greatest at second month of service among non-deployed (i.e., recently joined the service but not deployed)<sup>(49)</sup>, at six-<sup>(49)</sup> and nine-months<sup>(39)</sup> during deployment, and fifth month post-deployment<sup>(49)</sup>.

### *Help seeking and support*

Repeated help seeking indicated greater risk. More meetings with a primary (not mental health) health professional among Israeli personnel<sup>(50)</sup>, at least three<sup>(51)</sup> and after nine<sup>(33)</sup> mental health care professional visits increased risk of a suicide attempt for both Israeli and U.S.A. personnel. For deaths by suicide, associations of risk increased if personnel received relationship counselling during their service<sup>(35)</sup>, mental health care<sup>(52)</sup>, particularly six or more visits in 12 months<sup>(53)</sup> or had a documented mental-behavioural disorder in the previous year<sup>(54)</sup>. If hospitalised for a psychiatric-related reason, then the first 90-days after being discharged is when risk is increased, with the first 30-days being the highest risk period<sup>(55)</sup>.

### *Rank, occupation, and time in service*

Combat-related roles were at the greatest risk of attempting suicide for U.S.A. military personnel, although job loss was itself a risk factor<sup>(56)</sup>. Combat arms (i.e., those who engage in direct ground combat)<sup>(39, 42, 43)</sup> and combat medics<sup>(42, 43, 57, 58)</sup> were the most at risk of attempting suicide. Contrary findings were reported for Israeli military personnel as support (non-combat) units were at greatest risk<sup>(50)</sup>. Marines' categories of undesignated/unknown, nonqualified (i.e., represent young Marines who had failed to complete occupational

training), service/supply, and infantry were more likely to die by suicide. Likewise, junior enlisted (i.e., E1 and E2) military personnel<sup>(29)</sup> and those with a less-than-expected rank based on the time they had served<sup>(47)</sup> were associated with greater risk for suicide death.

Personnel in their first two years of service had an increased risk of dying by suicide<sup>(29, 51)</sup> and first four years of service increased the risk of suicidal ideation<sup>(38)</sup> and suicide attempt<sup>(39, 40, 43, 50)</sup>. Risk for suicide attempts peaked at second month of service<sup>(41)</sup> and ninth month<sup>(59)</sup>. Other risk factors for suicide attempts were dwell times (i.e., time between deployments) of less than six-months<sup>(46)</sup> entering the Army at 25 years or older<sup>(41)</sup>, and an unauthorised absence from service<sup>(50)</sup>.

#### *Vulnerability factors within military context*

Suicidal ideation was more likely to be experienced if personnel had post-deployment alcohol use problems or reintegration difficulties<sup>(60)</sup>, hopelessness, or lacked a sense of belongingness<sup>(61)</sup>. Decreased neurocognitive functioning contributed to a higher likelihood of both ideation and suicide attempt<sup>(62)</sup>. Being a sexual assault victim<sup>(63)</sup>, having low optimism or high and low levels of sociability<sup>(64)</sup>, or having an impulsive or risk-taking profile<sup>(65)</sup> were associated with increased risk for an attempt. Two mental health items (i.e., feeling detached and avoiding situations) increased the likelihood of dying by suicide<sup>(15)</sup>.

#### **Protective factors**

Eight studies reported significant findings for protective factors. Unit cohesion was protective for suicidal ideation<sup>(20, 44, 66)</sup> and suicide attempt<sup>(20)</sup>. Increased psychological flexibility<sup>(21)</sup> and actively engaging in sport also decreased the risk of suicidal ideation for Norwegian personnel<sup>(67)</sup>. Contrary to earlier findings, more appointments with mental healthcare professionals decreased risk of suicide attempts in an Israeli sample<sup>(50)</sup>. An additional protective factor for suicide deaths included having disciplinary action recorded<sup>(30)</sup>. Further, a study that looked at omega-3 fatty-acid serum concentrations found higher levels of monounsaturated fatty acids reduced risk of dying by suicide<sup>(15)</sup>, likewise higher concentrations of vitamin D (25(OH)D)<sup>(68)</sup>.

