



Women's Mental Health in the U.S. Military — Where Are We Now? A Review of Recent Research

Paulette T. Cazares¹ · Evan Caporaso² · Danielle Rumsey³ · Francine Segovia⁴ · Abigail Yablonsky⁵ · Lyndse Anderson³ · Genelle Weits³

Accepted: 6 July 2021 / Published online: 29 September 2021

This is a U.S. government work and not under copyright protection in the U.S.; foreign copyright protection may apply 2021

Abstract

Purpose of Review The field of women's mental health has grown in the military healthcare system, which has begun to acknowledge and address the sex-specific differences in mental health for service women. The purpose of this review is to examine recent research in active duty populations addressing perinatal mental health, post-traumatic stress disorder (PTSD), depression, and gender isolation.

Recent Findings Within the examined literature focused on active duty populations, analyses by sex and gender continue to exist as notable gaps, and a majority of studies reviewed either do not aim to examine sex or gender-based differences, and/or do not analyze data with an eye towards these paradigms. Within perinatal mental health, the lack of studies led to an inability to make any notable conclusions. PTSD was the area with the most robust publications focused on active duty women, studies of major depression showed significant occupational impact, and the area of gender isolation continues to grow as a promising field with practical implications.

Summary We discuss current promising research and advance ideas for future research trajectories that will provide clinicians, policy makers, and scientists with more data to support improved mental healthcare for both military women and men.

Keywords Military · Active duty · Women · Gender · Female · Mental health · Postpartum · Isolation

Introduction

In 1973, the U.S. Government abolished the all-male draft and began to offer voluntary service roles to women, albeit limited in scope. These roles have expanded over time, and in 2016, the final sex-based occupational limitations

were removed, allowing women the latitude to pursue all military roles that had heretofore been open only to men [1]. Consistent with executive research which has shown a diverse workforce is a stronger one, the emphasis on inclusion of women in the military would be consistent with enhanced mission accomplishment [2]. As military demographics continue to shift toward a larger female contingent, the military medical infrastructure that developed over centuries, without organic need to accommodate the unique needs of female service members, is recognizing the need to shift. This need has emerged as of-value to the female population, through observed surveys, focus groups, and reports [3]. Not only do women desire privacy in both hospital and deployed settings [4], but they also want providers with specific training in comprehensive women's health reference and enforcement of policies to protect women. The need for awareness of sex-based musculoskeletal differences and orthopedic injuries are two broad examples [5, 6], although access to, and provision of, preferred contraceptive options is one specific, more readily understood example [7, 8]. This rubric extends

This article is part of the Topical Collection on *Military Mental Health*

✉ Paulette T. Cazares
ptucc76@gmail.com; paulette.r.cazares.mil@mail.mil

¹ Naval Medical Readiness and Training Center (NMRTC), PSC 482, Box 1600 FPO AP 96362, Okinawa, Japan

² 3rd Marine Regiment, 3rd Marine Division, Hawaii, USA

³ Naval Medical Readiness and Training Center San Diego, San Diego, USA

⁴ Naval Medical Readiness and Training Center Pearl Harbor, Pearl Harbor, USA

⁵ Naval Medical Research Center Silver Spring, Silver Spring, USA

beyond the military health system, where clinical practice guidelines are beginning to be encouraged across medical disciplines, in line with guidance from the NIH and multiple medical societies, to address the unique role of sex in the development, treatment, and trajectory of various illnesses [9].

The evolving scope of women in active duty military service raises important questions about how this unique life experience moderates the sex and gender-based discrepancies in mental illness that have been observed in the general population. A growing area of focus in women's mental health is the link between mental health disorders and influential social factors such as gender discrimination, gender-directed violence, military service, wage gaps, poverty rates, and disproportionate caregiving roles [10]. The unique social and occupational challenges confronted by female military service members, combined with the stressors, pressures, and risk factors universally known to women, present an opportunity to expand women's mental health research.

The authors herein have elected to carefully examine research published within the past 3 years addressing the following major topics: perinatal mental health, post-traumatic stress disorder (PTSD), depression, and gender isolation. This is not an exhaustive list, but one that was considered to represent major areas of mental health morbidity, and one that reflects available research for summary. Search criteria were initially limited to articles involving female active duty service members and were expanded to include relevant female veteran articles, notably when active duty data was unavailable. Landmark articles prior to the 2015 cut-off were included to establish a baseline understanding when needed.

Significant disparities across sex and gender have been noted in the development of depression, anxiety, post-traumatic stress disorder (PTSD), substance use disorders (SUD), suicide rates, and somatoform syndromes [11, 12]. These epidemiologic differences have been observed and yet remain unexplained. This is not unique in the general medical literature, as it was not until 1993 that the Congress mandated fair inclusion of women and minorities in clinical research [13]. In 1994, the National Institutes of Health (NIH) followed, going further, and mandating all grant applications to include women or justify their exclusion [9]. These initiatives have been advanced over subsequent years, most recently in 2016 with further articulation of the need for gender consideration in research design, analysis, and reporting [14]. The aim is to elucidate evidence that details the differences in incidence, prevalence, and disease trajectories and, ultimately, in possible unique treatments and clinical care models that may decrease both morbidity and mortality in men and women.

Mental Health in Female Active Duty Populations: a Major Recent Investigation

As a notable background, a large-scale scoping review was recently performed appraising the scientific literature on the complete spectrum of published articles on the health of U.S. military women, focusing on the years 2000–2015 [15]. The review utilized a gap analysis matrix which overlaid quality criteria and numbers of articles within each specific subtopic, consistent with national organizational research priorities, with in-depth military healthcare system diagnostic data. This technique revealed several areas of concern, including psychological health in active duty military women [15]. Mental health stigma was one subtopic identified as a research gap due to a low number of published articles ($n = 13$). Furthermore, in the past 10 years, four national organizations (Department of Veterans Affairs, American College of Obstetrics and Gynecology, Defense Health Agency, and Department of Defense) have highlighted the underutilization of mental health services as problematic for military populations. As stated by the authors, “The mental health of service members, as well as the associated stigma of seeking care, are of particular concern because they can impact individual, as well as socially accepted, beliefs about mental health and treatment-seeking behavior” [15; p.123]. The authors in the above study commented that the gap analysis methodology was conservative by design (only 4 subtopics were identified as gaps within psychological health); mental health professionals may have found additional gaps and areas of concern not annotated in the review, and all articles included in the scoping review have been made publicly available in an online searchable database for the research and clinician communities [16].

Pregnancy and Peripartum Mental Health

Traditionally, the overarching view of Women's Mental Health has been that of “reproductive psychiatry.” A large proportion of psychiatric research among servicewomen to date comprises gynecological and obstetric investigation, with a particular emphasis on readiness and health promotion within this domain. However, there are limited numbers of studies involving mental health considerations and psychological pathology among military women during the perinatal period, and a number of recently published articles allude to this significant research gap. Despite a growing body of science investigating the psychosocial stressors of pregnancy and childbirth in military women [17, 18], longitudinal studies are lacking that examine the impact of behavioral health assessment and intervention

in the obstetric and postpartum populations. Studies in this arena would help to decrease perinatal psychosocial stressors and psychiatric symptomatology [19].

This section addresses military women's mental health as it relates to contraceptive use, pregnancy, and postpartum outcomes. We do not address the impact of infertility issues, which is an important research gap for future analysis.

Utilization of long-acting reversible contraception (LARC) among active duty women is steadily rising, noted to be 14.5% among Army female service members in a 2017 study [20•]. The effects of LARC use on mental health and deployment readiness within the military population is a subject of ongoing research. A recent analysis involving active duty, veteran, and dependent postpartum women evaluating the link between hormonal contraceptive use and subsequent diagnosis of depression (or initiation of antidepressant therapy) in the postpartum period found that depression rates varied with the type of hormonal contraception used [21]. Relative to use of norethindrone-only pills or levonorgestrel intrauterine systems, etonogestrel-containing methods of contraception (i.e., Nexplanon, NuvaRing) were associated with an elevated adjusted hazard ratio of 1.22 ($p < 0.001$) for antidepressant use [21].

Due to a dearth of recent publications addressing prenatal mental healthcare in active duty populations, studies involving expectant mothers in the veteran community were reviewed. A recent study evaluated the scope of modifiable preconception risk factors (health behaviors, chronic conditions, and mental health, among women of childbearing age) and their impact on perinatal mental health in women with, and without, a history of active duty military service. This analysis demonstrated a higher prevalence of prenatal depression (26.5% vs 21.6%, $p < 0.01$) and insomnia (49.6% vs 36.3%, $p < 0.001$) among those with a history of military service, perhaps suggesting a unique preconception mental health profile among active duty women [22].

Group prenatal care is a recent healthcare innovation designed to improve obstetric patient education and spark social support among pregnant women in local communities, while maintaining individualized physical assessments and routine risk evaluations. According to the American College of Obstetricians and Gynecologists (ACOG), evidence suggests that patients who partake in group prenatal care acquire more robust prenatal knowledge, feel better equipped for the labor and delivery process, and appear to be more satisfied with their prenatal care overall [23]. A 2017 randomized controlled trial involving active duty and dependent females aimed to determine the efficacy of a military-based group prenatal program termed Mentors Offering Maternal Support (MOMS) in alleviating pregnancy-specific prenatal anxiety and depression [24]. Compared to the care-as-usual arm, the MOMS program decreased prenatal depression and anxiety and improved resiliency. Of note, compared to

all other demographic groups in the study, rates of prenatal anxiety were highest in single military women ($p < 0.0001$ vs $p = 0.014$) [24]. Another study with a similar pregnant population revealed no statistical difference in depression and anxiety rates among women using group prenatal care (via the Centering Pregnancy model) and those seeking prenatal care from a provider one-on-one [25]. Given these incongruent findings, further investigation into the efficacy of new prenatal mental health initiatives, both for active duty women and for healthcare systems, is necessary.