#### **DISCUSSION**

This systematic review provides an overview of risk and protective factors for suicide-related outcomes among serving military personnel. Findings mostly align with previous reviews that combined serving and ex-serving military personnel<sup>(5, 10, 11)</sup>. That is, risk factors such as shorter length of service, adjustment to military environment difficulties, and combat-related exposures. However, this review extends on previous findings through a specific focus on serving members, highlighting military factors and their contribution to suicide-related outcomes. Importantly, this may be used to inform suicide prevention initiatives and strategies for personnel during service.

Some risk factors may be considered modifiable (i.e., “factors that could reasonably be altered, such as psychiatric symptoms and social support”)<sup>(5)</sup>. Deployment within the first year of service contributed to both suicide attempt and death, which may be due to combat exposure<sup>(21)</sup> and the development of an individual’s capability for suicide<sup>(37)</sup>. Therefore,

consideration about the role and support for first year deployments is a potential target for suicide prevention strategies. Cognitive factors hopelessness and low optimism were found to be associated with an increased risk for suicidal ideation and suicide attempts, respectively. These results build on previous findings and offer potential cognitive processes to target for preventing suicidal-related outcomes<sup>(69)</sup>.

Several of the risk factors appear less modifiable. Combat includes various adverse experiences that many personnel are exposed to as an aspect of serving, yet this is less modifiable as a risk factor for suicide-related outcomes. Likewise deployment status, which is also less modifiable as personnel need to be deployed for military to operate and conduct missions. Notwithstanding, the United Kingdom Armed Forces Harmony Guidelines were developed to mitigate psychological risks of long deployments and too frequent deployments, thus indicating that preventative advances have been made regarding deployments. Nonetheless, given that combat and deployment are inherent to serving in the military, the focus on these risk factors should perhaps be managing individuals' wellbeing after these experiences. However, as seen in the results of this review, repeated help seeking was identified as a risk factor. As such, the management of personnel wellbeing may be improved using appropriate, timely, and evidence-based supports<sup>(70)</sup>. Encouragingly, personnel are reaching out for support more than ever although there are still barriers to accessing support (e.g., stigma, career impact)<sup>(70)</sup>. Thus, an opportunity for defence forces is to work towards the reduction of barriers for serving personnel to access supports whilst improving support services (e.g., value-based healthcare)<sup>(71)</sup>. In addition to providing supports, identifying ways in which individuals with psychiatric conditions can be retained in roles within defence forces that cater to their conditions may also help reduce risk. Nonetheless, a potential byproduct of more personnel receiving sufficient care is that they develop psychological skills that may serve as a protective factor during their service<sup>(6)</sup>.

Despite the limited number of studies, protective factors appear more modifiable within a military context. The importance of unit cohesion indicates that more resources and efforts be spent on increasing this element of military culture<sup>(66)</sup>, perhaps through sport<sup>(67)</sup>. Bullying by unit members increased suicide attempt risk and therefore increased efforts to target and report have potential to reduce this risk. Further, social support as a critical protective factor has been a key component of suicide prevention strategies across population<sup>(5, 10)</sup>. As such, the unique camaraderie of serving provides an opportunity for defence forces to enhance this aspect of military life while addressing behaviours that disrupt it.

This review had considerable strengths, such as a preregistered broad search strategy and only including cohort studies that included nested case-control studies as a subtype cohort study. A limitation was that we only extracted and analysed military factors. We acknowledge that other risk factors are important for suicide-related outcomes and may be germane within a military context (e.g., time away from family and friends). However, we did not aim to cover them as we focused on military specific factors. The body of literature heavily comprised U.S.A. personnel and the use of the Army STARRS dataset, which needs to be considered when interpreting the results of this review. That is, the review can only report what data was collected and therefore other risk and protective factors likely exist, but

without the data these potentially unknown factors remain speculative. However, a strength of the dataset was the use of ICD codes for suicide attempts and administrative data systems and mortality registries for deaths by suicide. Thus, overcoming self-report limitations noted in other reviews<sup>(11)</sup> by providing confidence for comparing these suicide-related outcomes.