There were no identified studies within the past 3 years investigating postpartum psychiatric issues in active duty females; however, a publication addressing this topic in female veterans indicated a significant association between a history of military sexual harassment and postpartum emotional disturbance ($\chi^2 4.6$, $p < 0.05$) [26•]. Other authors have expounded on the need for further investigation of the interplay of reproductive health and psychiatric disorders in the female veteran population [27].

Post-traumatic Stress Disorder

PTSD is among the most robustly studied topics in military women's mental health [28••, 29], and recent research confirms that PTSD is of concern among active duty and veteran personnel. Historically, wartime exposures have been linked to PTSD prevalence rates of 20% among active duty female populations who served in Vietnam [30]. Three studies below address more current rates in the active duty forces. First, in a recent study that involved 27,997 active duty Army women who served in Afghanistan and Iraq, the odds ratio of a post-deployment positive PTSD screen ranged from 4.19 in those who experienced 1 combat exposure to 27.83 in those who had 3 or more combat exposures [31]. An analysis of U.S. Navy healthcare personnel in 2017 investigated PTSD symptomatology among 667 female and 3608 male subjects, as assessed by the Post-Deployment Health Assessment (PDHA) [32]. After adjusting for deployment factors and other demographic variables, women had significantly higher odds of a positive PTSD screen compared to men (OR 1.99, $p < 0.001$), with combat exposure conferring the greatest effect on the statistical model [32]. In a review of psychiatric aeromedical evacuations from Operations Enduring Freedom, Iraqi Freedom, and New Dawn, females were 14.9% of the active duty force but represented 16.1% of psychiatric aeromedical evacuees (OR = 1.1, $p < 0.01$) [32]. PTSD was a leading diagnosis substantiating removal from military theater among both genders, representing 9.7% of total cases [33].

Reports in both the scientific and lay realms have highlighted the tragic role that sexual assault has played in the etiology of PTSD. A recent analysis demonstrated that

sexual assault independently increased the odds of several negative outcomes, including PTSD diagnosis, and contributed to military career attrition [34], even after controlling for pre-assault characteristics [35]. A study involving 383 veteran women investigated the link between specific aspects of military trauma and their correlation to post-traumatic symptomatology as assessed by PCL-5 (Post-Traumatic Check List-5) score [36]. Statistically significant associations with PTSD symptomatology were identified, in decreasing order of strength, for sexual assault ($p < 0.001$), feeling in danger of being killed ($p < 0.001$), sexual harassment ($p < 0.01$), and witnessing someone else killed or injured ($p < 0.05$) [36].

Other research has highlighted limitations in current standard-of-care therapies for PTSD. A randomized controlled trial of 235 female veterans and Army soldiers evaluated prolonged exposure (PE) vs present-centered therapy (PCT) [37]. Symptom retention following treatment was generally high, but particularly so in those with hyperarousal symptomatology, with “difficulty falling asleep” having the highest probability for symptom retention (81%) across both treatment groups [37]. The authors suggest that although PTSD might initiate symptomatology, patients may develop a primary sleep disorder over time that requires additional adjunctive interventions, such as CBT-insomnia, for adequate treatment [37]. Other PTSD symptom clusters, namely anhedonia and dysphoric arousal, were demonstrated to mediate an association between military sexual trauma and downstream sexual dysfunction in a 2018 large-scale study involving 1189 active duty and veteran women [38].

Other researchers have investigated the contribution of gender role socialization as a mediator of PTSD development, maintenance, and treatment response [39]. Additionally, there is a body of research investigating the potential link between gonadal hormones and physiological susceptibility to PTSD [40]. These lines of research will help to untangle the confluence of psychological factors, biologic susceptibility, and unique military psychosocial stressors on the development of PTSD in active duty service women. In addition, research specifically investigating contributory factors to PTSD diagnoses, such as healthcare-related stressors, lack of social support, gender isolation, sexual assault experiences, and potential provider bias, is needed.

Depression

Consequent to the interplay of biological and social forces, gender rates of depression strongly diverge in adolescence with an almost doubling of rates in females [41]. Matriculation into military service represents another point of divergence specific to active duty women. An analysis of 2013/2014 Centers for Disease Control and Prevention

Behavioral Risk Factor Surveillance System data demonstrated that women with a history of military service exhibited higher rates of diagnosed depression (27%) compared to those who had not served (22%) [22]. A recent review on the epidemiology of major depression in the U.S. military identified that rates of disability discharge due to major depressive disorder (MDD) increased significantly across fiscal years 2007 to 2012, with females having a higher incidence rate ratio (IRR) than men across all military services, ranging from an IRR of 1.91 ($p < 0.05$) in the Army to an IRR of 2.74 ($p < 0.05$) in the Navy [42].

Major depression is often comorbid with other mental health conditions, such as PTSD, and efforts have been made to identify correlates of MDD with stressors more likely to be encountered in a military context. A recent study involving 403 female veterans investigated the link between depressive and post-traumatic symptomatology and specific trauma etiologies associated with active duty service. In this sample, sexual assault and sexual harassment, but not combat-associated traumas, were significantly associated with general depressive symptomatology [36]. When trauma etiologies in this sample were further assessed for linkages with suicidal ideation (a concerning marker of depression), perceived life threat and military sexual harassment significantly predicted suicidal ideation [43]. Although an assessment of sex and gender-based factors in suicide is beyond the scope of this article, it remains an area of highly relevant research given known gender differences in the lethality of typical suicidal self-directed violence. In a longitudinal cohort study of U.S. Army enlisted soldiers, female soldiers were more likely to attempt suicide than men in any deployment status (never deployed, currently deployed, or previously deployed) with the highest odds occurring while on a current deployment (OR 3.4, $p < 0.05$) [44••].

The interrelationship between female gender and military authority was analyzed with respect to depressive and post-traumatic symptomatology in a study conducted in 2016 [45]. This investigation, which involved 2003 active reserve component (RC) service members, found that female officers were at greatest risk of post-deployment PTSD and depression, relative to their enlisted and male counterparts [45]. This is consistent with past studies of officers and stigma [46•]. The authors postulate that this may be related to the increased strain women experience in achieving occupational status, which aligns with previous studies suggesting a “dose–response” between cumulative trauma load and depression and PTSD. These stressors may be ameliorated by post-deployment social support and financial security, as was evidenced during a 2018 study which demonstrated that these elements were significantly associated with reduced levels of depression among a sample of female veterans of who served in Iraq and Afghanistan [47].

The highly publicized topic of mood disorders in the military has primarily focused on PTSD and suicide. In a study of female military survivors of combat-related injuries from 2003 to 2015 ($n = 1023$), 203 were diagnosed with PTSD within a year of injury, and 173 were diagnosed with a depressive or anxious disorder [48]. In the same study, women with mental health diagnoses ($n = 81$) had significantly lower quality-of-life scores relative to women without mental health diagnoses ($n = 123$) ($p = 0.001$) [48]. Depression should not be underestimated as a source of significant morbidity among women with military traumas. Longitudinally, the presence of depression is an important marker for women's health as they transition to veteran status, with recent studies demonstrating linkages between civilian-sector unemployment and long-term dementia risk [49, 50]. Overall, depression is concentrated in women in both civilian and active duty populations and represents a major target for future interventions in the field of women's military mental health.

Gender Isolation

Research on gender isolation as it relates to mental health is divided into three areas, addressed below. The authors believe this growing body of literature has significant valence for active duty women, and it aims to better understand the negative effects of social isolation on health and performance.

Policy/Program Evaluation

The well-being of active duty women is examined through military service reports which address the organizational and individual consequences of gender on integration, as well as related gaps in current DOD policy. A recent RAND report with the U.S. Air Force focused on gender integration models in the military basic training setting and outlined concerns regarding the fundamental incongruence of the new paradigm of operational gender integration and continued gender-based segregation in basic training environments [51•]. Other reports focused on gender discrimination, sexual harassment, and related policy gaps as they pertained to military women [52•]. One example of clearly identified gender-gaps within DOD policy and program evaluation is the use of male equipment for female service members in military training.

Women and Ostracism

Empirical research on gender isolation has largely focused on psychological health and performance. Investigation in the field of mental health has noted that the psychological

needs of female service members are poorly understood, as is the impact of their status as numerical minorities across all military branches [53]. As the DOD continues to see women expand into all occupational opportunities across all services, the Navy in particular is working diligently to develop strategies that address gaps in women's healthcare. While groups exist across all of the services to survey and recommend best clinical practices for women, there currently is no centralized system in place within the DOD to assess policy, research, and treatment gaps among female service members, and this remains problematic as women are at an increased risk of experiencing gender ostracism and exclusion [54]. This is especially concerning as evidence shows that isolation manifests in lower levels of unit cohesion and leads to increased incidences of mental health symptoms [55].

Solo Status

The negative impact of gender isolation has been further examined through the lens of solo status, a field within social psychology that systematically examines situations in which an individual is the sole representative of a particular social category within a group (i.e., the only woman in an all-male group) [56]. Research in this field has consistently demonstrated that such circumstances elicit *performance detriments* due to stereotype threat, a psychosocial phenomenon in which a person feels they are at risk of conforming to stereotypes about their social group [56]. These situations also stimulate attribution bias and can negatively affect how women in male predominated fields are evaluated, and this in turn can impact female recruitment and retention [57]. Extensive literature reviews revealed only one published work [58••] that utilized this framework to better understand the various barriers encountered by female service members. Knowledge in this area is well established and is being used to create evidence-based interventions in the science, technology, engineering, and math (STEM) fields, and the DOD could benefit by applying these concepts in the operational setting.

Discussion

At first glance, the large-scale review by Yablonsky et al. [15] appears to show that Women's Mental Health is a high priority in current military health research, as the broader topic of psychological health encompassed nearly half of all the articles evaluated within their scoping gap analysis. However, with the exception of post-traumatic stress disorder, we found that the actual availability of usable data on mental healthcare in active duty women remains limited in nearly all topic areas reviewed by our team.