Three key recommendations for future research were identified. First, similar longitudinal research programs to Army STARRS could possibly be implemented in other branches of military and in other nations to better understand the epidemiology and risk and protective factors beyond the U.S.A. Army. However, individual nations would benefit from conducting studies similar to U.S.A. Army STARRS longitudinal research that is further tailored to their specific military and cultural contexts. This is needed to reflect contemporary perspectives on understanding contributors of suicide-related outcomes while also offering timely evaluation of suicide prevention resources. Second, big data and artificial intelligence have emerged as promising research systems and therefore data linkage is warranted for understanding risk and protective factors for suicide-related outcomes<sup>(65)</sup>. Finally, research focused on modifiable factors, particularly how to enhance protective factors, is needed to inform and improve suicide prevention initiatives and strategies. This may need to be supported by an evaluative process to optimise the identification of mechanisms that can potentially reduce risk and improve wellbeing.

## **CONCLUSION**

Better understanding of suicide-related outcomes in serving military personnel is a priority for defence forces. Whilst some risk factors are modifiable, many are not due to the nature of military service. Opportunities for reducing suicide-related outcomes among serving personnel include increased preparation and post-deployment support when deploying personnel in their first year of service, addressing barriers to and improving support services, and increasing unit cohesion and social supports. Militaries should consider implementing longitudinal research programs similar to Army STARRS that includes the measurement of modifiable risk and protective factors.

## **Contributorship Statement**

KK, LTB, JH had the idea for the article.

LTB performed the literature search.

LTB, JH, ZJ, NJ, EH, JW, KK wrote the article.

LTB is the guarantor.

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## REFERENCES

1. Moradi Y, Dowran, B., & Sepandi, M. The global prevalence of depression, suicide ideation, and attempts in the military forces: a systematic review and meta-analysis of cross sectional studies. *BMC Psychiatry*. 2021;21:1-31.
2. Australian Institute of Health and Welfare. Serving and ex-serving Australian Defence Force members who have served since 1985: Suicide monitoring 1997 to 2020 2024 [Available from: <https://www.aihw.gov.au/reports/veterans/serving-exserving-adf-suicide-monitoring-2024/contents/summary>].
3. U.S. Department of Veterans Affairs. 2023 National Veteran suicide prevention annual report 2023 [Available from: <https://veteransmentalhealth.texas.gov/wp-content/uploads/2023/11/2023-National-Veteran-Suicide-Prevention-AnnualReport.pdf>].
4. Bryan CJ, Griffith, J. E., Pace, B. T., Hinkson, K., Bryan, A. O., Clemans, T. A., & Imel, Z. E. Combat exposure and risk for suicidal thoughts and behaviors among military personnel and veterans: A systematic review and meta-analysis. *Suicide and Life-Threatening Behavior*. 2015;45(5):633-49.
5. Williamson C, Croak, B., Simms, A., Fear, N. T., Sharp, M. L., & Stevelink, S. A. Risk and protective factors for self-harm and suicide behaviours among serving and ex-serving personnel of the UK Armed Forces, Canadian Armed Forces, Australian Defence Force and New Zealand Defence Force: A systematic review. *PLoS One*. 2024;18(4):e0299239.
6. Oltvolgyi CG, Meurk, C., & Heffernan, E. Suicide and suicidality in Australian Defence Force veterans: A systematic scoping review. *Australian & New Zealand Journal of Psychiatry*. 2024;00048674241246443.
7. Atuel HR, & Castro, C. A. Military cultural competence. *Clinical Social Work Journal*. 2018;46(2):74-82.
8. Meyer EG, & Wynn, G. H. The importance of US military cultural competence. In: Roberts L, Warner, C., editor. *Military and veteran mental health: A comprehensive guide*. New York, NY: Springer; 2018. p. 15-33.
9. Lane J, & Wallace, D. Australian military and veteran's mental health care part 1: an introduction to cultural essentials for clinicians. *Australasian Psychiatry*. 2020;28(3):267-9.
10. Jones N, Sharp, M. L., Phillips, A., & Stevelink, S. A. Suicidal ideation, suicidal attempts, and self-harm in the UK Armed Forces. *Suicide and Life-Threatening Behavior*. 2019;49(6):1762-79.
11. McKenzie A, Burdett, H., Croak, B., Rafferty, L., Greenberg, N., & Stevelink, S. A. Adjustment disorder in the armed forces: a systematic review. *Journal of Mental Health*. 2023;32(5):962-84.
12. Ein N, Liu, J. J., Houle, S. A., Easterbrook, B., Turner, R. B., MacDonald, C., Reeves, K., Deda, E., Hoffer, K., Abidi, C.B., Nazarov, A., & Richardson, J. D. The effects of child encounters during military deployments on the well-being of military personnel: a systematic review. *European Journal of Psychotraumatology*. 2022;13(2):2132598.
13. DeMars MM, & Perruso, C. MeSH and text-word search strategies: Precision, recall, and their implications for library instruction. *Journal of the Medical Library Association: JMLA*. 2022;110(1):23.
14. Moola S, Munn, Z., Tufanaru, C., Aromataris, E., Sears, K., Sfetcu, R., Currie, M., Qureshi, R., Mattis, P., Lisy, K., & Mu, P-F. Systematic reviews of etiology and risk. In: Munn EAZ, editor. *JBIM Manual for Evidence Synthesis* 2020.