Echoing the broader trends in women's mental health among the general population, studies involving active duty females consistently report differences in rates of psychological morbidity, incidences of comorbid conditions, and impacts of social isolation but fail to investigate the intersectional psychosocial factors contributing to these disparities. An implicit risk is the potential to conclude that these differences are inherent to women themselves rather than stemming from the multifactorial interface between gender and the institutional and sociocultural platforms in which women and men both subsist. For example, the study showing higher rates of medical evacuation of women from military theater could be attributed by readers to a greater difficulty women have in coping with combat exposure and austere deployment environments. However, this presumption neglects to consider the psychosocial effects of gender isolation, family separation, and the impact of higher rates of sexual assault among female service members. It also does not assess the potential bias of commands and healthcare providers. Without increased focus on empirical data that informs the causal and correlational forces behind these differences, such discrepancies are likely to be filtered through long-standing social and cultural biases, whether intentional or not. Furthermore, there is insufficient training to prepare healthcare providers to attend to sex and gender based differences in the domain of ground-level practice [59], and data is widely absent with regard to how awareness of these gender discrepancies might optimize therapeutic approaches for both men and women [60, 61].

Due to limitations in space and a paucity of corresponding research articles, this review was limited to perinatal mental health, post-traumatic stress disorder, depression, and gender isolation. The authors stress, however, that there are important sex-based differences across other areas of women's mental health, including substance use disorders, eating disorders, sexual dysfunction, TBI, and suicide. These differences can be both clinical in nature, as well as systems-based issues and effects of policy effects are areas of focus. As an example, there are unanswered questions in the area of access to substance use disorder treatment for women. Suicide by firearm rates differs in the civilian and veteran populations. Lastly, treatment of sexual dysfunction secondary to a mental health diagnosis is not a covered care under current DOD policy. These impacts, and others like them, may have a disproportionate impact on female service members.

Other areas of research disparity not elucidated within this review include the impact of environmental-chemical exposure on fertility, the risks associated with single motherhood within military service, mental health effects and treatment needs related to perinatal loss, and family planning needs as they relate to health and mission readiness. As a result of government initiatives to increase the DOD's female composition to 25% [62] and the recent removal of

duty restrictions on servicewomen across all branches [63], the need to address these deficiencies in research will likely intensify moving forward. Developing investigative partnerships between the DOD and the Department of Veterans Affairs may help to satisfy the need for ongoing investigation into women's mental health in the U.S. military, with adjustment disorders, personality disorders, eating disorders, and mental health stigma representing four domains where deficits in research mandate new investigation.

Conclusion

The identification of evidence that addresses diagnosis and treatment in this population is crucial for the development of novel and innovative policies and procedures that will support our female military workforce in the future. In the journey towards progress, it is imperative that both clinical leaders and policymakers act with the understanding that women can be both equal to and different from their male counterparts. This mindset will fuel enhancement of services and mission delivery for both women and men.

Acknowledgements This paper was written with the support of the Director for Mental Health, CAPT Scott Kane, Naval Medical Readiness and Training Center, San Diego, who has shown leadership and vision in his support of the growing field of Women's Mental Health within the MHS.

Compliance with Ethical Standard

Conflict of Interest The author declares no competing interests.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

Disclaimer The views expressed in this article reflect the results of research conducted by the author and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the U.S. Government.

I am a military service member or federal/contracted employee of the United States government. This work was prepared as part of my official duties. Title 17 U.S.C. 105 provides that "copyright protection under this title is not available for any work of the United States Government." Title 17 U.S.C. 101 defines a U.S. Government work as work prepared by a military service member or employee of the U.S. Government as part of that person's official duties.

References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

1. Kamarck, K. Women in combat: issues for congress. U.S. Congressional Research Service (R42075). 2016.
2. Hunt V., Prince s., Dixon-Fyle S. & Yee L. Delivering through diversity. McKinsey Academy. 2018.
3. Kimberling, R., Bastian, L., Bevanne, A., Bean-Mayberry, Bucossi, M., Carney, D., Goldstein, K., Phibbs, C, Pomernacki, A, Sadler, A. Yano, E. Frayne, S. Patient-centered mental health care for female veterans. *Psychiatr Serv.* 2015;66(2):155–162. <https://doi.org/10.1176/appi.ps.201300551>.
4. MacGregor C, Hamilton A, Oishi S, Yano E. Description, development, and philosophies of mental health service delivery for female veterans in the VA: a qualitative study. *Women's Health Issues.* 2011;21(4):138–44. <https://doi.org/10.1016/j.whi.2011.04.006>.
5. Templeton KJ, Hame SL, Hannafin JA, Griffin LY, Tosi LL, Shields NN. Sports injuries in women: sex- and gender-based differences in etiology and prevention. *Instr Course Lect.* 2008;57:539–52 (PMID: 18399608).
6. Stumpff K, Hadley M, Corn K, Templeton K. Sex-based reporting of common musculoskeletal conditions. *J Womens Health (Larchmt).* 2020. <https://doi.org/10.1089/jwh.2020.8628>. Epub ahead of print. PMID: 33090896.
7. Access to reproductive health care: the experience of military women, Service Women's Action Network (SWAN). 2018. https://www.servicewomen.org/wp-content/uploads/2018/12/2018ReproReport_SWAN-2.pdf
8. Powell-Dunford NC, Deuster PA, Claybaugh JR, Attitudes and knowledge about continuous oral contraceptive pill use in military women. *Mil Med.* 2003;168(11).
9. Kalt M, Mowery R, Friedman L, Kelty M, Lowman C, Counts G, et al. NIH guidelines on the inclusion of women and minorities as subjects in clinical research. In: *The Federal Register* of 9 Mar 1994. <https://grants.nih.gov/grants/guide/notice-files/not94-100.html>.
10. Diaz-Granados N, McDermott S, Wang F, Posada-Vilaa J, Saavedra J, Rondon MB, et al. Monitoring gender equity in mental health in a low-, middle-, and high-income country in the Americas. *Psychiatr Serv.* 2011;62(5):516–24. https://doi.org/10.1176/ps.62.5.pss6205_0516.
11. • Gender Disparities in Mental Health. World Health Organization. Department of Mental Health and Substance Dependence. https://www.who.int/mental_health/media/en/242.pdf?ua=1. **This is a global summary of gender disparities in mental health with a focus on depression and the impact of socio-economic factors.**
12. Kulkarni J. Women's mental health: still not a priority, still not good enough. *Aust N Z J Psychiatry.* 2014;48(8):701–4. <https://doi.org/10.1177/0004867414541684>.
13. National Institutes of Health Revitalization Act of 1993. S. 1. 103rd Cong. (1993)
14. NOT-OD-15–102: Consideration of sex as a biological variable in NIH-funded research. The National Institutes of Health. 2015
15. Yablonsky AM, Martin R, Highfill-McRoy RM, McAnany J, Fitzmaurice S, Rychnovsky J, et al. Military women's health: a scoping review and gap analysis, 2000–2015 *J Obstet, Gynecol and Neonatal Nursing,* 2019 Jan;48(1):5-15. doi: 10.1016/j.jogn.2018.10.009.
16. TriService Nursing Research Program. Military women's health database [Searchable data set for 979 articles]. 2018. Retrieved from <http://triservicenursing.org/database/womenshealth>
17. Quarterly Meeting Minutes, Defense Advisory Committee on Women in the Services (DACOWITS). 2017. https://dacowits.defense.gov/Portals/48/Documents/Reports/2017/Minutes/JuneDACOWITSQuarterlyBusinessMeetingMinutes_FINAL.pdf.
18. Bray RM, Camlin CS, Fairbank JA, Duntelman GH, Wheelless SC. The effects of stress on job functioning of military men and women. *Armed Forces Society.* 2001;27(3):397–417.
19. Weis KL, Elmore KO. Current military perinatal mental health treatment models. In: *Perinatal mental health and the military family: identifying and treating mood and anxiety disorders.* Thiam M. A. (ed). New York: Routledge; 2016.
20. • Erickson AK, Nelson DA, Shaw JG, Loftus PD, Kurina LM, Shaw KA. Long- acting reversible contraceptive placement among active-duty U.S. Army servicewomen. *Obstet Gynecol* 2017; 129(5): 800–809. <https://doi.org/10.1097/AOG.0000000000001971>. **This study quantifies the uptake of long-acting reversible contraceptives (LARC) among U.S. Army active-duty female soldiers and identifies characteristics associated with uptake.**
21. Roberts TA, Hansen S. Association of hormonal contraception with depression in the postpartum period. *Contraception.* 2017;96(6):446–52. <https://doi.org/10.1016/j.contraception.2017.08.010>.
22. McCabe JE, Katon JG, Ma E, Fortney JC, Grote NK, Zephyrin LC, et al. Preconception health risk factors in women with and without a history of military service. *Women's Health Issues.* 2018;28(6):539–45. <https://doi.org/10.1016/j.whi.2018.08.002>.
23. ACOG committee opinion no. 731. Group prenatal care. *Obstet Gynecol.* 2018;131(3):e104–e108. <https://doi.org/10.1097/AOG.0000000000002529>
24. Weis KL, Lederman RP, Walker KC, Chan W. Mentors offering maternal support reduces prenatal, pregnancy-specific anxiety in a sample of military women. *J Obstet Gynecol Neonatal Nurs.* 2017;46(5):669–85. <https://doi.org/10.1016/j.jogn.2017.07.003>.
25. Tubay AT, Mansalis KA, Simpson MJ, Armitage NH, Briscoe G, Potts V. The effects of group prenatal care on infant birthweight and maternal well-being: a randomized controlled trial. *Mil Med.* 2019;184(5–6):e440–6. <https://doi.org/10.1093/milmed/usy361>.
26. • Miller LJ, Ghadiali NY. Mental health across the reproductive cycle in women veterans. *Mil Med.* 2018;183(5–6):e140–6. <https://doi.org/10.1093/milmed/usx094>. **This study revealed high proportions of study participants at a VA Women's Health clinic who reported emotional symptoms across pre-menstrual time periods, pregnancy, postpartum, and peri-menopause.**
27. Shivakumar G, Anderson EH, Suris AM. Managing posttraumatic stress disorder and major depression in women veterans during the perinatal period. *J Womens Health (Larchmt).* 2015;24(1):18–22. <https://doi.org/10.1089/jwh.2013.4664>.
28. • Tolin DF, Foa EB. Sex differences in trauma and posttraumatic stress disorder: a quantitative review of 25 years of research. *Psychol Bull.* 2006;132(6):959–92. <https://doi.org/10.1037/0033-2909.132.6.959>. **This article is a landmark summary of data that reveals sex-based differences in the incidence and prevalence of PTSD.**
29. Surís A, Lind L, Kashner TM, Borman PD, Petty F. *Psychosom Med.* 2004;66(5):749–56. <https://doi.org/10.1097/01.psy.0000138117.58559.7b>.
30. Magruder K, Serpi T, Kimerling R, Kilbourne AM, Collins JF, Cypel Y, et al. Prevalence of posttraumatic stress disorder in Vietnam-era women veterans. *JAMA Psychiat.* 2015;72(11):1127–34. <https://doi.org/10.1001/jamapsychiatry.2015.1786>.
31. Adams RS, Nikitin RV, Wooten NR, Williams TV, Larson MJ. The association of combat exposure with postdeployment behavioral health problems among U.S. Army enlisted women returning from Afghanistan or Iraq. *J Trauma Stress.* 2016;29(4):356–64. <https://doi.org/10.1002/jts.22121>.
32. Macgregor AJ, Clouser MC, Mayo JA, Galarneau MR. Gender differences in posttraumatic stress disorder among U.S.