15. Lewis MD, Hibbeln JR, Johnson JE, Lin YH, Hyun DY, Loewke JD. Suicide deaths of active-duty US military and omega-3 fatty-acid status: a case-control comparison. *J Clin Psychiatry*. 2011;72(12):1585-90.
16. Bond FW, Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., ... & Zettle, R. D. Preliminary psychometric properties of the Acceptance and Action Questionnaire–II: A revised measure of psychological inflexibility and experiential avoidance. *Behavior Therapy*. 2011;42(4):676-88.
17. Stein MB, Kessler RC, Heeringa SG, Jain S, Campbell-Sills L, Colpe LJ, et al. Prospective longitudinal evaluation of the effect of deployment-acquired traumatic brain injury on posttraumatic stress and related disorders: results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *Am J Psychiatry*. 2015;172(11):1101-11.
18. Conner KR, McCarthy MD, Bajorska A, Caine ED, Tu XM, Knox KL. Mood, anxiety, and substance-use disorders and suicide risk in a military population cohort. *Suicide Life Threat Behav*. 2012;42(6):699-708.
19. Krauss SW, Züst J, Frankfurt S, Kumparatana P, Riviere LA, Hocut J, et al. Distinguishing the Effects of Life Threat, Killing Enemy Combatants, and Unjust War Events in U.S. Service Members. *J Trauma Stress*. 2021;34(2):357-66.
20. Campbell-Sills L, Flynn PJ, Choi KW, Ng THH, Aliaga PA, Broshek C, et al. Unit cohesion during deployment and post-deployment mental health: is cohesion an individual- or unit-level buffer for combat-exposed soldiers? *Psychol Med*. 2022;52(1):121-31.
21. Bryan CJ, Ray-Sannerud B, Heron EA. Psychological flexibility as a dimension of resilience for posttraumatic stress, depression, and risk for suicidal ideation among Air Force personnel. *Journal of Contextual Behavioral Science*. 2015;4(4):263-8.
22. Ursano RJ, Kessler RC, Naifeh JA, Mash HH, Fullerton CS, Bliese PD, et al. Frequency of Improvised Explosive Devices and Suicide Attempts in the U.S. Army. *Mil Med*. 2017;182(3):e1697-e703.
23. LeardMann CA, Matsuno RK, Boyko EJ, Powell TM, Reger MA, Hoge CW. Association of Combat Experiences With Suicide Attempts Among Active-Duty US Service Members. *JAMA Netw Open*. 2021;4(2):e2036065.
24. Khan AJ, Campbell-Sills L, Sun X, Kessler RC, Adler AB, Jain S, et al. Association Between Responsibility for the Death of Others and Postdeployment Mental Health and Functioning in US Soldiers. *JAMA Netw Open*. 2021;4(11):e2130810.
25. Bernecker SL, Zuromski KL, Gutierrez PM, Joiner TE, King AJ, Liu H, et al. Predicting suicide attempts among soldiers who deny suicidal ideation in the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *Behav Res Ther*. 2019;120:103350.
26. Start AR, Allard Y, Adler A, Toblin R. Predicting Suicide Ideation in the Military: The Independent Role of Aggression. *Suicide Life Threat Behav*. 2019;49(2):444-54.
27. Shelef L, Essami N, Birani A, Hartal M, Yavnai N. Personal and psychiatric characteristics among Druze soldiers attempting suicide during military service. *J Affect Disord*. 2019;256:486-94.
28. Shelef L, Tomer G, Tatsa-Laur L, Kedem R, Bonne O, Fruchter E. Risk factors for suicide in the Israeli army between the years 1992-2012: A case-control study. *Eur Psychiatry*. 2017;39:106-13.
29. Schoenbaum M, Kessler RC, Gilman SE, Colpe LJ, Heeringa SG, Stein MB, et al. Predictors of suicide and accident death in the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS): results from the Army Study to

- Assess Risk and Resilience in Servicemembers (Army STARRS). *JAMA Psychiatry*. 2014;71(5):493-503.
30. Mahon MJ, Tobin JP, Cusack DA, Kelleher C, Malone KM. Suicide among regular-duty military personnel: a retrospective case-control study of occupation-specific risk factors for workplace suicide. *Am J Psychiatry*. 2005;162(9):1688-96.
  31. Madsen T, Karstoft KI, Bertelsen M, Andersen SB. Postdeployment suicidal ideations and trajectories of posttraumatic stress disorder in Danish soldiers: a 3-year follow-up of the USPER study. *J Clin Psychiatry*. 2014;75(9):994-1000.
  32. Ripperger MA, Kolli J, Wilimitis D, Robinson K, Reale C, Novak LL, et al. External Validation and Updating of a Statistical Civilian-Based Suicide Risk Model in US Naval Primary Care. *JAMA Netw Open*. 2023;6(11):e2342750.
  33. Zuromski KL, Bernecker SL, Chu C, Wilks CR, Gutierrez PM, Joiner TE, et al. Pre-deployment predictors of suicide attempt during and after combat deployment: Results from the Army Study to Assess Risk and Resilience in Servicemembers. *J Psychiatr Res*. 2020;121:214-21.
  34. Campbell-Sills L, Stein MB, Liu H, Agtarap S, Heeringa SG, Nock MK, et al. Associations of Lifetime Traumatic Brain Injury Characteristics With Prospective Suicide Attempt Among Deployed US Army Soldiers. *J Head Trauma Rehabil*. 2020;35(1):14-26.
  35. Phillips CJ, LeardMann CA, Vyas KJ, Crum-Cianflone NF, White MR. Risk Factors Associated With Suicide Completions Among US Enlisted Marines. *Am J Epidemiol*. 2017;186(6):668-78.
  36. Ursano RJ, Kessler RC, Naifeh JA, Herberman Mash H, Fullerton CS, Bliese PD, et al. Risk of Suicide Attempt Among Soldiers in Army Units With a History of Suicide Attempts. *JAMA Psychiatry*. 2017;74(9):924-31.
  37. Chu C, Zuromski KL, Bernecker SL, Gutierrez PM, Joiner TE, Liu H, et al. A test of the interpersonal theory of suicide in a large, representative, retrospective and prospective study: Results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *Behav Res Ther*. 2020;132:103688.
  38. Ursano RJ, Kessler RC, Stein MB, Naifeh JA, Nock MK, Aliaga PA, et al. Medically Documented Suicide Ideation Among U.S. Army Soldiers. *Suicide Life Threat Behav*. 2017;47(5):612-28.
  39. Naifeh JA, Ursano RJ, Kessler RC, Aliaga PA, Mash HBH, Fullerton CS, et al. Early First Deployment and Risk of Suicide Attempt Among First-term Enlisted Soldiers in the U.S. Army. *Suicide Life Threat Behav*. 2020;50(2):345-58.
  40. Naifeh JA, Mash HBH, Stein MB, Vance MC, Aliaga PA, Fullerton CS, et al. Sex Differences in US Army Suicide Attempts During the Wars in Iraq and Afghanistan. *Med Care*. 2021;59(2 Suppl):S42-s50.
  41. Ursano RJ, Kessler RC, Stein MB, Naifeh JA, Aliaga PA, Fullerton CS, et al. Suicide Attempts in the US Army During the Wars in Afghanistan and Iraq, 2004 to 2009. *JAMA Psychiatry*. 2015;72(9):917-26.
  42. Ursano RJ, Kessler RC, Naifeh JA, Mash HH, Fullerton CS, Ng THH, et al. Suicide attempts in U.S. Army combat arms, special forces and combat medics. *BMC Psychiatry*. 2017;17(1):194.
  43. Ursano RJ, Kessler RC, Naifeh JA, Herberman Mash HB, Nock MK, Aliaga PA, et al. Risk Factors Associated With Attempted Suicide Among US Army Soldiers Without a History of Mental Health Diagnosis. *JAMA Psychiatry*. 2018;75(10):1022-32.
  44. Anderson L, Campbell-Sills L, Ursano RJ, Kessler RC, Sun X, Heeringa SG, et al. Prospective associations of perceived unit cohesion with postdeployment mental health outcomes. *Depress Anxiety*. 2019;36(6):511-21.