- Navy healthcare personnel. *J Womens Health (Larchmt)*. 2017;26(4):338–44. <https://doi.org/10.1089/jwh.2014.5130>.
33. Peterson AL, Hale WJ, Baker MT, Cigrang JA, Moore BA, Straud CL, et al. Psychiatric aeromedical evacuations of deployed active duty U.S. military personnel during Operations Enduring Freedom, Iraqi Freedom, and New Dawn. *Mil Med*. 2018;183(11–12):e649–58. <https://doi.org/10.1093/milmed/usy188>.
 34. Parnell D, Ram V, Cazares P, Webb-Murphy J, Roberson M, Ghaed S. Sexual assault and disabling PTSD in active duty service women. *Mil Med*. 2018;183(9–10):e481–8. <https://doi.org/10.1093/milmed/usy048>.
 35. Rosellini AJ, Street AE, Ursano RJ, Chiu WT, Heeringa SG, Monahan J, Naifeh JA, 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. <https://doi.org/10.2105/AJPH.2017.303693>.
 36. Goldstein LA, Dinh J, Donalson R, Hebenstreit CL, Maguen S. Impact of military trauma exposures on posttraumatic stress and depression in female veterans. *Psychiatry Res*. 2017;249:281–5. <https://doi.org/10.1016/j.psychres.2017.01.009>.
 37. Schnurr PP, Lunney CA. Residual symptoms following prolonged exposure and present-centered therapy for PTSD in female veterans and soldiers. *Depress Anxiety*. 2019;36(2):162–9. <https://doi.org/10.1002/da.22871>.
 38. Blais RK, Geiser C, Cruz RA. Specific PTSD symptom clusters mediate the association of military sexual trauma severity and sexual function and satisfaction in female service members/veterans. *J Affect Disord*. 2018;238:680–8. <https://doi.org/10.1016/j.jad.2018.05.052>.
 39. Street AE, Dardis CM. Using a social construction of gender lens to understand gender differences in posttraumatic stress disorder. *Clin Psychol Rev*. 2018;66:97–105. <https://doi.org/10.1016/j.cpr.2018.03.001>.
 40. Garcia NM, Walker RS, Zoellner LA. Estrogen, progesterone, and the menstrual cycle: a systematic review of fear learning, intrusive memories, and PTSD. *Clin Psychol Rev*. 2018;66:80–96. <https://doi.org/10.1016/j.cpr.2018.06.005>.
 41. Salk RH, Hyde JS, Abramson LY. Gender differences in depression in representative national samples: meta-analyses of diagnoses and symptoms. *Psychol Bull*. 2017;143(8):783–822. <https://doi.org/10.1037/bul0000102>.
 42. Packnett ER, Elmasry H, Toolin CF, Cowan DN, Boivin MR. Epidemiology of major depressive disorder disability in the US Military: FY 2007–2012. *J Nerv Ment Dis*. 2017;205(9):672–8. <https://doi.org/10.1097/NMD.0000000000000692>.
 43. Khan AJ, Li Y, Dinh JV, Donalson R, Hebenstreit CL, Maguen S. Examining the impact of different types of military trauma on suicidality in women veterans. *Psychiatry Res*. 2019;274:7–11. <https://doi.org/10.1016/j.psychres.2019.02.025>.
 - 44.●● 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 Psychiat*. 2016;73(7):741–9. <https://doi.org/10.1001/jamapsychiatry.2016.0600>. **This study identified that the timing and risk factors for suicide attempts in soldiers requires consideration of environmental context, individual characteristics, and mental health diagnoses.**
 45. Cohen GH, Sampson LA, Fink DS, Wang J, Russel D, Gifford R, et al. Gender, position of authority, and the risk of depression and posttraumatic stress disorder among a national sample of US Reserve component personnel. *Womens Health Issues*. 2016;26(3):268–77. <https://doi.org/10.1016/j.whi.2016.01.001>.
 - 46.● Britt TW, Wright KM, Moore D. Leadership as a predictor of stigma and practical barriers toward receiving mental health treatment: a multilevel approach. *Psychol Serv*. 2012;9(1):26–37. <https://doi.org/10.1037/a0026412>. **This study examined positive and negative leadership behaviors as predictors of stigma showing that positive NCO leader behaviors were inversely related to practical barriers to mental health treatment.**
 47. Sairsingh H, Solomon P, Helstrom A, Treglia D. Depression in female veterans returning from deployment: the role of social factors. *Mil Med*. 2018;183(3–4):e133–9. <https://doi.org/10.1093/milmed/usx065>.