45. Luu A, Campbell-Sills L, Sun X, Kessler RC, Ursano RJ, Jain S, et al. Prospective Association of Unmet Mental Health Treatment Needs With Suicidal Behavior Among Combat-Deployed Soldiers. *Psychiatr Serv.* 2023;74(8):809-15.
46. Ursano RJ, Kessler RC, Naifeh JA, Herberman Mash H, Fullerton CS, Aliaga PA, et al. Associations of Time-Related Deployment Variables With Risk of Suicide Attempt Among Soldiers: Results From the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *JAMA Psychiatry.* 2018;75(6):596-604.
47. Gilman SE, Bromet EJ, Cox KL, Colpe LJ, Fullerton CS, Gruber MJ, et al. Sociodemographic and career history predictors of suicide mortality in the United States Army 2004-2009. *Psychol Med.* 2014;44(12):2579-92.
48. Street AE, Gilman SE, Rosellini AJ, Stein MB, Bromet EJ, Cox KL, et al. Understanding the elevated suicide risk of female soldiers during deployments. *Psychol Med.* 2015;45(4):717-26.
49. Ursano RJ, Kessler RC, Stein MB, Naifeh JA, Aliaga PA, Fullerton CS, et al. Risk Factors, Methods, and Timing of Suicide Attempts Among US Army Soldiers. *JAMA Psychiatry.* 2016;73(7):741-9.
50. Shelef L, Kaminsky D, Carmon M, Kedem R, Bonne O, Mann JJ, et al. Risk factors for suicide attempt among Israeli Defense Forces soldiers: A retrospective case-control study. *J Affect Disord.* 2015;186:232-40.
51. Shakarchy N, Tatsa-Laur L, Kedem R, Yehuda AB, Shelef L. Risk Factors Associated With Various Severities of Suicidal and Non-Suicidal Self-Harm Among Israel Defense Forces Soldiers—A Nested Case–Control Study. *Military Medicine.* 2023;188(7-8):E2133-E42.
52. Ryan AT, Ghahramanlou-Holloway M, Wilcox HC, Umhau JC, Deuster PA. Mental Health Care Utilization and Psychiatric Diagnoses in a Sample of Military Suicide Decedents and Living Matched Controls. *J Nerv Ment Dis.* 2020;208(9):646-53.
53. Kessler RC, Warner CH, Ivany C, Petukhova MV, Rose S, Bromet EJ, et al. Predicting suicides after psychiatric hospitalization in US Army soldiers: the Army Study To Assess Risk and Resilience in Servicemembers (Army STARRS). *JAMA Psychiatry.* 2015;72(1):49-57.
54. Ribeiro JD, Gutierrez PM, Joiner TE, Kessler RC, Petukhova MV, Sampson NA, et al. Health care contact and suicide risk documentation prior to suicide death: Results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *J Consult Clin Psychol.* 2017;85(4):403-8.
55. Luxton DD, Trofimovich L, Clark LL. Suicide risk among US Service members after psychiatric hospitalization, 2001-2011. *Psychiatr Serv.* 2013;64(7):626-9.
56. Edwards ER, Coolidge B, Ruiz D, Epshteyn G, Krauss A, Gorman D, et al. Situational stress and suicide attempt behavior in Army soldiers and veterans: Insights from the Army Study to Assess Risk and Resilience in Servicemembers-Longitudinal Study. *Suicide Life Threat Behav.* 2023;53(4):642-54.
57. Mash HBH, Ursano RJ, Kessler RC, Naifeh JA, Fullerton CS, Aliaga PA, et al. Predictors of Suicide Attempt Within 30 Days After First Medically Documented Suicidal Ideation in U.S. Army Soldiers. *Am J Psychiatry.* 2021;178(11):1050-9.
58. <sup>58</sup>. Mash HBH, Ursano RJ, Kessler RC, Naifeh JA, Fullerton CS, Aliaga PA, et al. Predictors of suicide attempt within 30 days of first medically documented major depression diagnosis in U.S. army soldiers with no prior suicidal ideation. *BMC Psychiatry.* 2023;23(1):392.
59. Naifeh JA, Ursano RJ, Stein MB, Mash HBH, Aliaga PA, Fullerton CS, et al. Association of Premilitary Mental Health With Suicide Attempts During US Army Service. *JAMA Netw Open.* 2022;5(6):e2214771.