 48. Dye, JL. Factors that contribute to mental health in combat injured military women [Dissertation]. Tucson, AZ: the University of Arizona; 2018.
 49. Hamilton AB, Williams L, Washington DL. Military and mental health correlates of unemployment in a national sample of women veterans. *Med Care*. 2015;53(4 suppl 1):S32–8. <https://doi.org/10.1097/MLR.0000000000000297>.
 50. Yaffe K, Lwi SJ, Hoang TD, Xia F, Barnes DE, Maguen S, et al. Military-related risk factors in female veterans and risk of dementia. *Neurology*. 2019;92(3):e205–11. <https://doi.org/10.1212/WNL.0000000000006778>.
 - 51.● Agnes GS, Jones DD, Naber AM, Goughnour T, Lim N. An assessment of options for increasing gender integration in Air Force Basic Military Training. Santa Monica, CA: RAND Corporation; 2018. **This publication summarizes a USAF request from the RAND Corporation to assist its assessment of options to increase gender-integrated training in Basic Military Training.**
 - 52.● Davis TJ, Myers JC, Bowling II RD. *2018 executive summary*. Defense Advisory Committee on Women in the Services. 2019. <https://dacowits.defense.gov/Portals/48/Documents/Reports/2018/Annual%20Report/DACOWITS%20ES%202018.pdf>. **This summary highlights the latest from a stalwart group, highlighting the need for continued recruitment and retention of women for a mission-ready force, suggestions for gender-integration in training, assurances for personal protective equipment, and recommendations for well-being.**
 53. McGraw K, Koehlmos TP, Ritchie EC. Women in combat: framing the issues of health and health research for American's servicewomen. *Mil Med*. 2016;181(1 Suppl):7–11. <https://doi.org/10.7205/MILMED-D-15-00223>.
 54. McGraw K. Mental health of women warriors: the power of belonging. Women at War. Ritchie E. C. & Naclerio A. L (Ed). New York, NY: Oxford University Press. 2015:311–320. <https://doi.org/10.1093/med/9780199344536.001.0001>
 55. DeViva JC, Sheerin CM, Southwick SM, Roy AM, Pietrzak RH, Harpaz-Rotem I. Correlates of VA mental health treatment utilization among OEF/OIF/OND veterans: resilience, stigma, social support, personality, and beliefs about treatment. *Psychol Trauma*. 2016;8(3):310–8. <https://doi.org/10.1037/tra0000075>.
 56. Lewis NA, Sekaquaptewa D. Beyond test performance: a broader view of stereotype threat. *Curr Opin Psychol*. 2016;11:40–3. <https://doi.org/10.1016/j.copsy.2016.05.002>.
 57. Lacosse J, Sekaquaptewa D, Bennett J. STEM stereotypic attribution bias among women in an unwelcoming science setting. *Psychol Women Q*. 2016;40:378–97. <https://doi.org/10.1177/0361684316630965>.
 - 58.● Archer E. The power of gendered stereotypes in US Marine Corps. *Armed Forces Soc*. 2012;39:359–91. <https://doi.org/10.1177/0095327X12446924>. **This study highlights not only the negative impact that gendered stereotypes have on female USMC members, but also the potential these stereotypes carry to impact the performance of others around her.**
 59. Osborne LM, Hermann A, Burt V, Driscoll K, Fitelson E, Meltzer-Brody S. Reproductive psychiatry: the gap between clinical need and education. *Am J Psychiatry*. 2015;172(10):946–8. <https://doi.org/10.1176/appi.ajp.2015.15060837>.
 - 60.● Reicher-Rossler A. Sex and gender differences in mental disorders. *Lancet Psychiatry*. 2017;4(1):8–9. <https://doi.org/10.1016>

[S2215-0366\(16\)30348-0](#). This article is one of four in a unique series on women's mental health to discuss gender-specific issues relevant to mental disorders and highlights the continued lack of studies in this area.

61. Pineles SL, Borba CPC. A path towards effectively investigating the impact of sex and gender on mental health. *Clin Psychol Rev.* 2018;66:1–2. <https://doi.org/10.1016/j.cpr.2018.11.004>.
62. Olson W. Admiral says Navy's goal is 25 percent women in each ship, Squadron.
63. Roth, T. Redefining women's place in National Defense: a history of women in the military. *Perspectives on History: The Newsmagazine of the American Historical Association.* 2015.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.