60. Cigrang JA, Balderrama-Durbin C, Snyder DK, Talcott GW, Tatum J, Baker M, et al. Predictors of Suicidal Ideation Across Deployment: A Prospective Study. *J Clin Psychol.* 2015;71(9):828-42.
61. Hom MA, Duffy ME, Rogers ML, Hanson JE, Gutierrez PM, Joiner TE. Examining the link between prior suicidality and subsequent suicidal ideation among high-risk US military service members. *Psychol Med.* 2019;49(13):2237-46.
62. Naifeh JA, Nock MK, Ursano RJ, Vegella PL, Aliaga PA, Fullerton CS, et al. Neurocognitive Function and Suicide in U.S. Army Soldiers. *Suicide Life Threat Behav.* 2017;47(5):589-602.
63. Rosellini AJ, Street AE, Ursano RJ, Chiu WT, Heeringa SG, Monahan J, et al. Sexual Assault Victimization and Mental Health Treatment, Suicide Attempts, and Career Outcomes Among Women in the US Army. *Am J Public Health.* 2017;107(5):732-9.
64. Naifeh JA, Ursano RJ, Stein MB, Mash HBH, Aliaga PA, Fullerton CS, et al. Optimism, Sociability, and the Risk of Future Suicide Attempt among U.S. Army Soldiers. *Mil Med.* 2024;189(7-8):e1642-e52.
65. Naifeh JA, Ursano RJ, Stein MB, Mash HBH, Aliaga PA, Fullerton CS, et al. Prospective associations of emotion reactivity and risk behaviors with suicide attempts in US Army soldiers. *Psychol Med.* 2023;53(13):6124-31.
66. Trachik B, Oakey-Frost N, Ganulin ML, Adler AB, Dretsch MN, Cabrera OA, et al. Military suicide prevention: The importance of leadership behaviors as an upstream suicide prevention target. *Suicide Life Threat Behav.* 2021;51(2):316-24.
67. Chioqueta AP, Stiles TC. Cognitive factors, engagement in sport, and suicide risk. *Arch Suicide Res.* 2007;11(4):375-90.
68. Umhau JC, George DT, Heaney RP, Lewis MD, Ursano RJ, Heilig M, et al. Low vitamin D status and suicide: a case-control study of active duty military service members. *PLoS One.* 2013;8(1):e51543.
69. Bryan CJ, Ray-Sannerud, B. N., Morrow, C. E., & Etienne, N. Optimism reduces suicidal ideation and weakens the effect of hopelessness among military personnel. *Cognitive Therapy and Research.* 2013;37:996-1003.
70. Fikretoglu D, Sharp M-L, Adler AB, Bélanger S, Benassi H, Bennett C, et al. Pathways to mental health care in active military populations across the Five-Eyes nations: An integrated perspective. *Clinical Psychology Review.* 2022;91:102100.
71. van der Wal H, Duijnkerke, D., Engel, M. F., Hoencamp, R., & Hazelzet, J. A. Value-based healthcare from a military health system perspective: a systematic review. *BMJ Open.* 2024;14(11):e085880.

Figure 1

This figure shows the process of identifying, screening, and assessing eligibility for studies included in this systematic review.